COMPUTER SCIENCE & APPLICATIONS

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CONTENTS

CHAPTER 1

RECENT ROLE OF HUMANCOMPUTER INTERACTION IN E-LEARNING FOR THE DEVELOPMENT OF EDUCATION SYSTEM

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ABSTRACT: Human-computer interaction (HCI) is a technological development of science that studies how humans and computers interface.The use of HCIplays a major role in boosting the education and learning experiences in the institutions of higher learning. There are many E-learning choices on the market place now, and the majority of them are even free. SuchresolutionsincludeE-books, interactive lessons, mobile-based instructional resources, educational games, video-based lectures, interactive revision exercises, and so on. This study focuses on the importance of HCI in electronics learning and how it provides benefits to the educational sectors. Students of various ages attend higher education institutions. This study examines the importance of HCI in the creation of an advanced E-learning systems. It's important to assess all of the concepts of Human-Computer Interaction (HCI) to assure that an efficient E-learning solution is equipped with a suitable user interface. The results conclude that HCI in today's generation helps to develop recommendations for improving the design of E-learning solutions for certain users in future.

KEYWORDS: Education, E-learning, HumanComputer Interaction, Mobile Learning, Technology.

1. INTRODUCTION

The creation of effective E-learning systems with a heavy emphasis on accessibility relies heavily on human-computer interaction (HCI).The goal of this study is to look at the connection among human-computer interaction as well as advancedE-learning. In order to meet the project's objectives, enough collected data were analyzed to look into the possibility of integrating HCI with E-learning.In order to generate the maximum possible E-learning apps for learners, developers and designers should recognize and apply appropriate HCI concepts as technology progresses. E-learning is no exception to the concepts of human interaction. For diverse levels of users, E-learning systems require proper design of user's interface (UI).The UI pattern for simple users, which may be considered school levels, which might include a screen interface that is acceptable for that level in terms of color or font combinations, aside from visuals.

Whenever it relates to education execution, the user experience should be assessed for appropriate users, including the elderly or any others.Technological developments in human–computer interaction (HCI) is enabling a variety of different HCIs as well as attempting to bridge the gap between people and computers at the human–machine interaction level. Machines are becoming increasingly capable of perceiving, or inferring, human traits, and engaging with user's technologies used in neuropsychological evaluation and as adjunct faculty to behavioral treatment for a variety of phobias, employing a growing number of available modalities.Hardcore computing journals have typically featured descriptions of techniques and applications that were only a few decades previously investigated by a few graduates in a section of some of the most well-funded research organizations, and also wearable technology[1].

HCI has evolved as the most important strand of computing-related research, with the design of innovative information, interaction, and communication technologies at its core.Two

models may be utilized to exhibit the significance of plan in HCI. To start with, HCI analysts are ordinarily associated with creating concentrate on models in light of hypotheses from the social and mental sciences, ethnography examinations, exceptional necessities clients, or just new and innovative ideas. Such models are habitually made due to legitimate need, since they are the main technique for analysts to set up preliminaries for testing and surveying their ideas on a reasonable user's populace.Secondly, it's becoming clear that modern HCI is more than just an academic study; it's also a field that's reaching out to and involving industry consultants, investigators, as well as designers. Their work might result in artefacts that can be used by the general people outside of the safe confines of research labs. These two examples show how HCI frequently involves academic researchers in design and also industrial designers in HCI research[2].

HCI is a designing science. It aims to comprehend and assist humans who engage with and through technology[3]. Technology is responsible for much of the structure of this relationship, and many of the modifications must be done through technological design. HCI is more than just a branch of psychology.It has affected and created fundamental science however much it has been impacted by it. It epitomizes the capability of brain research as a plan science. During the 1970s,[4] the work that shaped the authentic groundwork of HCI was named programming brain science.The goal was to demonstrate the value of a social approach to programming arrangement, coding, and the use of intelligent platforms, as well as to energies and inspire framework designers to think about human factors.

There were two separate methodological assumptions in software psychology. The first presupposed the validity of a widely held perspective on system and software development, specifically the so-called waterfall model of top-down deconstruction as well as discretely scheduled phases with clearly defined hand-offs.The next assumed two key responsibilities for psychology in this sense: (a) producing generic explanations of human beings engaging with systems and software that could be synthesized as developer recommendations, and (b) directly verifying the usability of systems as well as software as they were produced.

The concept of designing and developing computer systems and software with explicit consideration of the requirements, capabilities, as well as preferences of its eventual users was not treated seriously in the early days of HCI. The majority of computing articles from the mid-1970s are contemptuous of usability and condescending of users. The computer industry as well as the study of computer science were altered in less than a decade. The argument had already been made for a user-centered system development method, one that prioritized usability. People began to make a clear distinction between technology-driven experimental development that is now frequently accompanied by explicit accessibility disclaimers as well as Development of the system, in which empirically proven usability is the final arbitrator.HCI professionals have been well-integrated in system development in the industry.

Beyond human-factors assurance, HCI professionals have expanded into a wide range of positions. They've been regularly included into customer/user interaction to better understand the demand for new products, product planning, and specification; prototype creation and assessment; documentation and training design; and installation and user support. There has been a clear tendency in the promotion of HCI professionals into managing projects. None of these tendencies cast doubt on HCI's psychological character; rather, they show that it has proven to be a practical success. Furthermore, they remind us that effective applied work entails more than simply implementing lab-based ideas and outcomes, an issue that is still being discussed in the modern period. In computer science, human-computer interaction

(HCI) is still a developing field. Its scope as a field of applied social and behavioral science keeps expanding.

The present study focuses on the importance of human computer interactions in today's world. This study was characterized into different sections in which the first section is an introductory section where the author discussed the utilization of HCI on the environment. After that literature review section is mentioned where reviews and suggestions of the previous studies related to importance of HCI are discussed. Furthermore, the discussion of this study was stated in which the author discussed the principle of HCI. Lastly, the conclusion of the present study was mentioned where the authors give the final outcomes and suggestions of this study.

2. LITERATURE REVIEW

Jane Carey et al. discussed about the significance of Human computer interactions in management of information systems. The authors of this study firstly describe depending onsaid during a discussion panel at the Americas Conference on information technology during 2003, explain why HCI resources should be included in Management Information System (MIS). Secondly, they give a set of specialized as well ascrucial HCI knowledge and abilities that our learners will require on the workplace. Third, since each MIS degree has a limited number of credit hours, researchers look into a range of approaches and options for adding HCI into current and future MIS programs. Finally, based on the authors' classroom experience, the researchers provide pedagogical recommendations for educating HCI to undergraduates and graduate students Their results shows that using HCI in students education will improve the education system and also helps to interact students interface with the computers [5].

Ali Amkhani proposed that it was primarily apparent that a logical turn of events as well as expansion in working hours and time limits forced people to use worldwide network availability and other compact personal computer (PC) frameworks. As per the author these days, PCs and Internet networks are used for an assortment of purposes in various pieces of human life, online business is one of these applications that has brought about tremendous changes in this day and age. Web based business is viewed as a practical technique for controlling time and diminishing expenses, and it is broadly embraced by lead representatives and the overall population; its capacities are filling constantly in light of the serious worldwide economy. Subsequently, by means of proficient advancement, online deals associations and sites are endeavoring to cover all or the vast Future majorities of their activities as online administrations for consumers [6].

Froehlichdiscussed about the use of energy which is different from most consumer products. Home energy use typically goes unreported because it lacks a visible representation. Real-time data on energy, gas, and water consumption in the home will soon be available thanks to advancements in resource monitoring systems. The author's study will provide a massive quantity of data that can be examined and supplied back to the user, generating a plethora of research opportunities in HCI. The author's study looks popular myths about household energy use, and shows the power of feedback to improve energy consumption habits, and proposes 10 feedback design elements with which to construct and assess future systems [7].

Hudlicka discussed that human-computer interaction (HCI) and User interface technology as well as methodologies have grown at an unparalleled rate during the last decade.The redefinition of the conditions for effective as well as acceptable human-computer interaction is being driven by the converging of technology as well as methodological advancements on the one side, and shifting users ' expectations on another. His study aims to analyze the

effects on users after interface with HCI in their learnings. The capacity of developing systems to address user affect is a critical component of these emerging needs, as well as of effective HCI in general. The results of his study conclude that this special issue is to give readers an overview of the new field of emotional HCI, as well as some of the approaches and techniques that are available, as well as examples of applications and systems [8].

3. DISCUSSION

HCI is a designing science which aims to comprehend and assist humans who engage with and through technology. Technology is responsible for much of the structure of this relationship, and many of the modifications must be done through technological design. HCI is more than just a branch of psychology. However, reducing energy use in the home is a challenging endeavor as shown in Figure 1. Energy consumption, whether in the form of heating fuel or electricity, differs from that of other consumer items. It is intangible, impenetrable, and untouchable. Home energy use typically goes unnoticed because it lacks a visible manifestationunlike, say, the diminishing amount of milk in the fridge, the dulling of a razor blade, or a gas gauge approaching empty.

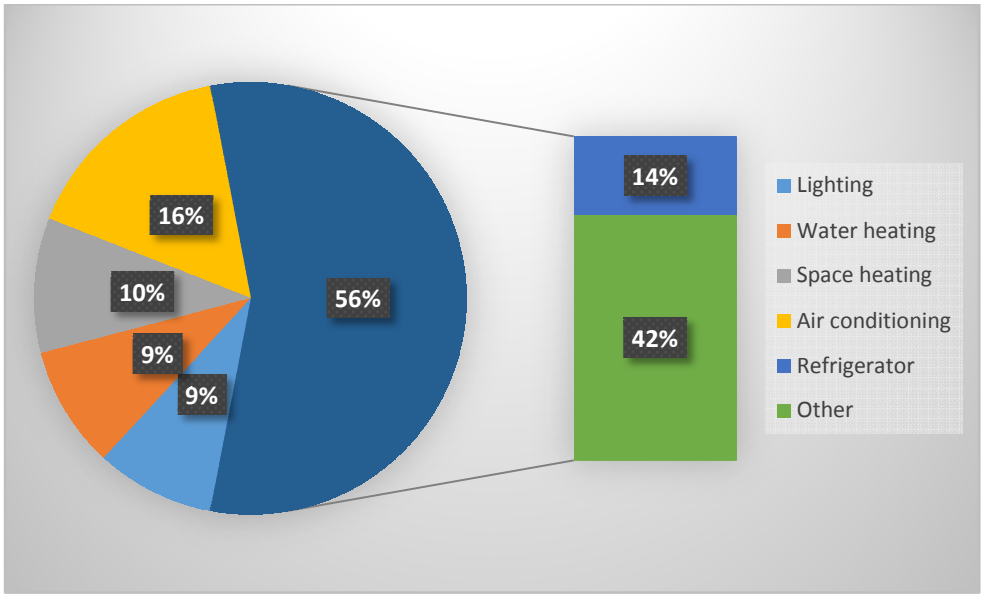

Figure 1. Illustrates the Percentages ofEnergy Breakdown Usage in the Smart Homes.

Many people have no way of appraising their household energy use, much less its impact on the environment, besides a monthly (bi-monthly) energy bill. The authors compare it to shopping at a grocery store where the products aren't labelled with individual prices and the only way to get feedback on your purchases is through a monthly charge that shows a single, total cost. Furthermore, energy consumption is rarely a goal in and of itself, but rather a side effect of a wide range of activities such as doing laundry, travelling to work, remaining warm, or watching Television(TV).

3.1.HCI Principles:

In order to create an effective graphical user interface, human-computer interaction within E-learnings which is a combination of science as well as art which demands a thorough assessment of user profiles and also technical capabilities [2].In order to satisfy people in the setting of its usage while developing successful E-learning systems, HCI concepts are employed to research methods of matching basic functions to increasing mobility. E-learning app designers are responsible for analyzing user demands and setting exact standards to

ensure that the end product is not only practical but is also promotes learning performance via effective design. Shneiderman's eight golden standards help in the design of human interaction platforms which improve users' learning opportunities.The regulations should be clearly stated in the E-learning program's user experience. In terms of design, instructions, and conversation, consistency is essential for an interface. People must receive appropriate feedback for their accomplishments in need to be inspired to continue using the app. Options for practicing shortcuts for completing E-learning tasks should be available in the user interface. In addition, the user must be notified of the work's conclusion as soon as possible.

An E-learning program's user experience must prevent users from making errors, and in the event of a problem, users must be offered assistance in resolving it. The client experience of an E-learning project ought to give the capacity to invert the client's activities all of a sudden. The client is intended to oversee the framework as though he were the expert of the whole curio, which will urge him to keep utilizing it [9]–[12].The program likewise has state of the art show configuration includes that save clients time while learning activity successions. The systems must swiftly and effectively support user tasks while absolving thoughtless errors. The criteria above cover all aspects of an interactive interface, with a concentrate on creating the E-learning program more usable.

3.2.Use of HCI in E-learning:

In the education system the teaching and learning which are mainly oriented to develop competitive learners who are not only educated in their areas, but also forward-thinking, inventive, and responsible citizens. The institution has designed a set of standard graduate traits that are incorporated in program curriculum as well as module academic outcomes in order to attain this goal. As students go from broad topic to skill development, a range of teaching approaches are employed, including lectures, practical practice, including the use of technological developments. In the field of education, HCI is in great demand for producing a variety of E-learning materials employing cutting-edge equipment and methods. E-learning with interactive games motivates pupils to study more and develops a good attitude between learners[13], [14].

By utilizing HCI evaluation methodologies, students participate in an educational game. These games create a new way of learning and improve it. The main goal of creating educational interactive games is to engage students and inspire them to study while having fun. The designer can utilize HCI assessment philosophies to make and survey instructive innovation devices as well as stages, bringing about a profoundly useful learning climate. Examining the Human Computer Interaction aspects of the definite platforms is the first step toward effective student engagement with educational technology tools. The level of interaction among the learner as well as the tool is used to determine user engagement[15], [16]. Learning possibilities and user engagement will be sustained if HCI is used in E-learning.

3.3.E-learning:

It includes all sorts of technology-enhanced learning (TEL), as well as particularly specialized types of TEL like online or Web-based learning. Nonetheless, there is disagreement in the E-learning business concerning whether a technology enhanced system can be labelled E-learning if no fixed pedagogy exists, as some believe E-learning is: "pedagogy enabled by digital technology."As we approach closer to a world where information technology affects practically every area of our lives, more natural ways of interfacing with computers and other electronic devices become necessary [17].

From a technological standpoint, it is currently possible to design interactions that take use of the perceptual abilities that have previously solely been associated with human-human interaction.There in setting of E-learning, the nature of the collaboration is basic, since it straightforwardly affects the growing experience by implementing specific correspondence ideal models [18], [19]. Inexperienced computer users are particularly susceptible to these limitations, but even people who work in the informatics sector on a regular basis may be affected[20].

The development of knowledge via the use of electronic technology and media channels is referred to as E-learning, sometimes known as online learning or electronic learning. E-learning is described as "electronically enabled learning," which includes anything from "how-to" videos on YouTube to university E-learning platforms, whole internet learning programs and virtual master classes. In general, E-learning takes occur through the Internet, with learning materials accessible at any time and from any location.

3.4.Advantages of E-learning:

The investigation of how humans interact with technology and how effectively computers are built for social interactions is known as human-computer interaction (HCI). HCI is presently being studied by a large number of significant organizations and academic institutions. With notable exceptions, computer system designers have traditionally given little consideration to computer accessibility. Numerous computer users today believe that computer makers continue to fail to develop computers which are "user-friendly". The way pupils are taught has radically changed as a result of eLearning. E-Learning, in contrast to the conventional chalk-and-board mode of teaching, makes the learning easier, faster, and much more productive.

- *Flexibility*:

The primary advantage of E-learning has been its flexibility in terms of location and time. Minimal learning programs are often available and can be terminated at any time. Whether you utilize the learning resources on your commute, at work, or even in our leisure time, they could become ingrained in your everyday routine. Written descriptions or recordings of live online workshops are frequently available if you skipped them. As a result, E-learning is perfect for those who are working, learning or simply want to learn as much about their favorite interests and hobbies.

- *Availability:*

Without frameworks like Moodle as well as Blackboard, coordinating informative substance at organizations would be almost inconceivable, however E-advancing additionally save a great deal of time in the business area. Anyone with Internet connectivity, regardless of physical limits, may access learning possibilities at the same time - as long as the servers are robust enough to resist the load.

- *Efficiency:*

The time it takes to follow through with a course is enormously abbreviated thanks to E-learning bundles that adjust to the specific understudy. Customary courses are made to address the necessities of the whole class. However, a single person rarely need everything that the group has to give. There is no need to travel for the course anywhere because with the help of HCI learners can get all the information about their study at their actual place.

- *Low cost:*

An individual can reuse an E-learning bundle however many times as they need without bringing about extra costs. There are likewise various free course choices as well as “freemium access”. E-learning is by and large more affordable than conventional learning choices since it permits more individuals to take an interest in a courses at similar times.

- *Mobile:*

E-learning might happen anyplace and all people want is admittance to the web as well as towards the computing. Everything is saved in digitized the internet, including learning assets, instructional exercises, and records, and can't be lost assuming you have a respectable backups. These benefits alone demonstrate E-near-limitless learning's potential. Traditional teaching and learning techniques, on the other hand, are far from outdated for a variety of reasons. Here some of the benefits of mobile learning are demonstrated in Figure 2.

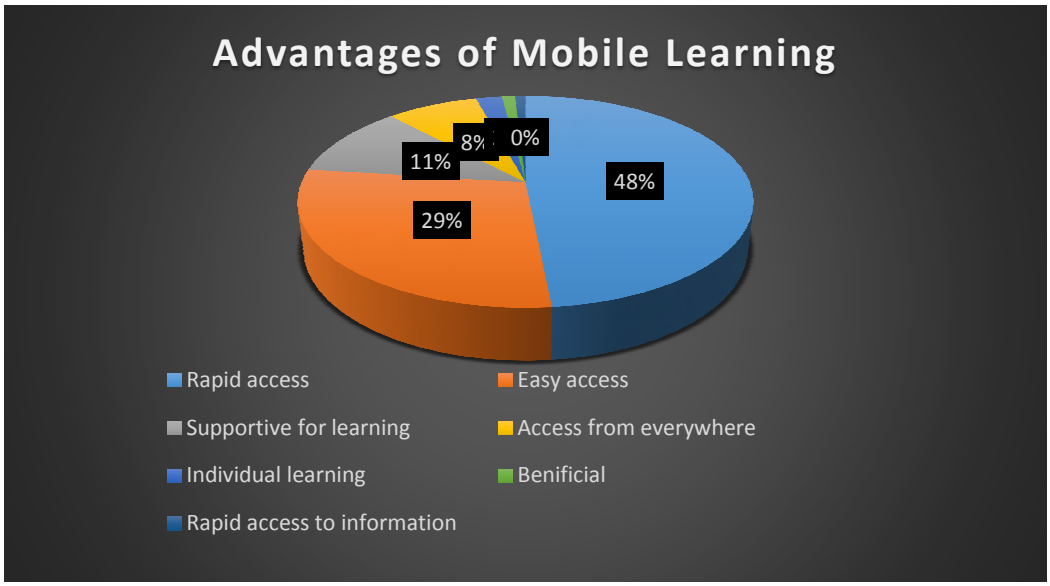

Figure 2: Demonstrate the Various Advantages of Mobile learning In Today’s Generation.

3.5.Disadvantages of E-learning:

Due to technology improvements, E-learning is now possible. Several learners all around the globe may now attend a range of classes online without ever having to leave their houses. They may learn from skilled lecturers and interact with students from all over the globe. E-learning is described as “electronically enabled learning”, which includes anything from "how-to" videos on YouTube to university E-learning platforms, whole internet learning programs and virtual master classes. In general, E-learning takes occur through the Internet, with learning materials accessible at any time and from any location.There are also some disadvantages of E-learnings are discussed below:

3.5.1. Discipline:

It is quite simple to postpone when you can learn at any time and from anyplace. For some people, studying in a new location, as well as being in the same place as other individuals who are studying with oneself, is essential for discipline and attention. Being in the same location with others who are learning fosters ambition and openness to new and different ideas [21].

3.5.2. Distraction:

There's a lot much more acquire on the internet than just instructional content. Furthermore, you are frequently online at the same moment on your email account or even on social media [22]. Furthermore, spouses, roommates, as well as children are prone to causing disruption and noise at home. Staying focused in such an atmosphere takes a great deal of planning as well as concentration. The user experience of an E-learning software should avoid users from making mistakes, as well as people must be provided aid in addressing problems. An E-learning project's client experience should have the ability to abruptly flip the client's activity. The customer is supposed to manage the system as if he were the curator of the entire curio, which would encourage him to keep using it.

3.5.3. Practical Knowledge:

While it is possible to teach theoretical information online, several people still find actual skill training to be unsatisfying. As example, your arm position cannot be changed during an online dance instruction, and steps could only be watched to a limited amount while dancing, and movement sequences can only be managed incorrectly [23].

3.6.Mobile-learning:

Mobile learning is a boon to today's students who don't have time to attend to learning centers or study in a classroom setting. It's a type of distant learning that lets students utilize educational technologies on their mobile devices anyway they desire. We'll look at how mobile learning may benefit your learning environment in this blog article.The craving and ability to master utilizing virtual media, like individual electronic gadgets, social associations, and material, is described as versatile learning, additionally alluded as M-Learning. Handheld PCs, MP3 players, workstations, cell phones, as well as tablets are instances of m-learning innovation. M-learning underlines the student's versatility while drawing in with compact innovation. Making learning helps and assets with portable contraptions has turned into a fundamental part of casual learning [24].

4. CONCLUSION

This paper demonstrate the importance and role of Human Computer Interaction (HCI) in our life as well as on education system.HCI aims to create systems that are both safe, effective as well as productive. In the mid-1980s, the term HCI was used to describe this emerging field of research. This phrase recognized that the focus of attention was larger than just the design of the interfaces, and that it included all elements of user-computer interaction.HCI attempts to design systems that are both helpful, secure, as well as efficient. To construct or enhance the protection, effectiveness, performance, productivity, as well as accessibility of computer-based technology, according to the goals. As a consequence, it's vital to assess all of the concepts of HCI to guarantee that an efficient E-learning solutions is equipped with a suitable user interfaces. The significance of HCI in the development of an E-learning system is examined in this research report.The results of this study would be utilized to develop recommendations for improving the development of E-learning solutions for certain users for their future benefits. It will fundamentally alter the way humans create user interfaces as well as engage with computers. Interactions would no longer be confined to little displays, but would instead occupy our three-dimensional environment for the future benefits.

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CHAPTER 2

AN ANALYSIS ON OPTIMIZATION OF ELECTRICAL ENERGY IN SMART HOME WITH AUTOMATION SYSTEM

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ABSTRACT: Smart Home Electricity Management System (SHEMS) is a household predictive control instruments which alters as well as curtails the demand which is based on real-time electricity pricing and customer comfort to improve energy efficiency and save money. In view of the rising cost of electricity, home energy management systems are gaining popularity as a means of evaluating the uses of household power. With the rising of Smart home electricity management system in household, consumers has received increased attention and the significance reason behind that which is it reduce the cost of electricity. A home energy management system is an excellent solution to address the issues high electricity costs. The main objective of paper is to demonstrate about the application as well as advantages of SHEMS. The authors also addressed the functions and automated solutions for Home Electricity Management System (HEMS) in this study. The long term goal of this study is smart home allows you to manage and automate every item and appliance in your house, also take care of safety and security requirements while conserving energy and reducing costs.

KEYWORDS: Electrical Energy, Energy Management, Home Automation, Optimization, Smart Home.

1. INTRODUCTION

Smart Home Electricity Management System (SHEMS) is a household power storage instruments that alters as well as curtails consumption based on real-time electricity pricing and consumer satisfaction to improve energy efficiency and save money Costs [1]–[4]. In view of the rising cost of electricity, home energy management systems are gaining popularity as a means of evaluating household power use. Sensor nodes are put in smart homes to enhance the quality of life while also lowering electrical equipment consumption by interpreting energy use and the characteristics of each household electrical item. Furthermore, these electrical device nodes may be used to infer many conclusions about their functioning and the need for replacement. Also, if an electrical equipment has used abnormally large quantities of power while switched off and should be unplugged, this may be determined. Electricity usage and expenditures may be lowered in this manner. Through the collection of data, it is possible to reduce power use.

These smart power management techniques make it simple to see how much energy we use and how much money we save. It's simple to see our power use and save money with an intelligent smart household electricity monitoring system.People usually switch off the lights or electronic devices whenever they leave the house to minimize disasters like faulty wiring or burns, but sometimes we forget and have to come home to turn them off. This is really a wastage of time which leads to a lot of tension and uncertainty. Smart home system is perhaps the most current technology to develop internationally to avoid such a situation. A smart home includes all of the electrical devices in and around the house that is technically sophisticated, intelligent, or computerized, as well as a sophisticated automated safety feature. A smart home system may benefit everybody, and can also be used in daily life at home.

This SHEMSconsists of a smart homes network, in which sensor nodes are connected to household electrical equipment (lamps, computers, TVs, and so on) to regulate energy use and collect critical data from diagnostics, proper functioning, and failure. Through the use of smart sensors, this application may optimize power use. Data security is becoming a need in a wide range of applications [5]. As a result, reducing energy consumption requires the development and building of security devices for smart homes networks between the detecting nodes and the power management server [6]. To ensure fast response, the secrecy as well as integrity of electrical knowledge must be ensured. The SHEMS has been around for a long time in the energy business. The monitoring, control, as well as optimization of energy flow and consumption are the primary tasks of such systems. The SHEMS offers a broad ranges of applications in the electrical network's generation, transmission, and distribution systems [7]. Supervisory control as well as data gathering, as well as management of energy system functionality, which are among the most important applications.

SHEMS is a significant recent advancement for residential users. Demand response, desire side management, peak shaving, and load shifting, all of which are thought to provide network operators with answers, have fueled the demand for more robust and sophisticated SHEMS. In order to incorporate more sustainable energy supplies, energy management in homes is becoming more important. With the developing expense of energy and the consistently expanding requests, we, as well as our home, should turn out to be more creative to keep our bills low. Brilliant lattice arrangements are supposed to assume a part in this undertaking to further develop energy producing/supply framework use [8]. In this journey, the Home Energy Management System may be respected the foundation. Its significant object is to make energy the board administrations accessible for viable observing and organization of power creation, power preservation, and brilliant home energy stockpiling arrangements [9].The innovation utilized becomes basic to address since it fills in as both a fundamental connection in transmission foundation for settling the power organization and an observing unit in private homes. In compared to the traditional power grid transmission technology, it allows for higher power quality and reduced generating costs.

1.1. Smart Home:

A home automation is one with a smart home network which linked to your gadgets to automate certain tasks and can be controlled through remotely or from your mobile phones as illustrated in Figure 1. With a smart home network, anyone can automate their sprinklers, set up to monitor their home security system as well as cameras, or even manage equipment such as refrigerators or air conditioning as well as heaters. By automated things like temperature management, switching on and off luminaires, opening as well as shutting window treatments, and performing irrigation changes based on the climate, home automation provide users increased control over their power consumption. It also provides you with information on your electricity use, which may assist you in being more energy efficient and ecologically aware.A home generally has a well-designed electricity distribution interconnection between both the electrical grid as well as energy-consuming appliances.

A smart home automation also serves as a platform for data interchange among appliances as well as third-party aggregators, and also the end customer, the electricity utility, as well as the electric company. This increasing capacity benefits players on both sides of the interaction utility customers, utilities, and third-party power management companies because there are considerable incentives for both sectors to help the others function well. For example, a homeowner may not be concerned about the utility's peak demand difficulties, yet power costs and supply dependability are linked to the service provider's operating methods. On

either hand, although a utility's primary focus may be to fulfill the criteria of public utility commissions, dissatisfied customers may lead to commercial and regulatory issues [10].

Figure 1: The above figure depicts the home automation system in smart homes which is controlled by cell phones.

This study focuses on the optimization of electrical energy in smart home automation system. The present study is characterized into different sections in which the first section is the introductory part where functions of smart home were discussed. Furthermore, the second section is discussed about the reviews of various literatures on smart home energy management system. The third section is the discussion section of the present study where the author discussed about the benefits and application of energy management system in smart homes. Lastly the conclusion of this study is mentioned where the author gives the final outcomes and suggestions about the present study.

2. LITERATURE REVIEW

B. Hamed showed the lab view software platform which was used to create a sample home environment monitoring and managing system in his research. The technology shown in his article served as the house's security guard. The author suggested solution demonstrate the use of Lab view to provide a multiplatform control system for home automation. The system's test findings showed that it can be utilized for smart home automation applications without a certainty [11].

P. Stluka et al. developed an advanced consumer's energy management system for monitoring and managing end-user energy use. Energy management as well as control techniques were addressed in his study as a large-scale optimization issue. The authors also explain an optimization-based energy management system for a hospital in the Netherlands, including financial information as well as an assessment of the savings obtained [12].

Mohsenian-Rad A. H. et al. presented a demand-side energy management system that is autonomous and distributed and takes use of a two-way digital communication infrastructure. Their suggested approach created an energy consumption schedule using game theory. Customers will profit from engaging in energy usage scheduling, according to their research [13].

H. Pensas et al. proposed a Position Based Delay Management strategy for reducing energy usage that has the advantage of gathering client location information in a home automation context to improve energy expectation. Their proposed technique was put to the test using

simulations power based usage patterns, and it was discovered that adding location data might give useful as well as encouraging data for minimizing grid electricity use without harming the usability of linked appliances [14].

Y. Son et al. proposed a power line communication-based home energy management system (HEMS). Smart metering as well as power line connection make it possible to provide comprehensive data on energy usage patterns and smart control to devices in the home. The authors' suggested solution provided for simple access to real-time information on home energy use as well as intelligent planning for home device management [15].

M. Nassereddine et al. discussed that Electrical energy is a necessary component of human comfort. Without electricity, a variety of tasks would have been impossible. Engineers face new issues as a result of the introduction of the photovoltaic (PV) solar system, such as how to improve the system's efficiency. Micro grid PV systems are being installed on the roof tops of residential houses all around the globe. The authors said that energy can only be fed into the electrical grid without the storage system. The notion of an electricity management system for a smart house is introduced in their study. They suggested smart system allows for the usage of a portion of the PV-generated electricity during working hours. Furthermore, authors suggested method allows the person complete control over the usage of produced energy, lowering power costs and reducing environmental effect [16].

From the above reviews the literatures demonstrate how home automation system is beneficial not for only households but it also provides benefits in the industrial sectors for controlling and managing. Through the present study the author wants to discuss how home automation system plays a significant role in all over the globe and how it helps to reduce the electricity costs. The author also addressed the functions and advantages of HEMS in this study through which people can get more comfort by using in their coming days.

3. DISCUSSION

The exponential growth of technology has transformed humanity's lifestyle and ushered in the digital age. The requirements for sustainable power management or electrical energy is constantly at an all-time high, thanks to the rising use of technological devices in our daily lives. The cost of electricity per unit use has risen as the demand for power has increased. India is fighting tooth and nail to fulfill its fast-growing economy's electric power needs. Rebuilding the electricity business has only exacerbated a number of issues. The rise in energy consumption is accelerating, and it may soon outstrip the installation of traditional energy producing methods. This academic premise have alarmed the world's energy fields, driving academics to offer alternatives including such simplifying sources of energy such as coal, natural gas oils, fossil fuels etc, yet its usage has led in adverse environmental impact, greater prices, and increased risk [17].

Indoor lighting control, motorized window blinds, as well as other comforts are all examples of home technology. Many people, in our experience, are unaware of how easy it is to save money by installing these items in their homes. By reducing your house's energy consumption, a well-designed home automation system may help you save money on your electricity bills and benefit the environment. Lighting control, motorized blinds, and other technological advancements may help you save money in a variety of ways.

India is experiencing a severe electricity crisis, which is expected to intensify in the next decades. It has a power sector with low generating capacity and large distribution losses. As a consequence, scientists' attention has shifted to devising techniques for preserving and creating an alternate source of electricity production.The current time of delivering new

electrical and electronic gear has impacted individuals' personal satisfaction and has significantly raised the requirement for a manageable utilization of electrical energy for home use. To beat the troubles and constraints of conventional instrumentation plans, savvy frameworks controlled by microchips and PCs should be utilized for internet checking and control of current enormous scope power frameworks. These sophisticated technologies, which constitute the foundation of the smart grid, do not, by themselves, alleviate the present demand-supply imbalance [18]–[20].

A Home Energy Management System (HEMS) is a mechanical stage that joins equipment and programming to empower clients to follow energy utilization and creation, as well as physically direct or potentially computerize energy use in their homes. Advanced Metering Infrastructure (AMI) gadgets have set off a dependable specialized strategy connecting both power utilities and private clients under the shade of lattice plan. This correspondence channel got the entryway for the incorporation free from financial motivations considered for a home robotization for overseeing request side assets by changing to and from energy utilization during top burden hours of the day as a kind of burden shedding for lower power bills. The intuitive connection between network administrators, utilities, and clients is a basic part that allows all of the new Smart Grid advancements to cooperate. The primary goal of using HEMS is to allow consumers to monitor and regulate their energy use, or to consume it more efficiently. To do so, the customer must first understand how energy is utilized in his home, which can only be calculated if energy is monitored throughout the house.

The usage of energy within the house is critical to the versatile HEMS's performance. It lets the user to see what devices are up to and remotely turn them on and off or adjust their behavior. Household conservation of energy is frequently inconsistent and non-autonomous. Electricity use monitoring offers a significant advantage in terms of sustainability. To provide an effective management process, the HEMS at home uses an electrical detector, switches, a data network, and a customizable computer platform. The goal of HEM is to priorities energy utilization in terms of cost as well as availability of energy.

3.1. House Energy Management Systems (HEMS):

The Home energy management system (HEMS) is an efficient network control mechanism equipped with smart grid, smart house, as well as smart meter technology. It utilizes a specific platform to handle and control power generation, consumption, as well as energy storage. HEMS can assist clients conserve money on their energy bills by improve the productivity of domestic sustainable energy [21]. The conventional power market lacks consumer engagement and has a single energy pricing structure, resulting in inadequate electricity supply during peak hours and wasted electricity during off-peak hours. Following that, the peak and off-peak pricing system is implemented, which aids consumers in adjusting their power usage times. It is, however, less flexible and unable to represent the true link between electrical demand as well as supplies.

Besides, HEMS can completely cooperate with the power network to get precise constant costs, team up with age and burden determining, perform smart energy automation, streamline family load assignment in the time aspect, accomplish client request reaction, ease lattice strain during top hours, and further develop matrix security. Trims is the littlest unit of the shrewd lattice, which is another age of data advancements, for example, the Internet of Things, distributed computing, versatile Internet, and large information that involves the family as a transporter to accomplish a low-carbon, solid, keen, agreeable, and safe family way of life. It deftly oversees different home apparatuses and accomplishes a keen method of

power and energy utilization by consolidating dispersed power advancements, for example, homegrown photovoltaic and energy capacity.

HEMS is now a popular topic, with optimization targets including cost savings, convenience, and power loss. Extensive study has been conducted to understand house electrical behavior and construct an intelligent model of power generation, with the objective of obtaining optimum peak usage dropping as well as the lowest power cost possible. Alternatively, other research look at the relationship between home appliance usage and household electrical behavior optimization with the objective of lowering power expenditures and increasing comfort.Researchers are looking at the impact of electric automobiles and power storage frameworks on house automation optimizations in order to propose a method of domestic energy management that includes real-time control approaches for energy storage systems as well as a variety of household equipment. There are limited studies on rational allocation techniques, despite the fact that the study indicated above includes home automation, power efficiency as well as charge or discharges operations for energy storage systems.

3.1.1. Functions of HEMS:

The main goal of HEMS is to improve the energy efficiency of buildings and homes. Benefits from electric utilities, such as controlling energy consumption to reduce power demands and promote load shifting, may also be mentioned. To fulfill such goals, the house electricity management must have the following functions and properties, as shown below (Figure 2):

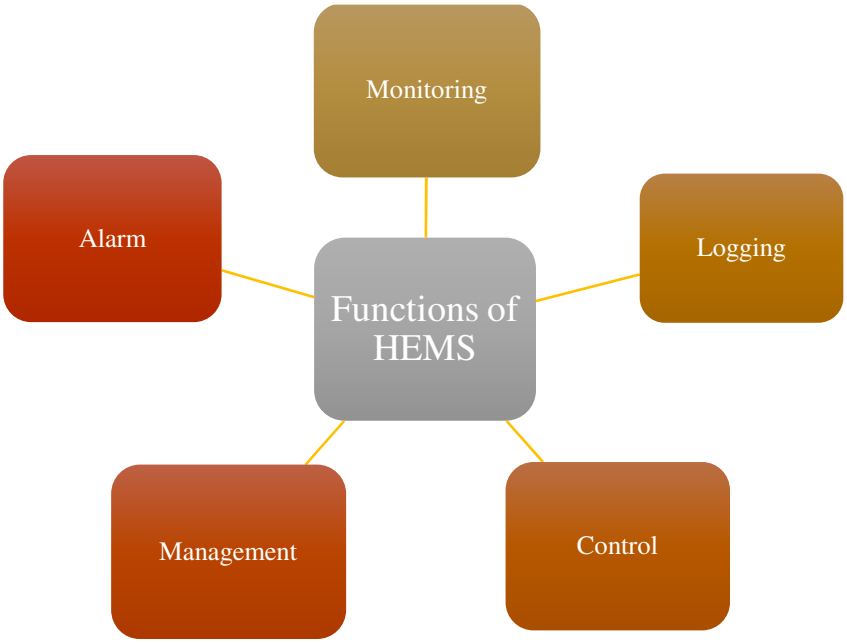

Figure 2: The Above Figure Illustrates the Functions and Properties of the Utilization of HEMS.

- Monitoring system

HEMS should be able to control the wide range of household electronic appliances as well as devices. The monitoring technique makes real-time information on energy use patterns available. The user may access device information through the interface of web or a phone and tablets application.

- Logging

The procedure of logging data on the unit of power utilized by each device is known as logging. Analysis of demand response (DR) for real-time pricing is part of this feature. Information for numerous houses in a neighborhood must be provided for improved DR support,Furthermore, the system is required to use an optimization approach to automatically respond to DR indicators as well as appropriately allocate resources to the households.

- Controls

Devices control should be offered to the users manually in its most basic form.If the control platform provides adaptive management, control can be computerized. Device control might either locally or remotely. Do not undervalue the importance of being able to operate the operations of the home remotely. On a really hot day, the house may cool down and immediately for you to return home from work. If you're in a hurry to get dinner prepared but still at the supermarket, your stoves may begin to heat when you're still driving home.

- Managements

Energy use data may now be gathered at various granularities from a broad range of devices in the smart grid era. HEMS should be able to efficiently handle enormous volumes of data.All home contraptions might be controlled from one area. The accommodation factor is extensive for this situation. The capacity to coordinate all of your home's hardware through a solitary connection point is an enormous advance forward for innovation and home administration. In principle, all you'll require is to figure out how to utilize one application on your cell phone or tablet to get to a plenty of capacities and devices across your home. This lessens the expectation to absorb information for new clients and simplifies it to get the elements you truly need for their home.

- Alarm

Alarms are created and sent to the smart HEMS center, which has information on problem locations, kinds, and so on. People requires a completely automated security system in their smart home to increase their safety and receive timely notifications for suspicious activities, even when they are not at home. It will assist you in notifying the appropriate authorities to guarantee the safety of your home and family members.

3.2. Advantages of Energy Management:

The process of discovering and analyzing data, then applying strategies to minimize energy use, is known as energy management. Numerous consumers, particularly large commercial and industrial businesses, have taken steps to better maintain their energy consumption by implementing energy-saving strategies such as installing an Energy Management System (EMS).

3.2.1. Control power supply:

One of the most important features of an Energy Management System is that it enables asset owners and building managers to examine the whole site's WAGES (Water, Air, Gas, Electricity, and Steam) use in a simple and easy-to-understand manner. Energy Management Systems enable asset owners and building managers to make better educated choices regarding energy consumption by bringing all of the data together in one site. This may significantly cut energy expenditures by highlighting and, in some situations, eliminating wasteful waste, and high-impact activities can be staged during off-peak hours. This lowers the demand for energy resources, which is good for both the environment and the bottom line.

3.2.2. Remote Access:

Management of Energy System collects all data onto an online gateway, allowing building administrators to supervise the system remotely utilizing accessible devices such as mobile, smartphones, and Desktop computers. Technology allows building controllers to be notified of changes in the system regardless of geographic location, which is ideal for keeping control across multi-building complexes. The ability to access the Energy Management System remotely is critical because it enables building operators to administer the system in a manner that matches their work style and position. Due to limited access to the system, it may be overlooked in the operations room and operate as a quiet controller. Remote access encourages users to utilize it more often, resulting in more efficient operations and cost savings.

3.2.3. Cost Reduction:

The decrease of operating expenditures such as heating, cooling, lighting, and water services is one of the key advantages of using a facilities management system. An EMS keeps track of your energy use over time and retains the information so you can see your building's historical energy performance at any time. Enabling peoples to create expense estimations based on future use.

3.2.4. Automated Solutions:

When a flexible and easy-to-use energy meter reading and reporting system is needed, Automation system is an alternative solution. According to the authors, it does not provide real-time power quality data like a genuine EMS, although this is not necessary for most consumption reporting systems. Customers buying today's web-based "EMS" systems should be aware that these are not real-time programs that must upload data to the cloud on a regular basis before reporting on historical data. Another point of worry, according to the authors, is the recurring data cost of competing hosted solutions, which may soon exceed the cost of the initial condition. Power Monitoring Expert would be installed by Schneider Electric experts for applications needing a fully featured, real-time EMS with power quality analysis capabilities. There are no continuing hosting costs, and the consumer retains ownership of the data. People also recognize that each building is unique and has its own customized Energy Management System. Automation IT has extensive experience creating and commissioning completely customized energy management systems for buildings and infrastructure.

4. CONCLUSION

The smart house, including its HEMS, plays a major role in the smart grid platform's effective utilization of electricity and demand response. The smart HEMS may increase lifestyle as well as economic standards while maintaining environmental and social assets, thanks to wireless connections, smart home gadgets, digital citizen services, and smart sensing technologies. Because of its great accessibility, simplicity, and cost via smart mobile and tablet connectivity, HEMS has gained in popularity over the years. Furthermore, smart grid infrastructure that includes a variety of two-way communications, metering, as well as monitoring equipment is building a solid foundation for smart HEMS implementations. In future, mass adoption of HEMS will fundamentally alter how people utilize electricity and renewable energy in their homes. This study covered smart house activities, with an emphasis on defining smart home goals, improving home automation as well as energy management, and lowering environmental emissions. The main objective of this review is to determine the importance as well as benefits of Electrical Energy Management in Smart Homes. The authors also addressed the functions and automated solutions for HEMS in this study. The

long term goal of this review is smart home allows you to manage and automate every item and appliance in your house, as well as take care of your safety and security requirements while conserving energy and reducing costs.

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CHAPTER 3

CONTROLLING POWER CONSUMPTION WITH PORTABLE SOLUTIONS: AN ANALYSIS

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ABSTRACT: Renewable energy sources (RES) must remain the possible source of clean energy in the next years, despite technological breakthroughs and the creation of novel sources to help meet rising energy demand. This study looks at both practical and complex technological possibilities for minimizing unpredictable events when it comes to energy reduction and it also provides information on the most recent Coronavirus Disease 2019 (COVID-19) sickness, which led to a decrease in energy consumption and thereby disrupted the project corporation's power generating schedule. The results looked at the role and relevance of renewable fuels' inefficient energy usage control during the COVID-19 crisis how the present coronavirus outbreak has affected electricity bills and pricing in numerous countries, as well as how it has paved the way for new power management. The author concludes that in different countries, adjusted energy demand, as well as daily total pinpoint power prices for pumped storage generation, have both reduced, and this number is expected to continue to fall in the future years. It can be readily employed in the future for the improvement of society, and it also explains the Covid-19 impact on humans household.

KEYWORDS: COVID-19, Electricity, Energy Consumption, Renewable Energy.

1. INTRODUCTION

As fossil fuel stocks diminish, several of the world's most powerful countries, such as the United States, China, and Russia, will battle for energy resources (ranging from becoming significant renewable energy producers to safeguarding and purchasing the world's remaining fossil fuel reserves). Climate change, energy supply, and economic growth appear to be significant factors in these countries' renewable energy developments, among other things. When green energy is essential for energy supply, several countries use energy to safeguard national performance and improve their international standing. As a result, energy is vital to the development of emerging economies as well as the global economy. This might be especially true for China, which is the world's second-largest energy consumer behind the United States [1]–[3]. Figure 1 illustrates the different years in which renewable energy boomed in India.

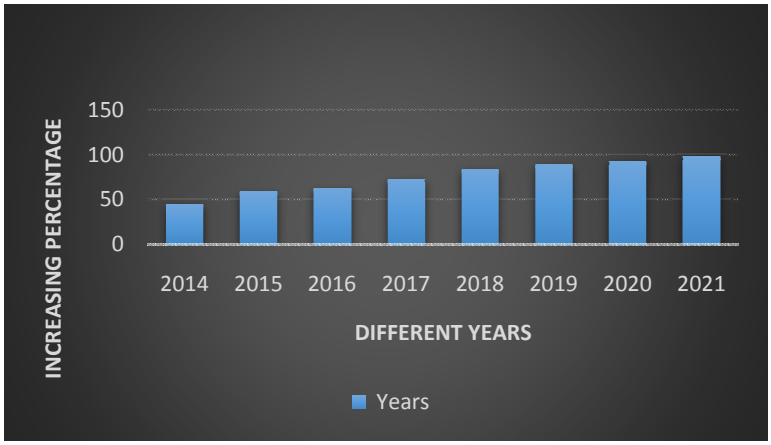

Figure 1: Illustrates the Different Years in which Renewable Energy is boomed in India [4]**.**

Since the European Union (EU) has long had its own goals for dealing with the effects of human-caused climate change, such as reducing greenhouse gas emissions by at least 40% and increasing renewable energy to 30% in the next ten years, China will be in a race to change the global oil landscape in the same way that the United States (US) and other major economies have done in recent years. With its traditional carbon fuel supply and the fact that it has had to place a heavy emphasis on renewable sources such as wind, renewable electricity, and hydrothermal energy, this change is plausible in China. While efforts have been made to develop renewable energy technology as the primary energy source [5].

Because of its growing global dominance as an energy consumer, India is on a path that might change the power generating sector. Solar power generation has already surpassed Germany, an Individual member territory, while the United States' growing need for energy innovations from China correlates to the twentieth century's growing strategic strength. This is due in part to China's rising energy demands in response to the global economic slowdown, which coincided with the growth of strategic power in the eighteenth century. As global players vie for a spot as world powers, competition between states will heat.

The world's two biggest economies, especially the United States, are now dedicated to incorporating renewable energy. China's energy mix is expected to incorporate renewables since domestic coal is an important fuel for the country's future energy demands. Furthermore, coal is a non-renewable resource that is predicted to run out by the mid-century, putting pressure on large coal consumers like China. Mostly on the flip side, the United States has considerable renewable resources, with the opportunity to be a global cleanout energy efficiency and the capacity to satisfy the majority of the region's energy demands throughout the next three decades. This is expected to become more important under the incoming US government, which is set to enter office in 2022. The world's big powers sway the periphery to embrace clean electricity in their quest for energy security. As conventional energy costs increase, nations' demand for solar and wind power such as RES will decline. Competitiveness for power sources seems to be spurring new energy development activities.

The competition for the final known oil and gas reserves, as well as lignite, and maybe other fossil resources, has intensified rapidly. Some countries, including the United States, Russia, China, Iran, India, and Brazil, appear to be attempting to maintain or increase their overall power positions. As a result, natural gas will increasingly replace coal, oil, and a variety of other fossil fuels in the global energy mix. The multitude of physical, chemical and energy concerns will continue to impact the energy industry. It's vital to note, however, that carbon-based fuels account for 80% of world energy and will be generated from carbon in the next two decades. Several projections predict that the world's largest and most significant energy market will experience a massive increase in energy consumption over the next several generations. By 2020, worldwide generation capacity will have expanded to 2.1 billion tonnes, accounting for approximately a third of total global electrical output by 2030. This forecast, which accounts for about a fifth of total global spending, has been at the center of some of the most detailed marketing growth projections in recent years. As a result, smart energy management tactics will become increasingly important in future electricity consumption.

Furthermore, addressing mobile users' tasks on distant virtual computers generates considerable problems. Users' mobile devices are uploaded to numerous cloud servers, which may cause network congestion and reduce cellular device energy consumption. The service quality (QoS) worsens when the network is overwhelmed. The major computing platform for many individuals has switched to mobile devices. Recent programs demand a significant quantity of computing power and storage space. Quick repairs are impossible due to cellular

devices' limited central processing unit (CPU) and memory capacity, as well as their low efficiency. As a result, one of the primary concerns is decreasing resource limits on smart device upgrades, as well as smartphone energy prices. When employing a cloudlet-based network, several considerations come into play. A swarm of cloudlets emerges all around the user once they connect to the internet or a mobile communication network. If one cloudlet is loaded more than the others, the procedure will be delayed. The main challenge is distributing the work of the device among multiple cloud servers. If a user accepts and solves a work in a local cloud, there will be fewer delays and less energy consumption. As the number of electronic channels expands, latency and energy usage should increase if servers are physically distanced from mobile devices. As a result, a technique for selecting a cloudlet that fits the customer's criteria is being in mobile cloud networking.

According to this study, energy creation is a very efficient thing, and in the COVID -19 phase, energy becomes even more efficient. In this study, the author also offered a mobile solution for energy usage. One of the most significant goals in recent years has been to develop ways for improving mobile device energy efficiency, particularly in the context of green computation and energy savings. Several studies have examined this issue from various angles, including infrastructure, software, and measuring how much energy certain business applications require. On the other hand, due to a lack of monitoring of users' actual browsing sessions, the power consumption of Web surfing behaviours has received less attention.

2. LITERATURE REVIEW

Souza in their study suggested that the present study was inspired by the existing wireless hot program's greater power usage, particularly the unpredictable computer routing. The author applied a methodology in which they stated that during the exploration process, a proposal was provided that included transmission power, queue length, plus proximity. The result shows that a model was conducted to see how DSR and MP-DSR compared. The author concludes that the suggested MP-DSR beat the DSR in any three experiments, comprising network throughput percentage, later part latency, and overall electricity usage, according to the findings.

Thomson et al. in their study suggested that resource holes, sometimes known as resorts, are a well-known problem in cognitive radio networks. The planned mobilization of the end nodes to fight this is also a good idea. Consequently, concerns like consumption spikes persist since such roaming name nodes may connect with certain nodes more than others. The author applied a methodology in which they stated that the Dynamic Migration and Energy-Aware Program is a minimal MAC layer solution that we present in this work. The results show system correlates significantly with optimized energy utilization thresholds and integrates a cross-layer technique, using prevailing resource usage and fluidly adjusting information sharing normal aggregate based on target water consumption. The author concludes that It builds on existing solutions that use a connectivity criterion respectively static nodes and then a sink node by using predictable position information. When compared to earlier methods, this strategy has been found to optimize water usage among individual nodes while not affecting total energy consumption. This is done without jeopardizing frame delivery here to sink. As a result, the network lifespan is increased. The author also proposes Mobile and Cloud Computing (MCC) apps for this system, which would remove partial functionality from base stations and place it in the mobile nodes at the edge networks.

Wang et al. in their study embellish that the contacts across smart things are rising as Cloud computing technology advances throughout smart living smart cities city, building automation, smart environments, or otherwise smart buildings, complicating the assessment

of energy utilization aspects on machine vision. The author applied a methodology in which they stated that with the proliferation of the Internet of things and extant connectivity among cloud computing environments, mobile apps, and human activities, energy consumption has become one of the most troublesome concerns. The results show one of the most crucial concerns in green IoT-enabled technology is managing energy improved power usage. The author concludes that the Systematic review scientific report, this study provides an overview of resource management options in the IoT.

In this study, the author elaborates on the renewable energy resources that employ a connection requirement in the form of energy. These studies provide information on the most recent coronavirus disease (COVID-19) sickness, which led to decreased energy consumption. The age of modern technological tactics in power utilization before and during the present coronavirus epidemic is also examined in this paper and it also concentrated on the role and significance of the ineffective energy usage regulation of renewable fuels during the COVID-19 crisis. The energy usage in many families has decreased in the COVID -19 phase compared to earlier methodologies and research because fewer people are utilizing numerous technologies and electrical items in their daily lives. The network's lifespan has therefore been increased as a result.

3. DISCUSSION

The fundamental goal of this study is to identify important academic situations in the area of knowledge administration and power consumption techniques that require additional research to assure the success of Internet of Things (IoT) technology. There is also a discussion of evaluation aspects and characteristics, as well as a statistical and professional life of previously published journal papers. The bulk of published study publications in the smart home measure power usage in the IoT, according to our findings. Furthermore, in IoT case studies, the phrases reinforcement learning and clustering techniques have been employed to estimate energy savings. Finally, there are difficulties and challenges in power generation operations, as well as efficient power generation.

3.1.The Control Effect of Energy:

Adjusted energy demand and daily total pinpoint power costs for pumped storage generation have both decreased in nations, and this trend is projected to continue in the coming years. Significant shifts in the economy as a result of events like the COVID-19 epidemic resulted in lower office space utilization, reduced transportation, and business travel, and practically ceased commerce travel, tipping the balance dramatically toward RES. Because battery life is the most common constraint of Android platforms, emission solutions for portable apps should be created and implemented. In this study, key challenges, primarily in the design of mobile apps, are investigated from the perspective of energy utilization. Graphics and handling processes that need a lot of calculation time have been discovered to waste more energy. As a result, numerous solutions for improving mobile device energy usage, both at the silicon and operating system levels, have been proposed. On the one hand, some operating system approaches, such as Mobile Parallel Computing and graphical user interface (GUI) design, are available. These approaches, on the other hand, are only concerned with connectivity and aesthetic difficulties, with battery control issues being overlooked.

On the other hand, while there are various studies on mobile device conservation, many of them concentrate on a single technique, such as the use of mobile devices. The study's main contribution is a literature review that examines different energy-saving strategies, with a particular focus on those that deal with application development. Unlike all the other news reports, we have included several plans from publications as well as those established and

developed by our research program. Our findings imply that the explored methods prevent other aspects of the program design from being impacted by energy consumption limits, such as GUI flexibility and information management.

3.2.New Broadcast:

As a primary development performance on working on reducing the amount of power used in cell cycle information systems. Although the focus of our study on 5G energy use is on network energy saving, specific mobile app electricity generation must also be addressed. Programs, software items, and the display, for example, all contributed to a smart device's energy consumption. On the other hand, mobile data broadcasting plays an essential role. Wearable, fitness trackers, and developed modems are just a few examples of the gadgets that might be used with fifth-generation (5G). Advances in 5G New Broadcast (NB), particularly sparser broadcast of ever signals, have drastically reduced energy consumption on the client premises. Radio treatment techniques in NB android platforms need to be updated as well.

With NB, more bandwidth and lower latency are available, allowing customer information sessions to be completed faster than with long-term evolution (LTE). The amount of power unutilized by the device per transmitted bit is reduced as a result of this. Because data behavior categories are unpredictable, each instrument also retains a physical downlink control channel (PDCCH) for possible data programming instructions when the material is not intended. For more information, see our collaborators' previous research on the 5G NB open system interconnection (OSI) model. Figure 2 discloses the Integration of Information and Communication Networking in Energy Management.

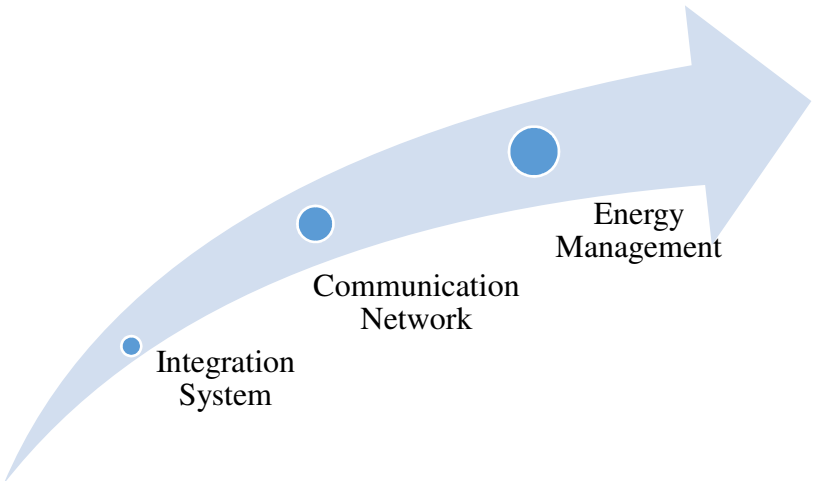

Figure 2: Integration of Information and Communication Networking In Energy Management.

Just about all the modes of human transportation depend significantly on natural gas, without diesel and combustion automobiles decimating the global market. Hydrocarbon, kerosene, CNG, and other energy fuels have afforded companies from selling nations great economic power since the mid-twentieth century. This has resulted in rising oil costs, although other nations, such as Copenhagen, Europe, and Denmark, have managed to endure by strengthening their economies. We have taken different countries' household units some of them are Germany, France, the US, and India. The author has taken different months' data and plotted them in the graph shown below, on the one side there are months and on the other side there are watts.Figure 3 discloses the average monthly electricity load in selected countries for 2022 compared to 2019.This study offered details on the most current

coronavirus disease -19 (COVID-19) illness, which resulted in lower energy consumption and, as a result, a disruption in the project corporation's power generation schedule. Furthermore, this paper examines the age of advanced technology strategies in power usage before and during the current coronavirus pandemic.

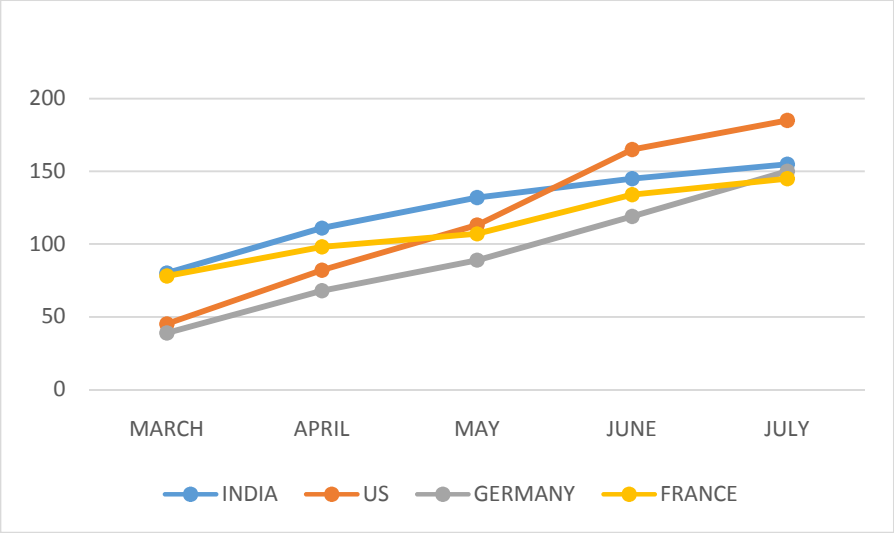

Figure 3: Illustrates the average monthly electricity load in selected countries (India, United States, Germany, France)in 2022.

During the COVID-19 crisis, this study focused on the role and importance of renewable fuels' ineffective energy usage regulation. After the data is collected, it is analyzed in such a way that the risks of mistakes are reduced, and the inflow and transformation engineering is completed by linking but those resources are listed as sources of power generation, and the outflow is stated as conversion fuel consumption. It's important to remember that coal and oil, which are made from biological materials and have been there for generations, have fuelled global economic advancement over the last century. Carbon emissions are a finite resource that has the potential to permanently destroy the biosphere. Combustion produces a significant fraction of all greenhouse gases, making it crucial for climate change.

Customers have been paying an increasingly high price for using fossil fuels for decades. Every energy source, even renewables, comes with its own set of dangers. The three primary types of energy sources now in use are secondary, medium, and doctoral fossil fuels. Primary energy sources include shale gas, uranium, oil, plutonium, hydropower, wind, solar, seismic, ethanol, and hydropower. The conversion of fundamental energy into electricity produces electricity, which is a renewable fuel. Wind, hydro, and solar (the most well-known sources) are additional energy sources that develop or produce a major energy source, as are many other renewables. Alternative fuels have become so popular that they are now included in estimates of primary energy use and converted into oil equivalent levels.

3.3.Modern Development:

Despite this, fossil fuels like coal, oil, and oil and gas continue to be the world's primary energy sources. The supply and transformation technologies used to convert these fuels are the sources of fuel production, and the output is the consumption of the transformed fuel. It's important to stress this since fossil fuels, which have been produced from biological materials over hundreds of years, have fuelled global economic advancement over the last century. Carbon emissions are a finite resource that has the potential to harm the ecosystem

irreversibly. Fossil fuel combustion accounts for more than half of all global greenhouse gas emissions, making it crucial in the fight against climate change.

Even by 2050, development's impacts are predicted to result in up to 1.5 million deaths each year. By 2050, solar and wind will account for a larger part of total electricity generation. It is now more expensive to transport, store, and transport fossil oil reserves than it is to transport, store, and transport renewable energy resources. Coal, energy, gas, or certain fossil fuels are being stored and towed, while oil and gas, which need considerable logistics and storage, are also being stored and towed. Despite predictions of oil and coal dominance, RES usage is expected to grow. However, various challenges must be overcome to improve resource efficiency and make generation and transmission more cost-effective. Wind and solar power may be generated indefinitely, but they should only be obtained from renewable sources like wind and the sun.

Several rich countries are making significant headway in developing their renewable energy networks. In Asia, renewable energy is less expensive than oil, and hence a third of the cost of shale oil in South Korea. Each MWh of renewable energy is owned by the end-user, but only a fraction of the cost of absorbing it into the system is borne by them. Origin guarantees aid in decreasing the cost of wind power generating projects and reinvesting electricity costs in new models. Sustainable energy licenses give more sustainable electricity and the potential to deliver large financial advantages to underdeveloped countries. These environmental and sustainable credentials were created with trade practices in mind, ensuring additional productive potential while also supporting the local economy.

4. CONCLUSION

To assure the success of internet of things (IoT) technology, this study's main goal is to pinpoint important academic conditions in the fields of knowledge management and power consumption strategies that need further exploration. The statistical and professional life of previously published journal papers is also discussed, along with evaluative characteristics. This study examined the current state of total energy optimization, particularly in light of novel and unexpected difficulties like the ongoing COVID-19 pandemic. In general, the COVID-19 outbreak has had a negative influence on almost every aspect of the global economy, and the energy business is no exception. The renewable energy sector is experiencing severe layoffs and risks, disrupting an industry that used to be at the forefront of job development in many countries. In the United States, for example, about 70 thousand energy efficiency employees used online compensation, which is a small percentage of the overall number of employees in the industry. The author concludes that adjusted energy demand and daily total pinpoint power costs for pumped storage generation have both decreased in various nations, and this number is anticipated to keep decreasing in the next years. Due to severe shifts in the economy brought on by incidents like the COVID-19 epidemic, less office space was used, fewer people traveled for business, and almost no one traveled for business, which drastically shifted the balance in favor of RES.

Energy efficiency is one of the most profitable sectors in the US energy industry, employing 2 to 4 million people. If it suffers job losses in renewable energy and other renewable energy fields, it might lose a net million new jobs in this industry. In contrast to the seeming significant economic benefits, investing in energy efficiency may ensure that utility prices remain low, water pollution is minimized, and homes and workplaces are healthier and more enjoyable. The future scope of the study is how much energy one consumes has a huge influence on how much energy one pays for, and how much energy one uses may fluctuate as one spends more time at home. It's hard to argue with the present limits on remaining at home

because of a man's energy use at work. The price will be lower than if a client raises or lowers the thermostats by one or two degrees in the summer and one or two degrees in the winter.The future potential of this work includes the ability to quickly apply it to society's advancement and the explanation of the effects of Covid-19 on human households.

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CHAPTER 4

MODELING AND DESIGNING OF SMART PARKING SYSTEM WITH IOT BASED INFRASTRUCTURE IMPLEMENTATION

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ABSTRACT: Smart-parking is a parking process that combines technological advances and human ingenuity to allow the motor vehicle to remain idle for most of the time to achieve faster, smoother, and denser parking, using minimal fuel, time, and space. The idea of imaginative smart cities has become quite popular recently and the development of the Internet-of-Things has led to the development of smart-cities. This is essential for the efficient and maximizing productivity and dependability of urban infrastructure. Internet of Things (IoT) is used to solve issues such as traffic jams, lack of parking spaces, as well as road safety. In this paper, the author uses a virtualized intelligent system that is IoT-based and the envisaged smart parking system calls for the introduction of an IoT-module on spot, which can be cast-off to display and report the accessibility of each vehicle parking space. Additionally, a software or application program is offered which enables people to monitor the availability of parking spaces and reserved parking slots as per their requirements. In the future, this paper will help in highlighting the parking-related problems as well as preparing a path to solve these problems.

KEYWORDS: Arduino,Cloud Computing, IoT, Mobile Application, Smart Parking System.

1. INTRODUCTION

Data can be sent over a network using the Internet of Things (IoT) without the need for human interaction. IoT enables users to adopt affordable wireless connectivity and supports data transfer over the same cloud. IoT enables consumers to update their transparency [1]. IoT was envisioned as a way of connecting different devices through the authentication of things. These gadgets can be monitored using a computer or viewed online. Two important terms in IoT are "Internet" and "Things", where Internet refers to a diverse network that connects computer systems. On the Internet, information can be delivered, received, or even connected to devices [2]. Air parking problem results in traffic congestion. In the present situation, it is difficult for a person to find a parking spot in his daily life. According to an assessment report, in 2035, the number of vehicles will still increase sharply to over 1.6 billion. About one million buckets of oil are burned in the world every day. Accordingly, a smart-parking-system is very important to decrease the petroleum leftover level [3]. Answers to the challenges being discussed. Adopting smart parking can increase user efficiency and communication costs while dramatically reducing the cost of gasoline used to find parking bays.

This data is transferred through devices that separate the relevant data and deliver some to an Arduino device, which immediately factors in controlling data for the devices needed. The Global System for Mobile Communication (GSM) module and Arduino work synergistically to provide a signal to the servo motor which also communicates and gives instructions to the user [4]. The radio frequency identification (RFID) card assigned to the username and password is scanned as soon as the user reaches the parking area while maintaining the security of identity verification. It enables the user to receive alert messages on their registered name and phone number as well as information about vacant parking areas [5]. It is divided into three sections, and the first is in the parking lot and contains Infrared-sensors (IRS) and Arduino devices. Due to all these gadgets, the customer can communicate with the parking lot. Managed cloud services that act as a middle-man between the worker and the

parking-garage are covered in the 2nd part of the essay. The cloud is generated based on the availability of parking space but even though the user can check the cloud service to evaluate its availability, the administrator can manage it. The third part of the article covers the user side. Through the GSM module, an SMS is received alerting the customers about the unavailability [5]. The user can interface with both the parking lot and indeed the cloud.

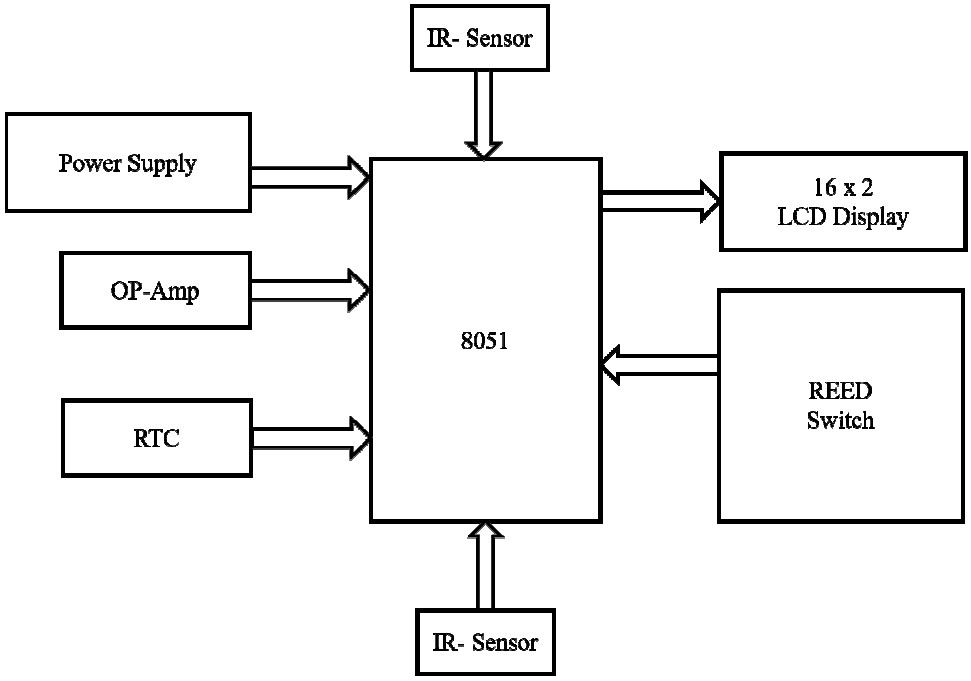

Figure 1: Display the Block-Diagram of the Smart-Parking-System.

According to Figure 1 the block diagram describes the whole working process of the smart-parking-system. The microprocessor 8051 is connected with the power supply and Operational amplifier(OP-Amp) and also connected with the real-time clock module (RTC).

1.1.System Architecture of Smart-Parking-System:

The first component of the parking area houses an IR sensor and Arduino devices. Figure 2 shows how and why the user uses these gadgets to communicate with the parking lot. Without such assistance of an RFID card, the user would be unable to enter the parking space Virtualized online services that act as an intermediary between the consumer and the parking lot is also covered in the second part.

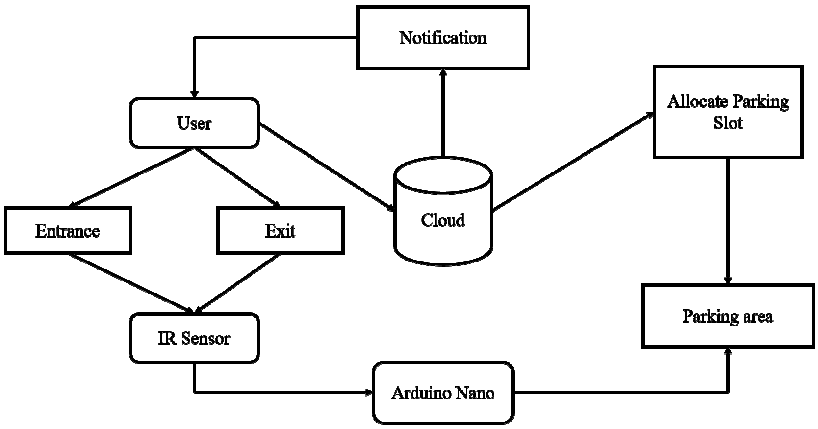

Figure 2: Illustrate the Block Diagram of the System Architecture of the Smart Parking System.

Depending on whether parking space is available, the array is updated. The user can check the cloud services to confirm their access, and the administrator is responsible for managing them. The user side would be the third section. Customers receive information through SMS through the GSM module depending on availability [6].

1.2. Hardware Architecture:

As shown in Figure 3, the three primary technical elements deployed are the GMS module, the RFID card, and the IR sensor. Only those who already have an RFID card are allowed access to the parking lot. The RFID-card only encompasses material about the recorded user. When the automobile pulls into the car space the reader applies knowledge of the username and password to the RFID tag [7]. The user is notified via text messaging of the status of the parking area, however, the data is then forwarded to Arduino to determine if this parking has excess capacity. Messages are sent by the GSM module as determined by availability. Depending on whether the vehicle is present, an IR sensor gives a signal.

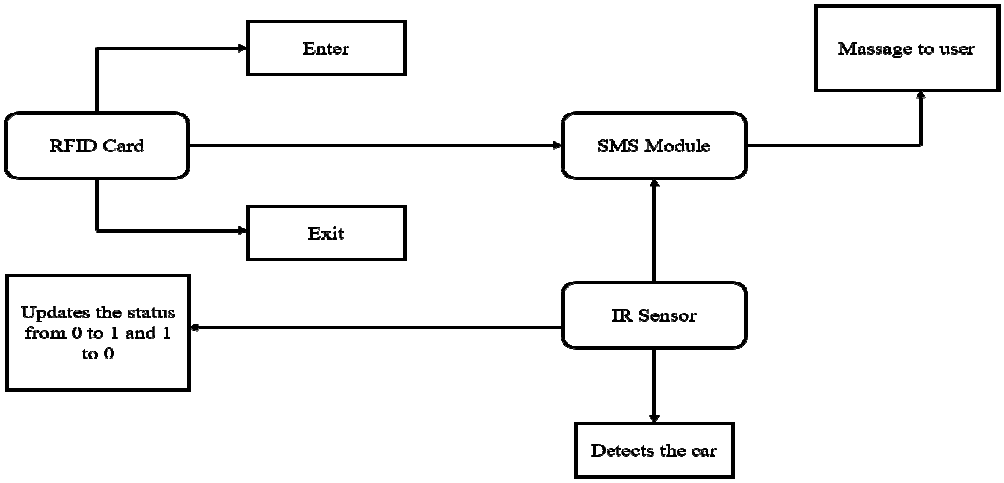

Figure 3: Illustrates the Block Diagram of the Hardware Architecture.

1.3. Software Architecture:

The modules mentioned in Figure 4 are connected through a cloud server, which it provides as an intermediary. The Wi-Fi module is connected to the cloud server. While vehicles enter and depart the parking garage using RFID cards, the user receives instructions through a Short Message Service (SMS) module [8]. The Cloud SMS module is in charge of managing the messages. The cloud status automatically changes from 0 to 1 as quickly as the IR-sensor can detect the vehicle, and the vehicle position switches from 0 to 1 when exiting the space [9].

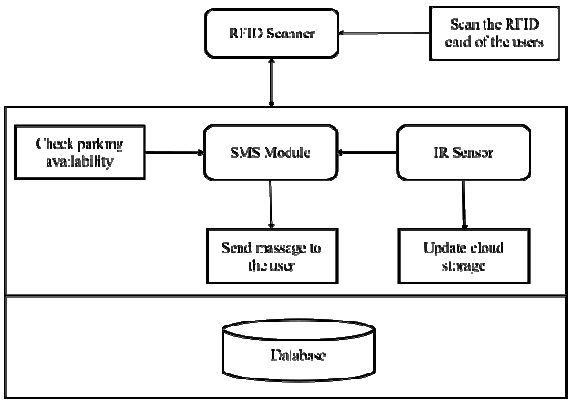

Figure 4: Illustrates the Block Diagram of the Software Architecture.

1.4.The infrastructure of the Smart-Parking-System:

The basic design of the PGI-system has been adopted by Smart Parking System. A Driver-Request-Processing-Center (DRPC) and a Smart-Parking-Allotment-Center (SPAC) are also included in such a system's structure. All real-time-parking-information can be collected and efficient by the Pavement Resource Management Center (PRMC), which then provides the product online or by VMS. DRPC driver parking applications collect real-time data, such as car whereabouts, monitor the progress of passenger allocations, and notify drivers of the results of their assignments [10]. Smart Parking Allocation Center allocates and reserves parking space for automobiles based on teamster applications and parking-resource requirements. The following is a description of the basic delivery process. A request comes with two economic conditions: a restriction on the cost of parking and a restriction on the rambling space between one's parking space and the actual driver's final terminus.

Basic details on the driver are also included, such as their license-number vehicle type, etc. [11]. To meet driver-specific and system-wide goals, SPAC aggregates individual driver-requests into the DPRC-over a specific time-frame and determines a comprehensive provision across conclusion time ideas. Each driver obtains a reserved place to park from the DRPC. Drivers can reserve a spot if they are happy with the assignment. After making an appointment, the motorist still has a chance to find a bigger parking space, with the assurance that it will be no worse than the situation they have now before filling up more allowed space. The PRMC then modifies the status of the appropriate car space from Available to Reserved and confirms that no other vehicle has the right to occupy that space. The driver must stay until the next specific moment if he is not happy with the appointment due to budget constraints, his overly strict parking demands, or some other reasoning.

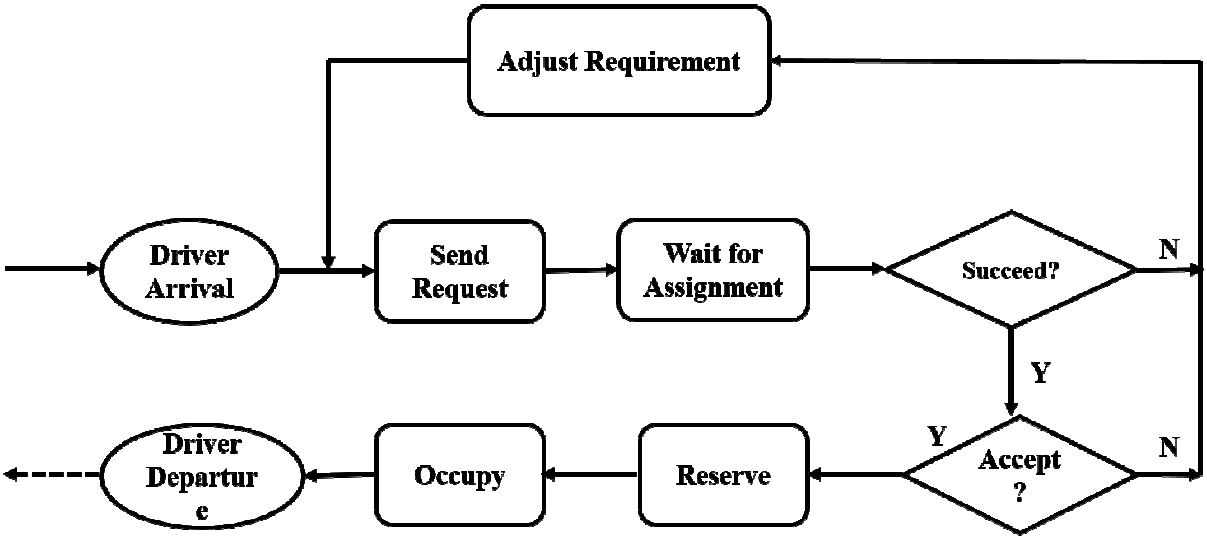

Figure 5: Illustrates the Block Diagram of the Basic Smart Parking System.

Drivers without undertaking parking have the chance to completely variation their walking-distance specifications during the time frame between allocation decisions made by the Centre, and flexibility in responding to the occasion of their appointment. Of course, if the parking system is used extensively, the driver may never be assigned a parking garage [12]. Figure 5 displays outline the entire experience and four prerequisites seem important for building such a smart parking system. The distribution center must first be made aware of the concerns of each parking area and the whereabouts of each car that submits the request [13]. Another criterion is the effective Wi-Fi connection between the cars and the allotment

middle. The infrastructure must be talented to set an arrangement that ensures the customer fixed parking space. To guarantee the best reservation, an efficient mechanism of allotting parking facilities should be put in place. In the coming paragraphs, man will focus on the specifics of the accomplishment of these four conditions.

2. LITERATURE REVIEW

C. Biyik et al. illustrate that The Internet of Things has progressed, enabling deeper integration into the framework and processes of advanced systems for urban management and management. Passenger vehicle ownership rates in cities are making it difficult to obtain parking and quality of life is reduced by high carbon emissions. Thus, to significantly reduce the time taken to find parking and greenhouse gases, smart parking technologies should be developed. The primary objective of this study paper is to investigate the technical aspects of parking management solutions, with an emphasis on systems and sensors that are already accessible and are discussed in the following sections. The assessment seeks to bring in-depth insights into the creation of parking guidance solutions. The classification of such systems should have been a component of a broader analysis of the state of driver assistance systems today as the giant automobile detecting technologies. The presentation of the network interface is clear at the end [14]. M. G. D. Ogas et al. illustrated that finding a commercial parking space can sometimes be daunting and challenging for both people and pedestrians due to the sheer volume of vehicles constantly trying to enter the congested areas in cities. Strategies that move cars from place to place and then try to find the best route are essential in this situation. The preponderance of the literature related to this study is routing techniques for choosing the best route to park on the street taking into account various variables. To assess where these system applications are developing at the moment, the author's aspirations include identifying the kind of smart-parking management organizations that are currently accessible, as well as the new vehicle identification technologies and algorithms they have. Or any other method they implement. The study successfully achieved research field status created on a pursuit and result withdrawal approach. Additionally, a discussion of the primary challenges, as well as the gaps found and unresolved issues for SPS, can be established thanks to the in-depth analysis of this study examined. The findings of this research may attend as an opening opinion for more exploration on the matter [15].

A. Sant et al. illustrated that the development and connectivity of a smart city, especially cars, is a significant one from a disproportionate correlation between the two, better resource organization and subsequent reduction in traffic congestion by reducing detour times to parking spaces. Taking advantage of empty garage parking areas, the author suggests and investigates a revolutionary green online service of smart parking systems based on things. The paper also identifies an intelligent method that links the pricing portfolio of private garages to the actual demand objective of the basement to provide customers with the best value. Malta, the country with only the fourth highest population density in the world, is used as an example of a smart city for the deployment of the planned method. Findings show that these countries have a highly promising system and that the developed value accurately predicts requests for a certain-garage at a detailed moment of the year. By motivating potential consumers to custom the program's amenities and dropping the while required for space, the envisaged smart-parking technology could help significantly with macro solutions for commuter traffic [16].

3. DISCUSSION

The need for smart parking systems has grown exponentially and it enables users to access available parking availability on time. Parking reservations and then checking the number of

parking spaces are not features of the current system in use today. The traditional generation was a vision-based tracking system that required an enormous amount of effort to estimate the number of vehicles accessible by the extent by including the number of motors coming and going. This same another method that was in use was a control system that employed high-frequency sound waves to sense the presence of an automobile. Subsequently, the idea of two-level parking emerged, which illegally consisted of parking one on top of the other. The outcome of the paper is that the space lot is associated with the rest of the area, which saves users money and effort. This paper will help in reducing auto theft. This paper reduces the amount of petroleum an automobile needs as a whole. Tracking of parking slots in conventional systems involves the use of such loop detectors at entry and exit locations.

To use the new vehicle tracking system, the smart system must be installed in single-spaced stands on roads. There is no official administrator overseeing the development and growth of various options and standards as IoT technology evolves. It has been highlighted that there will infrequently be exceptions in any of these cases in the generations to follow and even in the latter degrees of heterogeneity. The IoT topic encompasses a broad range of moderately that span a variability of perspectives and, as an effect, confront particular ideologies that struggle that cosmos don't debate one another. The instrument classical uses different kinds of communication-techniques to get around challenges that are repeatedly caused by a system letdown. Space may become unavailable due to an issue like vulnerability to distributed legitimate user assaults and uncontrolled hijacking situations. Due to privacy breaches as well as the potential for harm, there are significant difficulties that compromise sensitive information about motorists and their space knowledge that is recorded in the folder. The scaling constraints and resilient infrastructure required to effectively address the above threat are imposed by massively connected computers.

Smart parking systems can only perform simple tasks because there is no interface layer. The real-time information that enables drivers to make intelligent decisions should be supported by a web application. To handle large amounts of information and serve a large number of users, the infrastructure needs to be fairly compact. Achieving this requires the establishment of cloud-based services in the public or private sector. The information can uncover forces that require a great deal of attention and provide opportunities to neighboring consumers. In areas where there are no sensors or with unsatisfactory communication coverage, the data can also be used to predict capacity utilization and provide information about spots. Professionally speaking, this data approach could be valuable as a service point those experiences heavy traffic congestion at adjacent locations. In addition, construction firms can advantage of the material gained from the investigation of information on various parking-related facilities, particularly when influential where to build additional parking areas and to grow the number of parking-spaces available.

4. CONCLUSION

Humanity has also always aspired to the idea of pervasive computing. Great progress has been made in the construction of smart urban centers during the last few years. Job growth for smart cities has come to the fore with the advancement of IoT and cloud technology. Building smart cities have historically focused on installing automated parking structures and indicated intersection technologies. This paper outlines the parking problem and provides a cloud-based, IoT-based parking management solution. The approach designers suggest gives-real-time material about the quantity of space bays available in the parking-structure. Our free version allowed users in remote areas to reserve a parking space for themselves. This paper attempt to revitalize the city's parking infrastructure while also providing benefits for its residents. Several types of intelligent machines are discussed in this paper. The usefulness of

parking management systems in reducing traffic, especially in urban areas where there is traffic congestion and then there is a lack of parking spaces, is evidenced by the various examples of its application that are now being provided. It does this by educating customers and making more use of parking spaces. The advantages and disadvantages of each sensor technology can be examined using the study of all the biosensors used in locating trucks, which is one of the most important features of smart parking systems. While there are some drawbacks to using a visual-based approach to vehicle detection, those, as previously stated, are far from enhanced. Future goals include the implementation of a smart parking system based on slot booking using an Android app. The public may reserve their own, cheapest parking space using the slot allocation procedure. It is effective in resolving parking issues and provides automatic billing in addition to reducing traffic congestion.

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CHAPTER 5

WEATHER REPORTING AND FORECASTING STATION

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Abstract: Today's the focus has been shifted towards intelligent technologies like IoT and Machine Learning. Many IoT hardware platforms are available for IoT implementations. The IoT-based Weather Monitoring and Reporting System project is used to get Live reporting of weather parameters. It will monitor temperature, humidity, altitude, and pressure. When Scientists/nature analysts want to monitor changes in a particular environment like a volcano or rainforest and agriculture to see the weather condition to get the best yield or to monitor the physical parameters in a laboratory. For obtaining future weather conditions, an LSTM (Long Short-Term Memory) network-special kind of recurrent neural network (RNN) is involved. The framework used for developing the model is Keras. This model is trained using the pre-recorded values of sensor data.The sensed data from the sensors are uploaded to a ThingSpeak cloud server using ESP8266-01 module.The project has been developed usingESP 32 Microcontroller, DHT 11 temperature and humidity sensor, LDR (light dependent resistor), BMP280 pressure and altitude sensor, and OLED display to show the parameters measured. This system will monitor the changes in weather condition happening in the environment and then provides the users the fastest way to access the information from anywhere and also can be used for obtaining forecast on that collected data.

Keywords: IOT, Weather Station, Deep Learning, Microcontroller, Embedded C++, Weather Monitoring.

1. INTRODUCTION

The weather reports these days are unpredictable and need to be accurate because the climate changes drastically over the course of the weather. Because of that, the Weather Reporting System is needed to monitor the continuously changing climatic and weather conditions over various areas like houses, industry, agriculture, etc. And monitoring a weather parameter can help in laboratories as well for maintaining certain parameters. In real-time monitoring. The Human interaction interface we are using is just our laptop and then goes to our local server. It should be able to help us to display the weather parameters and also the information will also be visible from any place of the world. It's also displayed on the OLED display with the microcontroller communicating via Wi-Fi hotspots to get internet access. The value of some places that are sent by satellite weather report systems does not give their accurate condition. However, the problem comes when we need an accurate weather report at the current time. All-weather parameters measured using sensors will be controlled by the ESP32 microcontroller as the main node that will send all the data collected by sensors to the database and will be visible from anywhere in the world and also on the OLED display that uses the Wemos D1 mini as its microcontroller and an I2C connection. The display, as well as the pressure, altitude, and temperature sensors communicate via the I2C connection, which stands for an interconnected circuit in which one master device can control 64 slave devices (because it has an 8-bit address line). The added benefit of this is that we can control many devices simultaneously using only two lines called SDK and SDL (laving GND and VCC).

2. LITERATURE REVIEW

Jitcha Shivang et al. developed a simulated system to predict the weather conditions of the Indian subcontinent using machine learning. Data for training was collected from data.gov.in, ncdc.noaa.gov, and the UCI machine learning data repository. The system

utilizes a linear regression algorithm for data training [1]. Zaheer Ullah Khan et al. utilized different information-digging methods for expectation of climate determination, including diverse groupings like K-Nearest Neighbor and Decision Trees. Among the algorithms, the decision tree has accomplished promising outcomes compared with other calculations. In this paper, they achieved an accuracy of 82. [2]. Siddharth S. et al. used an information mining strategy and decision tree calculation to group climate parameters such as the lowest and highest extreme temperatures by day, month, and year [3]. Radhika et al. presented a paper on the use of Support Vector Machines for climate forecasts. Time arrangement information of every day's greatest temperature at an area was dissected to anticipate the most extreme temperature of the following day at that area dependent on the day-by-day most extreme temperatures for the past few days, alluded to as the request of the info. A non-straight relapse technique was utilized to prepare the SVM for this application [4]. Divya Chauhan et al. utilized information mining, an instrument that predicts practices and future patterns, enabling organizations to settle on proactive choices. This paper introduces the survey of data mining techniques for weather prediction and focuses on the advantages of utilizing them. The paper can be utilized to foresee meteorological information such as climate expectations. The paper gives a review of accessible writings of a few calculations utilized by various specialists to use different information mining methods for weather prediction [5]. After studying all the papers, it has been concluded that the training data is taken from some external source. But in this paper, all the data is measured in different conditions using a set of sensors. In this paper, two sensors, viz., LDR and DHT11, have been used to measure temperature, humidity, and light density.

3. DISCUSSION

In this paper, author tries to concentrate on the design and development of the IOT model and then deep learning model. The IoT model is divided into two parts, which are the hardware circuit part and the software development part. Hardware development entails building circuits and designing structures and circuitry. On the other hand, the software part involves microcontroller programming. By using three types of sensors to monitor the weather parameters which are temperature, humidity, luminance, pressure, and altitude, the system will be able to display the weather parameters with the sensor value data. All the data will be controlled by a microcontroller ESP32 and Wemos as the driver IC that will receive the sensor data from ESP32 and display it on an OLED display. Furthermore, the weather parameters value will be displayed on and store on ThingSpeak server from where it can be. The data collected will be sent to the Blynk web servers, and that data will be reflected in all the applications and microcontrollers. The Internet of Things (IoT) will connect the system with the user wireless and online without the need to check manually.

3.1. Design:

The block diagram consists of the components that are used in this project. Firstly, the microcontroller will involve the ESP32mcu. This microcontroller board will communicate with other sensors as specified to get sensor data from the respective sensors and send data collected to servers via wireless communication and hotspot Wi-Fi. The data is then synced with the ThingSpeak server using laptop and displayed on the OLED display. The microcontroller will display the sensor data on OLED and also on the Blynk app. The data collected will be analyzed and displayed in the application.

The microcontroller needs to be powered by a constant 5v 1A power supply via the V_{in} and ground pin or using the micro-USB port. We will be using the USB type A to micro-USB cable and a charger adaptor for powering as it is maintained under the specified range. The microcontroller can have a maximum output of 5v, 3.3v with a maximum current flow of

80mA, so to limit the current flow to 1 The 270 ohm resistors are used in series with the led for a stable output, and all connections are made on the breadboard. Our project includes a touch sensor that can be connected to any Metallic surface to make it touch sensitive. The touch sensor measures the amount of charge present in the surface, and it is used to switch between the displays (screens), and it is ground isolated from the supply.

For the data prediction, we have used the LSTM model, which is perfect for use on multivariate time series types of data. It takes data from the ThingSpeak server and also puts the predicted data on the ThingSpeak server, which helps us to do the data analysis and make one point stop for data-related work and makes work easier.

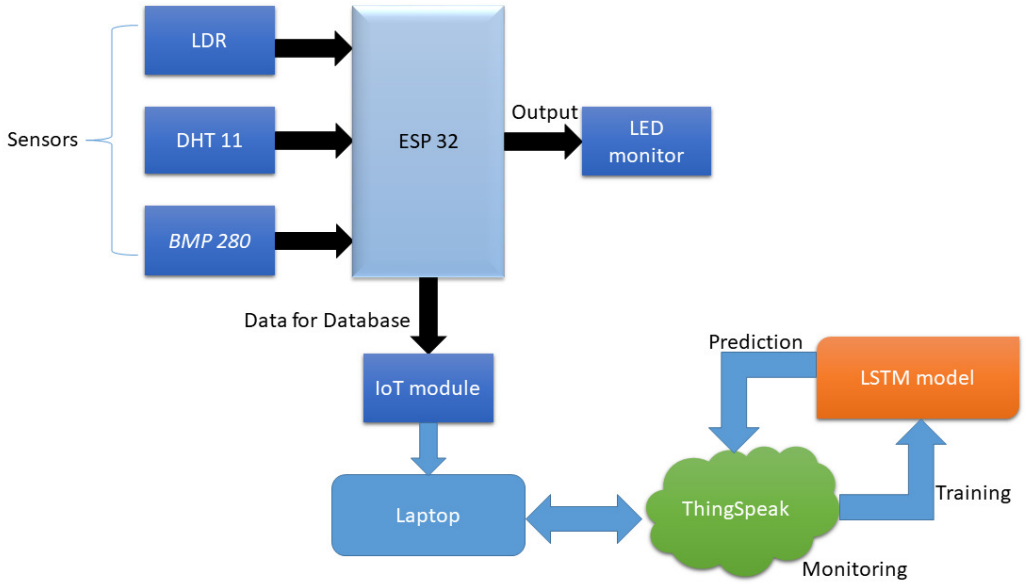

Figure 1: Illustrating the proposed design.

Two different sensors are connected with ESP 32, which measures temperature, humidity, and light intensity as shown in Figure 1. The LDR is connected to an analog I/O pin and the remaining sensors are connected to digital I/O pins. The complete block diagram of the system. Using ESP 32, data is sent to the ThingSpeak cloud server (database) as shown in Fig. 8. Further, ThingSpeak sends data to the ESP 32 in the form of a JSON file, so that data can now be displayed on an HTML Web Page that reflects measured readings of different sensors, as. Simultaneously, a Google spreadsheet is used to record the various temperature, humidity, and light intensity values in CSV file format[6] . This recorded data is used to train the machine learning algorithm. A model based on LSTM deep learning [7] is used and trained with the pre-recorded values stored in the Google spreadsheet. Furthermore, ESP32 records the real-time values of temperature, humidity, and light intensity, etc. value of a particular place or location that are used to test the model and take a decision. These values are sent back to the server. The model is used to make an attempt to predict the feasibility of a match. After that, either logic '0' or '1' is stored in the ThingSpeak server take as a predicted result [8]. The accuracy of this model is approximately 84%.

3.2. INSTRUMENT:

3.2.1. SYSTEM HARDWARE:

Our main microcontroller which we are using is called the node MCU because we can connect multiple of those controllers and form a network just like computers do. Because of this special feature, multiple microcontrollers like this can be connected to form a network

where each microcontroller will act like a node. Hence, it is called the node MCU and the MCU stands for the microcontroller unit. At the very least, the microcontroller must be connected to the internet during boot-up to retrieve data such as the current date, time, and altitude of our current location.

The microcontroller can be programmed in 2 ways: one using the Arduino IDE, which is well known for the Arduino development board, and the other way using the BareMetal programming language, specifically designed for this microcontroller. In our project, we are using the Arduino IDE and our project is written in C and C++.

3.2.1.1. ESP32 microcontroller:

ESP32 is a low-cost, low-power consumption system on a chip of microcontrollers with integrated Wi-Fi and dual-mode Bluetooth (low power and performance mode where the low power is for the short range and the high power can be use long-range and during the initial setup). The ESP32 microcontroller has a Tensilica Xtensa LX6 microprocessor. It is both a dual-core and single-core CPU chip that can be designed by the programmer and includes built-in antenna switches for Bluetooth and Wi-Fi connectivity, a low-noise receive amplifier, RF balun, power amplifier; filters; and power management modules. ESP32 is developed and manufactured by Espress Systems, a Shanghai-based Chinese company, and is manufactured by TSMC using its 40 nm process.

3.2.1.1.1. Features:

- Processor CPU: Xtensa dual-core (or single-core) 32-bit LX6 microprocessor, operating at 160 or 240 -MHz and performing at up to 600 DMIPS, Ultra-low-power (ULP) co-processor.
- Memory: 520 KiB SRAM, 448 KiB ROM.
- Wireless connectivity: Wi-Fi: 802.11 b/g/n, Bluetooth: v4.2 BR/EDR and BLE (shares the radio with Wi-Fi).
- Peripheral interfaces:
    a. 34 × programmable GPIOs.
    b. 12-bit SAR ADC up to 18 channels.
    c. 2 × 8-bit DACs. 10 × touch sensors (capacitive sensing GPIOs).
    d. 4 × SPI. 2 × I²S interfaces.
    e. 2 × I²C interfaces. × UART.
    f. SD/SDIO/CE-ATA/MMC/eMMC host controller.
    g. SDIO/SPI slave controller.
    h. CAN bus 2.0. Infrared remote controller (TX/RX, up to 8 channels).
    i. Motor PWM. LED PWM (up to 16 channels).
    j. Hall effect sensor and temperature sensor

3.2.1.2. OLED DISPLAY:

This display is made of 128x64 individual white OLED pixels; each one is turned on or off

by the SH1106 controller IC, its microcontroller chip. The display is made up of individual pixels; hence, no backlight is required and the display will also be compact and light-weight to carry. This reduces the power required to run the OLED display, which has a diagonal size of 0.96 inches. The 128x64 pixel OLED display has an outline dimension of 26.70 x 19.26 mm and an AA size of 21.74x10.86 mm, and it communicates via 6800/8080 8-bit parallel, I2C, and 4-wire serial interface. In our project we have the display programmed to perform five different operations, which are more likely called screens. The first display shows the current date and time of the current location, which will be fetched by the microcontroller once it is connected to the internet; the second display shows the temperature as a main parameter and humidity and pleasure as the secondary parameters and, correspondingly, the red led will be turned on; the third display shows the humidity as the main parameter and temperature and altitude as the secondary parameters and the corresponding blue led will be turned on; finally, the 5th display we have the luminance as the main parameter and temperature and humidity as the secondary parameters and the corresponding blue led will be turned on. Aside from these five LEDs, there are two more: the WIFI status led and the display switch led. The Wi-Fi status led is a multicolor led that shows us whether the microcontroller is connected to the internet or not. Once the microcontroller is connected to the internet, the Wi-Fi status led turns green, and when the Wi-Fi is not connected, the Wi-Fi status led will be blue. Since this is an IOT-based project, the microcontroller needs to be connected to the internet at least for the first time boot up because it needs to get some data like the current date and time. Our current location will be automatically identified once the microcontroller is connected to the internet. Well, the other led is the display switch indication led, which will turn on once the display switch command is given from a Blynk application, which will be mentioned in the upcoming pages (Figure 2).

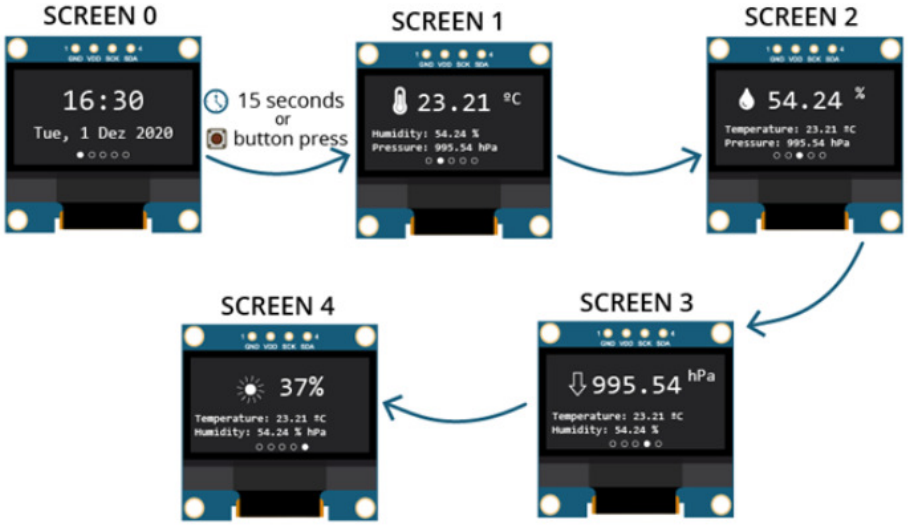

Figure 2: OLED DISPLAY AND ITS INTERFACE

3.2.1.3. LDR (LIGHT DEPENDENT RESISTOR):

A photo resistor (also known as a light-dependent resistor, LDR, or photo-conductive cell) is a passive component that decreases resistance when receiving luminosity (light) on the component's sensitive surface. The resistance of a photo resistor decreases with an increase in incident light intensity; in other words, it exhibits photoconductivity.

The LDR stands for light-dependent resistor. In our project, the LED is used to sense the amount of light present in the environment. As a result, instead of displaying the luminance,

we will be displaying the percentage of light falling on the sensor (the minimum and maximum values can be modified in the program which will be loaded into the microcontroller). The LDR's first terminal is connected to the ground, and the other pin is connected to the 10K resistor to limit the current, and the resistor leads to the +VCC. The junction of +VCC and the resistor is used as the data lines which will be connected to the analog to digital converter of the microcontroller. The code is written in such a way that the output is in percentages.

3.2.1.4. BMP280 SENSOR:

The BMP280 Digital Pressure Sensor is an absolute biometric pressure sensor specially designed for mobile applications. The sensor module is made in an extremely compact package. Bosch Sensor Tec is the company that manufactured the BMP280 Digital Pressure Sensor. Its small dimensions and low power consumption allow for its implementation in battery-driven devices.

The BMP280 is based on piezo-resistive pressure sensor technology, featuring high accuracy and linearity as well as long-term stability and high EMC robustness. Numerous device operation options offer the highest flexibility to optimise the device regarding power consumption, resolution, and filter performance (Figure 3).

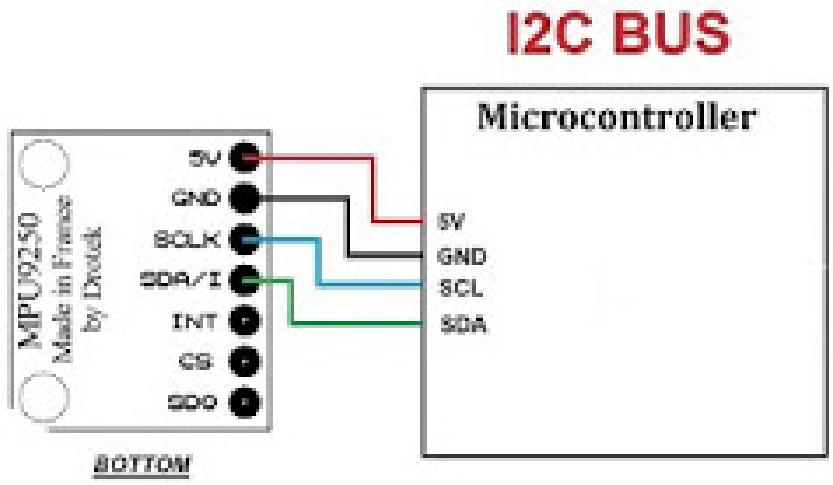

FIGURE 3: REPRESENT THE BMP280

THE ABOVE DIAGRAM SHOWS THE CONNECTION FOR THE FOR I2C CONNECTION APART FROM THE GROUND AND VCC THIS TYPE OF CONNECTION HAS THE SDA AND SDK WHERE SDA STAND FOR THE SERIAL DATA LINE AND SDK STANDS FOR SERIAL CLOCK LINE, BOTH OF THESE LINES ARE CONNECTED TO THE MICROCONTROLLER SDA AND SDK RESPECTIVELY.

3.2.1.5. DHT 11 SENSOR:

The DHT11 is a commonly used temperature and humidity sensor. The sensor comes with a dedicated NTC to measure temperature and an 8-bit microcontroller to output the values of temperature and humidity as serial data. The sensor is also factory calibrated and hence easy to interface with other microcontrollers.The sensor can measure temperatures from 0°C to 50°C and humidity from 20% to 90% with an accuracy of 1°C and 1%. If you are looking to measure in this range, then this sensor might be the right choice for you.

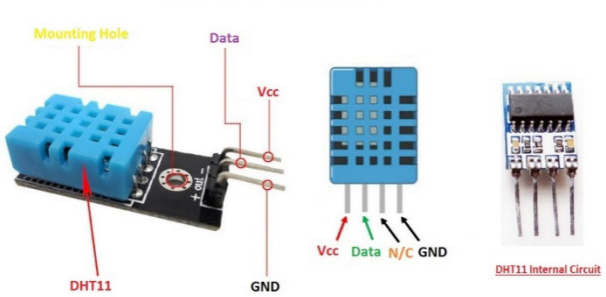

Figure 4: Illustrating DHT 11

As you can see in Figure 4 the 5K pull-up resistor is used when the data pin is connected to an I/O pin of the MCU. This data pin outputs the value of both temperature and humidity as serial data. If you are trying to interface DHT11 with Arduino, then there are ready-made libraries for it that will give you a quick start.

If you are trying to interface it with some other MCU, then the datasheet given below will come in handy. The output given out by the data pin will be in the order of 8bit humidity integer data + 8bit humidity decimal data +8 bit temperature integer data + 8bit fractional temperature data +8 bit parity bit.

3.2.2. System Software:

The Arduino IDE (Integrated Development Environment) is the environment where code is written, compiled, and uploaded to the Arduino or Arduino-compatible board. ThingSpeak is a platform for the Internet of Things that allows users to collect and store sensor data in the cloud. An HTML web page is a plaintext document with an.html or.htm filename extension. Typically, it also contains multimedia content (words, pictures, and other media) and code written in HTML, CSS, and JavaScript to control the look and behavior of that content. The Jupyter notebook is a very popular and flexible tool that helps put the code, output of the code, and any kind of visualization, plot, etc. in the same document.

3.2.3. Lstm deep learning model:

It is special kind of recurrent neural network that is capable of learning long term dependencies in data. This is achieved because the recurring module of the model has a combination of four layers interacting with each other.

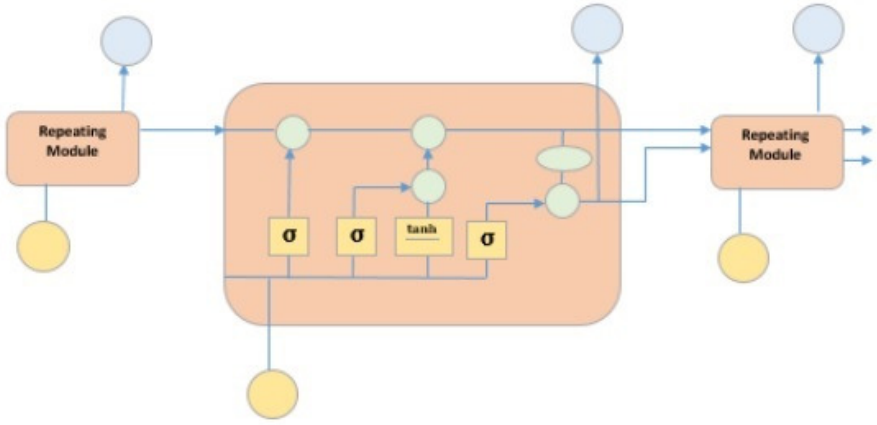

Figure 5: Illustrating the structure of LSTM

The Figure 5 depicts four neural network layers in yellow boxes, point wise operators in green circles, input in yellow circles and cell state in blue circles. An LSTM module has a cell state and three gates which provides them with the power to selectively learn, unlearn or retain information from each of the units. The cell state in LSTM helps the information to flow through the units without being altered by allowing only a few linear interactions. Each unit has an input, output and a forget gate which can add or remove the information to the cell state. The forget gate decides which information from the previous cell state should be forgotten for which it uses a sigmoid function. The input gate controls the information flow to the current cell state using a point-wise multiplication operation of 'sigmoid' and 'tanh' respectively. Finally, the output gate decides which information should be passed on to the next hidden state

4. CONCLUSION

The real time weather prediction system presented in this paper has been developed around low cost IoT board and sensors. The temperature, light and humidity are the three important parameters that are monitored and uploaded on ThingSpeak cloud [9]. The system has been deployed in an indoor environment and values of the parameters have been recorded in Google spreadsheet. A LSTM model has been used in Jupyter notebook environment that is trained with pre-recorded values of parameters and used to predict the weather parameters in real time environment. The result of the model is also compared with the other works available in literature and the proposed system is slightly better in terms of accuracy. Further, the system can be modified to be used at commercial level and have many applications in smart homes, buildings, sports, hospitals etc.

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CHAPTER 6

AN ANALYSIS OF HUMAN-COMPUTER INTERACTION AND TECHNOLOGY PROGRESSION

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ABSTRACT: Human Computer Interaction (HCI) is an interdisciplinary branch devoted to the development of computer technology and, in particular, the interaction between individuals and technology. Along with its basic relationship with computers, HCI has evolved to include essentially all aspects of information and technology design. The paper defends the claim that HCI has evolved into a design-oriented field of knowledge, with much of its focus on the development, design, and development of new types of information and interacting technologies. However, there appears to be a lack of information in the field regarding the procedures and techniques of such studies. The main purpose of this paper is to give a comprehensive summary of the field of personal communication. The introduction provided key terms and terminology, a survey of modern technologies and the latest developments in the field, and fundamental designs for donations in the creation of HCI systems, including untethered and multimodal setups, which ultimately included the implementation of HCI. In the future, this paper will provide a detailed list of places for each HCI theory, procedure, and example.

KEYWORDS: Human Computer Interaction, Computer Science, Communication, Information Technology, User Interface.

1. INTRODUCTION

Using technologies had always raised the issue of interacting with them. The ways that individuals have interacted with computers have evolved significantly through time. The trip is still ongoing, and design considerations for technology and systems arise more often every day. Over the past few decades, the pace of this field's research has increased consistently [1]. The Human-Computer Interaction (HCI) area has progressed throughout the history of its existence in more ways than just interaction quality. The various study areas have focused differentially on the ideas of met discourse instead of unimodality, intelligent and smart interfaces instead of directive or action-based ones, and finally lastly active instead of passive displays. Basic HCI terms used in this study are described in the following section [2]. Then a summary of recent and forthcoming advancements in technology in the area is given. The following paragraphs describe some of the uses of HCI and discuss probable future developments. For the first time, modern electronic devices became freely available to the general public for applications including word-processing programs, gaming consoles, and bookkeeping tools. Consequently, the demand to advance human-computer interaction that was equally simple and effective for less seasoned players became increasingly important as machines were no longer room-sized, sophisticated instruments that had only been created for professionals inside specialized environments [3]. Since its inception, HCI has developed to embrace a diverse range of areas, containing computer-science and human factors engineering as mentioned in Figure 1.

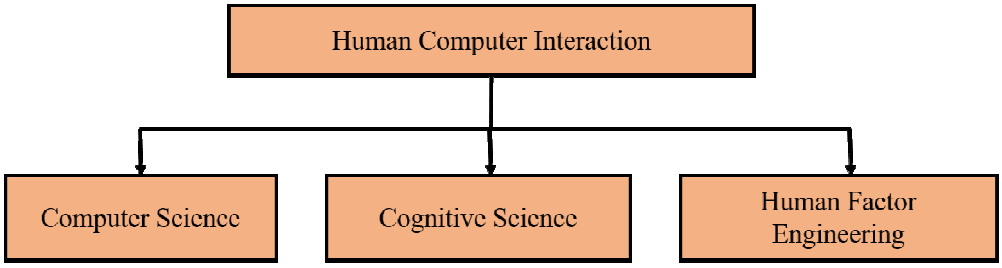

Figure 1: Multidisciplinary Field of Human Computer Interaction

1.1.Definition and Terminology of The Human-Computer Interaction:

The concept of Human Computer-Interaction (HCI), also abbreviated as interfacing, was naturally established with the invention of the computer, or further generally the computer, herself. In actuality, the answer is noticeable utmost complicated devices are unserviceable except the human species can utilize them appropriately. The four principles that should be taken into consideration while designing an HCI are performance and usability, as indicated by this concise explanation [4]. What a system can do, or how its functions potentially contribute to the attainment of its aim, can eventually be applied to explain why it was established. The variety of options or filling stations that coordination can perform for its users expresses its performance. The value of technology, however, is only superficial when it can be effectively secondhand by the consumer. The scope and quantity to which a classification equipped with a detailed capability may be successfully applied and suitably to accomplish various goals for particular people is the system's usability.

When the functioning and usability of a program are completely together, the system's true efficacy might well be realized. In light of these ideas and the frequent application of the terms computer, machine, and system in this specific situation, HCI is a design that attempts to establish a fit between the user, the contraption, and the essential infrastructure to achieve specific effects concerning the quality and convenience of the services [5]. The criteria for what constituted an effective HCI design are mostly variable and context-specific. For instance, while a graphics editing program may not require such perfection, an aviation component manufacturing tool may need to give incredible truthfulness in the view and strategy of the fragments. The sorts of HCI that are generated for a given goal may vary depending on the available technology. One illustration is accessing computer functionality through keystrokes, menus, graphical user interfaces (GUI), or virtual reality. The very next part affords a more extensive description of the current methods and methods of networking with computing as well as the latest signs of progress in the expanse [6].

1.2.Several aspects of Human-Computer-Interaction:

The point of communication between a hominoid user and then a computer is known as the human-computer interface. The loop of connection is the term used to describe the sharing of information between humans and a computer. The loop of communication has a plethora of components, such as:

- *Visual-Based:* The maximum prominent field of HCI study is possibly the graphical representations of human-computer interaction.
- *Audio-Based:* The alternative essential factor of HCI systems is audio-based human-computer interaction. This section examines information collected from countless audio signals.

- *Machine-Environment*: The setting inside which the mainframe is located, for illustration, is a laptop in a student's residence room.
- *Areas of the Interface*: Non-overlapping operations include measures undertaken by a computer and a person that seem to be unrelated to one another. The overlapping regions, nevertheless, are merely interested in the interactions' properties associated [7].
- *Input-Flow*: When a user has a project that mandates utilizing a computer, the sharing of information starts in the environment in which it operates.
- *Output*: The information exchange starts in a technology medium.
- *Feedback*: Processes that flow from a people via the connection to the technology and back are examined, monitored, and acknowledged throughout repetitions of the connection.
- *Fit*: This is the synchronization of the user, the activity, and the theory of computation to maximize the utilization of the human resource department needed to accomplish the task.

1.3.HCI Responsible for Interactive Devices:

To interact with computers, people use a diverse range of interactive gadgets. Certain of them are well-known instruments, while others have just been produced or are just concepts. They will learn about several modern and historic interactive gadgets throughout this chapter [8].

i. Touch-Screen:

Although the capacitive touch idea was predicted throughout decades, the platform was just recently acquired. Today, a great deal of technology uses touch screens. The capacitive touch experiences that manufacturers provide are personalized after thoughtful consideration of these devices. The touch screens made employing electrodes and a current relationship are the easiest and least expensive to construct. Even when comparable hardware is utilized, software alone would cause significant distinctions between one touch device as well as another, in addition to technological variations. Touch displays are anticipated to experience significant expansion shortly, along with cutting-edge aesthetics, and new technology, including cutting-edge software. A sync between the fingertips and other technologies may be built to further the advancement [9]. In HCI, the touch screen can be considered a new interactive device.

ii. Gesture-Recognition:

Language cloud computing study of sign language recognition aims to comprehend physical movements using computational methods. The area of interest right now is gesture recognition. With the assistance of this revolutionary technology, people and technology may interact in an improved manner without the need for any conventional instruments. This innovative interactive gadget may replace obsolete technology like keyboards while placing greater emphasis on cutting-edge equipment like touch screens [10].

iii. Speech-Recognition:

Speech Recognition is the process of turning spoken utterances into written text. These technologies can indeed be utilized for comprehensive device control, such as putting on and

off electronic systems. Only a few commands must be recognized for the transcribing to be complete. Big vocabularies, meanwhile, cannot benefit from all of this. This HCI tool enables hands-free movements for the user and preserves instruction-based technology contemporary for them [11].

iv. Keyboard:

A keyboard is a simple technology that we are all accustomed to nowadays. A keyboard is a safety mechanism for a computer that employs a combination of keys and buttons. A keyboard's keyboards each represent a distinct written character or letter. This is the oldest and perhaps most efficient tool for connecting human beings and machines. It has inspired the creation of several additional various functionalities and led to improvements like soft screen interfaces for mobile devices and computers [12].

v. Response-Time:

A device's system response is the length of time it takes to react to a request. A database query or the download of a website would both be examples of requests. The maintenance schedule and wait time are added together to calculate the response time. When an answer should travel via a network, the transmission time is introduced to the response time. Numerous programmers are loaded on contemporary HCI devices, and the plurality of them occur simultaneously or following the user's needs. A busier response time emerges from this. That whole improvement in response time is the result of prolonged wait times. The queue of inquiries that came after it and the execution of the requests are responsible for the propagation delay [13].

1.4.Human-Computer Interaction with UI and UX design:

The study of how humans create, utilize, and communicate with interactive personal computers, as well as how technologies impact our daily lives and our environments, is known as HCI. This refers as far as how we connect with technologies, obtain important information, communicate with other individuals outside of our surrounding surroundings, perform our daily duties, etc. It involves utilizing both input and output devices like a keyboard, mouse, finger, communication device, switches, and even various body parts, as well as interaction methodologies that make use of them, how documentation is requested and delivered to the user, how machine activities are governed and monitored, getting help, the tools and methodologies used to design, build, test, and evaluate interface design and the perceptions that users have with the machines, and the guidelines that developers and developers adhere to when attempting to create these interfaces [14]. The domain of HCI is heterogeneous. It is becoming a specialty issue within some areas, each with a special emphasis such as the application design and engineering of human interfaces, Sociology like communication between technology, employment, and organization, psychology the implementation of theories of cognitive processes, and indeed the empirical investigation of consumer behaviors and users' emotional link with machinery, industrial design connected products, etc. Even though Figure 2 shows that the above-mentioned disciplines address numerous components of HCI difficulties, everything is concentrated on tackling a single, more serious problem: how to make our connections with computers more comfortable and transparent [15]. Making human-machine interactions more comfortable is crucial to ensuring that people naturally adapt to them and utilize them in an easier, faster, and friendlier manner as machines grow more sophisticated, powerful, and omnipresent in our daily lives.

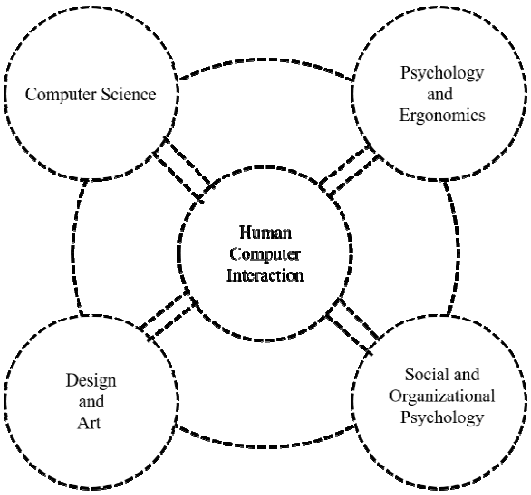

Figure 2: Illustrated the fundamentally major Factors of Human Computer Interaction.

1.5. Future Scope of Human-Computer Interaction:

The quantity and complexity of the internet age we use are astonishing when people considered the digital world in which they live. Not only has the proliferation of gadgets increased dramatically over the last few decades, but their nature has also transformed in an almost supersonic way as they have penetrated every aspect of our daily lives. In the future, this will have to coexist with a quickly growing and evolving array of digital instruments that are networked. Some of them will be near us or perhaps inside of us, and others will be covertly interwoven into the world around each other. These technologies will be interwoven into the world in a broad range of ways, and how much we would perceive them and their interacting capacities will also vary. In a world where the idea of an interface is therefore no longer clearly defined, secure, or fixed, we need to appreciate and design for interaction. Here, we are taking into account how this will impact the separation between computational power, including that somewhere between computers and physical components and humans.

Whatever happens, though, our engagement with technology should reflect the characteristics that characterize us, humans. Computer systems and programs have advanced in intelligence while increasing their independence. More individuals are now beginning to decide and make the choices for us. Popular recommendation engines, for instance, provide recommendations for things we would wish to do or buy. Computers are becoming more pervasive in our existence as they grow more autonomously [16]. Today's smart computers can clean our houses, guide us, and are now even starting to take on the role of our pets and companionship. These update the position on important considerations concerning how we should interact without them, the nature of our partnerships, as well as more general ethical and ethical concerns regarding responsibility and responsibility. Human-computer interaction approaches are still advancing rapidly. The influences determining the characteristics of future computation have an impact on human-computer interaction and the aforementioned traits are anticipated for HCI in the future:

i. *Ubiquitous-Communications:* Computers will be able to communicate through cellular, thermal, ultrasonic, large area networks, and other portable techniques in addition to high-speed smaller networks.

ii. *High-Functionality-Systems:* Systems will be associated with a vast assortment of functions.

iii. *Mass-Availability of Computer Graphics:* As affordable semiconductors become attainable for use in common workstations, computer graphics features including image processing, graphical transformation, rendering, and algorithms have been suggested will become more prevalent.

iv. *Mixed-Media:* Images, speech, acoustics, video, texts, and semantic information will all be handled by technologies.

v. *High-Bandwidth-Interaction:* The frequency of interactions between people and machines should significantly rise.

vi. *Large and Thin Displays:* Finally developing screen technology will allow for exceptionally enormous, thin, light, and inexpensive screens.

vii. *Embedded-Computations:* Beyond desktop computers, the calculation will spread to everything that has a use.

In this paper, the author has described human-computer interaction. The study on the creation emphasizes the interface between humans and computers is known as human-computer interaction. Researchers in HCI examine the way individuals use computers and create solutions that let people interact with them in novel ways. In this paper, the author has docked some terminologies of HCI. After that, together with some aspects of HCI, the combination of HCI and device is shown and finally, the author highlights the future utility of human-computer interaction.

2. LITERATURE REVIEW

T. Ozseven illustrated that the tremendous advancement of technology and computer systems, we use Computer-Human Interaction in every aspect of our everyday life. The proposal and employment of collaborative whiteboards are part of the multidisciplinary field of examination known as human-computer interaction. Human behavior, psychology, scientific method, computer technologies, software engineering, biomechanics, industrial design, sociology, and instructional sciences are just a couple of the fields that have connections to the field of human-to-human computer interaction. The user, task, tool, and environment are the four essential parts of the human-computer interdisciplinary approach. With the aid of planning, testing, and operational plans, interactive technologies are to be established. Usability is a requirement for the advancement of interactive technology. By combining the evaluation of usefulness, efficiency, and happiness, usability may well be evaluated. How well users seem to be able to do the things assigned to them while using the program is one measure of its effectiveness; efficiency and duration of the user work; The term satisfaction expresses how the respondents feel about the program after using it [17].

Y. Zhang stated with Digital media manifestations are continuing to evolve with the aid of science and technology, ushering in a brand-new age and propelling the advancement of computer-computer communication technology. The development of the medium of interaction and associated field implementations are still understudied in the domain of visual interaction blocky graphics and related technologies. This paper concluded to examine the visual interaction development process, possible applications, and related technologies from a technical standpoint. The author addressed how to better connect the visual dependent on application with creative design in combination with the technological advancement of digital media art, and we discussed the critical components of the architecture, technology, and manufacturing methods of visual interactive works. This paper will also develop an image processing model for the communication tool of a human-computer interface, harvest boundary requires identification using the edge contour method for feature extraction

combined with merge fusion technology to improve the processing of the visual language information, and create a perimeter package for the visual communication image. The network method makes the interface for human-computer interaction communication tools as efficient as possible. The test outcomes show that this approach may large and positively the integrity of its visual communication, increase the output of the interface's discriminate capability, and various performance metrics in the commenting of visual interactive works [18].

J. Wang embellished that in recent years, the multidisciplinary field of human-computer interaction has attained threshold status. The use of human-computer interaction in construction site management has increased throughout the fourth industrial revolution, which has substantially accelerated the advancement of hazard recognition in construction projects. The findings indicate that over the past 20 years, hazard recognition has benefitted immensely significantly from the use of human-to-human interaction. In addition, several entirely new research areas have now been created as a result of this work, including the multimodal neurobiological data analysis in hazard acknowledgment experimental studies, the creation of perceptive policies and antennae, and the development of a human-computer-interaction safety management system based on big-data. Future examination courses will focus on virtual reality, biomechanics, computer vision, and computational analysis. In this study, they constructed a conceptual base that reflected the findings of previous studies and their connections, and we made submissions for the practical enhancement of human-computer communication in the area of danger assessment in the future [19].

3. DISCUSSION

Human-computer interaction (HCI) examines the user, their task and objective, the communication and the HCI, as well as the surroundings in which the communication takes place. It's essential to keep advancing and researching the subject of HCI since technology has advanced and influenced every aspect of our lives, from smart watches to home gadgets that are related to the internet. Research by organizations like Adobe, Microsoft, and Facebook ultimately resulted in technology advancements that aid in developing user-friendly experiences for a wide range of industries. The speech interface is just the beginning of how user interfaces might change. The human race is today on the edge of revolutionary advancements in wearable technology, artificial intelligence, and computer vision. Beyond vision, listening, and touch, the connection between individuals and computers is getting stronger and stronger and will eventually embrace all of our senses. People can incorporate the computing capacity of contemporary technological devices to their full capabilities thanks to well-designed user interfaces. HCI allows designers to converse with machines. In these kinds of conversations, consumers experience communicating with other personalities instead of intricate systems. This is why it's crucial to pay close attention to the foundations of HCI when it comes to creating new technologies.

4. CONCLUSION

Adapting to a new, design-oriented HCI could be described as a dedication to technology and technical innovation that goes beyond criticism. The process-oriented conservative explanation, the product-oriented romanticism account, and the practical pragmatist account were established as three opposing views from system design that each attempt to determine what design 'is'. The significance of brainstorming in design work was researched, and it was discovered that the pattern of economic the designer to interact in a crucial conversation with the components of the given experiment, from which the design challenge and its solutions are developed immediately, is a highly associated pair. Because of this, it was noted that the

function of design in HCI could not just be viewed as a matter of problem-solving, as that of an art form, or as a connection to reality, it is, instead, an evolving practice that necessitates a significant level of involvement from the designer. In the future, this paper will support that the subject of HCI should recognize the distinction here between the conduct of research-focused design, which develops artifacts, and design-oriented research, which study area. These require various principles for interpretation, debate, and appraisal since they have different objectives and prerequisites.

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CHAPTER 7

AIR POLLUTION METER AND REQUIREMENT OF AIR POLLUTION MONITORING

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ABSTRACT: The practice of collecting and measuring the elements of air pollution, especially gases and particulates, is known as air pollution measurement. Rain gauges, Ringelmann charts to measure smoke, and basic soot and dust collectors known as deposit gauges are some of the oldest instruments used to measure pollution. Monitoring aids in quantifying pollution with reference to ambient air quality requirements. Setting standards is a government action aimed at reducing pollution and providing clean air. Strong surveillance alerts individuals and initiates the process of taking preventive measures against serious incidents. In this paper, the author discusses the tool that collects information on air quality in order to correct problems with it. The paper aims to build an air pollution detector that can measure levels of ozone, particulate matter, carbon monoxide, sulfur dioxide and nitrous oxide. One of the most promising areas for increasing air quality is the development of new technologies. Author have developed technologies to prevent indoor and outdoor air pollution, from catalytic converters to low-emission consumer goods.

KEYWORDS: Air Pollution, Air Pollution Monitoring, Air Quality, Environment,Pollution Monitoring.

1. INTRODUCTION

Environmental monitoring is a systematic strategy for observing and analyzing the state of the environment. Human beings need clean air to breathe in order to be healthy, but as the transportation system increases, the pure air is becoming more and more polluted. The way we travel affects the environment in which we live. As the number of vehicles increases, so do the emissions of traffic-related pollutants. Therefore, it is necessary to monitor pollution levels in urban and suburban areas to determine how this pollution affects the environment and people's health [1]. Air pollution is causing many health-related problems. Road traffic emissions are a significant cause of air pollution, emitting 97% CO and 75% NO. Therefore, monitoring of air quality is essential to be able to provide meaningful information about pollution and to implement necessary countermeasures when necessary. The goal of air quality monitoring is not only to collect data, but to provide scientists, planners and policy makers with the knowledge they need to decide how to manage and improve the environment [2]. The primary goal of the Air Quality Monitoring Network is to collect information about pollution levels and other pollution-related factors and to disseminate it to the public to alert people to potential hazards.

1.1 Requirement of air pollution monitoring:

One of the fundamental components of a person's environment is air. The planet's atmosphere is composed of gases such as nitrogen, oxygen, carbon monoxide, and microscopic amounts of some rare elements. Clean air environment is essential for human beings. On this the life and health of the people depends to a great extent. Any change in the natural composition of air can be very harmful for the life of the earth [3]. When one or more pollutants, such as gases, are present in the air in sufficient quantities to endanger people, animals, and plants, it is considered air pollution. Parts per million (ppm) and ug/m3 are the units used to measure air pollution. There is direct atmospheric release of primary contaminants. When the main

pollutant combines with other substances in the atmosphere, secondary pollutants are formed. Public health is affected by air quality. The effects of air pollution can include shortness of breath, cough, and worsening of asthma and emphysema [4]. Visibility can also be affected by polluted air. Globally, one in eight premature deaths or 7 million people die every year due to air pollution. Every year, around 570,000 deaths occur in children under the age of five due to indoor/outdoor pollution, secondhand smoking and respiratory infections. Children exposed to air pollution are more likely to develop chronic respiratory diseases such as asthma [5]. Many researchers around the world have created models to monitor various pollution chemicals, including sulfur dioxide (SO2), carbon monoxide (CO), carbon dioxide (CO2), nitrogen oxides (NO), and others. Design and deployment of a smart air pollution monitoring system are the main topics of this paper [6]. It describes how a gas sensor, Arduino microcontroller and WiFi module can be used to monitor the amount of contaminants in the air. The primary goal of this research is to develop an intelligent air pollution monitoring system that can track, analyze and record data regarding air quality on a remote server and maintain the data online.

Numerous health issues and physical harm are brought on by air pollution. Therefore, it is essential to keep an eye on the air quality so that we can take the proper action at the appropriate moment in order to limit the pollution rate. There are several factors contributing to pollution growth, including smoke from automotive exhaust, industrial chemical spills, radioactive materials, etc. These are the primary factors lowering air quality. Carbon monoxide (CO), hydrogen sulfide (HS), sulphur dioxide (SO2), and nitrogen dioxide (NO2) are the principal gases that directly impact human health, and traffic-related pollution emissions are the major source of these gases' emissions [7]. To enhance the quality of the air inside and outdoors, significant work is needed. Environmental monitoring has gradually transitioned from manual to automated control. The equipment for monitoring the environment has undergone several improvements, however it still falls short in hostile environments.

2. DISCUSSION

Every country, whether developed or developing, now has a serious problem with air pollution. Health problems are increasing rapidly, especially in metropolitan areas in developing countries, where industrialization and the increase in the number of cars cause the discharge of many air pollutants. The negative effects of pollution can result in irritation of the throat, eyes and nose as well as allergic reactions in some serious conditions such as bronchitis, heart disease, pneumonia, lung and worsening asthma [8]. According to one study, air pollution causes 50,000 to 100,000 premature deaths annually in the United States alone. In contrast, there are over 300,000 people globally and over 300,000 in the European Union. The alert will go off when the air quality drops below a specific threshold, which is when enough harmful gases, including CO2, smoke, alcohol, benzene, NH3, LPG, and NOx, are present in the air. The Air Pollution Monitoring System monitors air quality through a web server that accesses the Internet. The air quality will be displayed in ppm (parts per million) on the LCD and on the website for easy monitoring.

For a better future and the health of all, monitoring and managing air quality is essential [9]. The Internet of Things (IoT) is becoming more and more popular as a result of its durability and affordability. Industrialization and increased vehicular traffic have had a significant impact on atmospheric conditions. Pollution has negative health effects that range from minor allergic reactions such as throat, eye and nose irritation to more serious conditions including bronchitis, heart disease, pneumonia, worsening of the lungs and asthma. Concentrations of air pollutants and noise pollution are measured by monitoring, which can be analyzed,

interpreted and reported. They can evaluate by examining monitoring data how terrible air pollution and noise pollution is on a daily basis [10].

2.1 Technique used for pollution monitoring:

Previously, the method used to monitor air pollution was computed tomography, which produces a two-dimensional map of the concentrations of pollutants. Compared to the differential absorption approach, it offers several advantages. In this arrangement, the central laser source of the sphere is the only laser source present. The direction of this laser beam is rotated to point towards the equator of the circle. A cylinder-shaped mirror is used to reflect the laser beam so that it spreads as a fan beam across the circle [11]. The circular part of the mirror beam affects a group of detectors that are placed in the same plane and run parallel to the ground. This method focuses less transmitted laser energy, expanding the range and increasing the ability to monitor areas with multiple pollution sources [12]. The online GPRS sensor array, which has been built, used and tested, is another way to monitor air quality. The mobile data acquisition unit that collects pollution levels and packages it into a frame with GPS location, date and time is part of this system unit, composed of a chip of a microcontroller and a pollution server, a high-end. Personal application server with internet connectivity. This frame is uploaded in GPRS modem and sent to pollution server through public mobile network. A database server used by multiple clients that are connected to the pollution level. Various clients use pollution servers to store pollution levels. A pollution server connected to Google Maps can display the location and degree of pollution in a large metropolitan area in real time [13].

For people to perform daily activities, they need access to clean air and air in sufficient quantity. Most people do their daily tasks inside, spending 90% of their time doing so. Many extracurricular activities, such as activities for employment, school, or research, are often done indoors. Concerns are often raised about environmental pollution such as air pollution. In addition to indoor pollution, dangerous compounds can be found outdoors as well [14]. Homes and structures built without regulations are often at high risk of indoor contaminants, which ultimately have harmful health effects. Many chemicals are defined as criteria for indoor air quality (IAQ) in the World Health Organization (WHO) standards for indoor information sources on exposure levels. The burning of solid fuels while cooking food in the kitchen causes more than 1.5 million deaths annually. From 2011 to 2016, studies and surveys were conducted to explore the impact of air quality on health and to raise awareness of IAQ [15]. According to the Environmental Protection Agency (EPA) in the United States, people exposed to low IAQ may have symptoms of illness such as headache, dizziness, fatigue and irritation in the eyes, nose and throat. Asthma and health problems can get worse due to a poor IAQ. Air quality monitoring systems can be used to monitor indoor air pollution. With the integration of Internet of Things (IoT) data parameters for IAQ can be collected from the environment [16].

Production of hazardous gases by companies, automobile emissions, and increased amounts of hazardous chemicals and particulate matter in the atmosphere are all contributing to air pollution. Pollution levels are increasing rapidly due to factors that harm human health such as industries, urbanization, population growth and use of vehicles. Particulate matter is one of the most important factors contributing significantly to the increase in air pollution [17]. This requires measurement and analysis of real-time air quality monitoring to enable quick decision making. An independent real-time air quality monitoring system is presented in this study. The Internet of Things is now being used extensively in every industry and is essential to our systems for monitoring air quality [18].

The configuration will display the air quality in ppm on a website so that we can easily monitor it. With this IoT project, you can use a computer or mobile device to check pollution levels from anywhere. The configuration will display the air quality in ppm on a website so that we can easily monitor it. With this IoT project, you can use a computer or mobile device to check pollution levels from anywhere. There is a lot of air pollution. Automobile emissions, industrial chemicals, smoke and dust have become common in recent years. Because of this air conditioning has become quite dirty now. The effects of air pollution are particularly harmful to human health, especially in areas where our bodies draw air to breathe. Certain diseases including asthma, cough and lung abnormalities can affect our lungs. Human emotions are unable to feel air pollution. Air pollution can contain many dangerous compounds, including LPG gas, carbon monoxide and methane. The pollutants present in the air are quite harmful. For example, if carbon monoxide levels exceed 100 ppm, people may feel dizzy and restless and may even die within minutes [19].

Modern civilization has a serious problem with air pollution, which is bad for both the environment and human health. This is a serious problem in the city. The greenhouse effect, which is a well-known negative consequence for all of us, is caused by greenhouse gases, which are the result of air pollution [20]. Private automobile emissions have increased dramatically in recent years. The major source of vehicular pollution is carbon monoxide, which can be easily detected by semiconductor gas sensors. These contaminants impact human health, especially the respiratory and lung systems. These contaminants also settle on water, soil and other surfaces. Various types of sensors can detect gas emissions. This paper gives a suggestion that might reduce air pollution. A different model proposal to implement it as a real time project for detection and monitoring of air pollution is also discussed in the paper.

2.2 Different Pollution Monitoring methods existing:

(i) Electrochemical Gas Sensing Method:

The electrochemical process, more precisely oxidation-reduction reactions in the sensor, is the basic idea of electrochemical gas sensing. The interaction of the sensor and the gas molecules results in an electrical signal proportional to the concentration of the gas molecule. The working electrode (WE), counter electrode (CE), and reference electrode (RE), used to provide the external driving voltage, are the three primary electrodes that make up this sensor. Each of these three electrodes is introduced into the sensor's electrolyte one at a time. A variety of membranes, electrolytes, and working electrodes are used to detect certain gases as well as increase selectivity for those gases [21]. As soon as the gas touches the working electrode, the oxidation-reduction process is triggered. These reactions are catalyzed by electrodes specially made for a certain gas. The concentration of the target gas is determined by calculating the current between the working electrode (WE) and the counter electrode (CE). The reference electrode (RE) controls the oxidation and reduction processes and minimizes the potential drift on the working electrode as a result of wear and tear. It should be noted that most electrochemical ambient gas sensors work best with low levels of humidity and oxygen. Additionally, wind speed affects the chemical balance on the surface of the sensor and, consequently, the readings from the sensor.

(ii) Tapered Element Oscillating Micro-Balance (TEOM) Method:

This technique is often employed in conventional air pollution monitoring systems. The basic idea behind this technique is that the mass of the tapered glass tube has a direct relationship

with the oscillation frequency of the tube. The mass and oscillation frequency of the tube will be modified by the PM placed on the tube. Researchers can determine the mass concentration of PM in ambient air by measuring the change in the tube's oscillation frequency and the amount of air sampled. Takes an intake air sample with a size-selective filter [22].

(iii) Black Smoke Method:

Through size-selective intake, the black smoke approach collects particulate matter (PM) on a paper filter over the course of 24 hours. The mass concentration of PM is determined by measuring the blackness of the paper filter with a reflectance meter. This type of monitoring equipment is economical, straightforward and reliable. The mass concentration is then calculated by measuring the blackness of the filter paper, which varies by location. This implies that the ratio of dark to mass varies with time and space.

(iv) Light Scatting Method:

A powerful laser that acts as the light source is an essential element of this technology. Each time a particle enters the detecting chamber, which allows only one particle to be sampled, the particle scatters laser light, which is then picked up by a photo detector. The particle size can be determined by examining the intensity of the scattering light. Additionally, the number of illuminations detected on the photo detector can be used to determine the particle count. An advantage of this technique is that the same analyzer can detect particles of different sizes (eg, PM2.5, PM5, and PM10) simultaneously. After the particles are counted, the mass concentration is calculated (based on the number, type and size of the particles), although this introduces mistakes that further impair the accuracy and precision of the analysts, banning this approach.

(v) Direct Imaging Method:

This analyzer uses a halogen laser beam to illuminate each particle, and the resulting shadow cast by that light is then projected onto a camera with high clarity, high magnification, and high resolution. This camera captures the passing particle, and then the footage is examined using software to measure the characteristics of the PM. This technology provides data on the size and number of PMs in the surrounding air.

(vi) WSN Based Air Pollution Monitoring Systems:

Due to its impact on human life anytime and anywhere, urban air pollution has recently attracted a lot of attention from all over the world. To mitigate these effects a network of monitoring stations employing conventional measurement instruments has been established. The collected data can be used to create pollution maps and models that can be used to forecast environmental conditions. In these systems, limits in spatiotemporal resolution and service quality are important. Because of these restrictions, specific air pollution monitoring systems have flaws and concerns, such as restricted data availability on individual exposures and false alerts about acute exposure.

(vii) Static Sensor Network (SSN):

Sensor nodes in SSN systems are often installed on street lights, traffic lights or wall poles. Compared to a traditional surveillance system, the SSN system consists of a much larger number of sensors due to the use of inexpensive sensor modules. High spatio-temporal

solutions can be found in pollution information that can be collected using the SSN system. Public can access data on air pollution using websites, mobile apps etc.

Sensor nodes that make up an air pollution monitoring and control system include a communication system that enables data to be sent to personal computers. The data network is used to transmit data to a gateway node, which then transmits it to a sensor network computer. Sensor nodes collect data independently. The node also receives data on air quality from other nodes to control pollution levels. Outline of each element of an air pollution monitoring and control system shows in Figure 1.

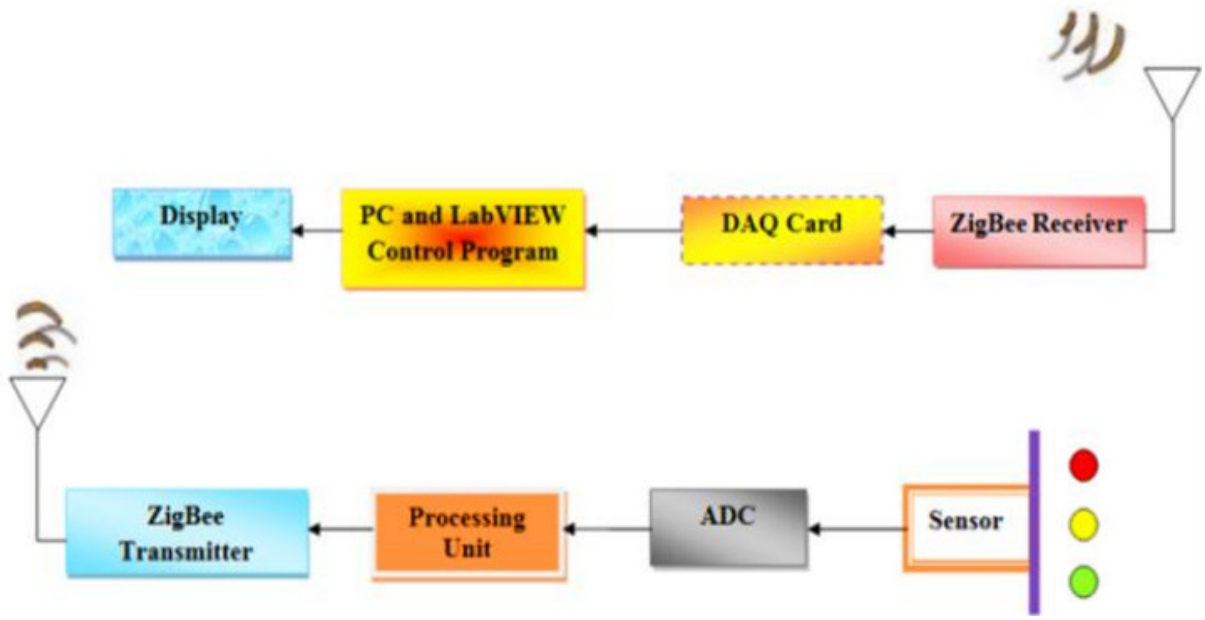

Figure 1: Illustrate the process of the air pollution through the pollution meter [2].

In today's world, monitoring of air pollution is a vital necessity. It used to take a lot of time and money to collect data regularly using data loggers. However, the biggest solution to meet these needs and overcome these shortcomings is WSN. The use of WSN system allows efficient and quick recording of data during air pollution monitoring. Rare reports of air pollution monitoring using WSN technology have been made so far. The WSN is made up of several sensor nodes that are often placed within or very close to the region of interest. WSN nodes are low-power embedded devices that integrate a wireless RF transceiver, some sensors, and actuators with computing and storage components (a CPU coupled with RAM and/or flash memory). The Air Quality Index (AQI) currently in use is used in the proposed system. To create sensing events, sensor nodes, which measure pollution information, were positioned evenly across the network.

Components in the air that, above a particular concentration, cause harm to health or hinder the performance of certain processes, can be found both inside and outside. It is possible to identify the presence of these compounds in the air and, if necessary, take necessary measures with the use of an appropriate air quality meter. Many indoor air quality meters include a color-rated display, an optical or audible alert function, or both. This eliminates the need to pay attention to constantly fluctuating numerical values by warning users if the number is too large. Installed in locations where the measured value cannot be observed at the measurement site, air quality meters transfer the measured data to external display devices or computer systems.

i. Measurable parameters:

The type and quantity of quantitative parameters is where air quality meters deviate most. Additionally, the measurement range and accuracy for the same parameter can vary significantly across different types of equipment. Carbon dioxide (CO2), formaldehyde (CH2O or HCHO), volatile organic compounds (TVOC), and particulate matter content are examples of measurable parameters commonly determined. Almost all air quality meters can also calculate temperature and humidity. The levels of ozone, nitrogen dioxide, sulfur dioxide, carbon monoxide, soot, lead, benzene and other air pollutants are also monitored by the government due to their direct and indirect effects on the environment and health. Federal states have established measurement stations for this purpose in both urban and rural areas with heavy traffic. There various air quality meters collect the data and send it for analysis and documentation. The websites of the respective state offices provide access to some measurement data.

For specified particle sizes, the fine dust content is usually expressed as a particle volume in g/m3. PM stands for particulate matter, or fine dust, regardless of the physical composition of PM1/PM2.5/PM10. The numbers indicate the largest particle size of the particles recorded in each event. The respiratory tract is affected differently by different particle sizes. As a result, they are measured independently and compared to the respective threshold values. There are several different gradations for particle size in addition to the three levels listed earlier.

ii. Memory and interfaces in the air quality meter:

It is important to consider storage options if air quality meter readings are being kept for extended periods for documentation and evaluation. Only a small number of readings may be kept by some air quality meters, and not all models include an interface for transferring data digitally. It is important to determine whether targeted assessments are generally feasible with data saved by a certain device.

iii. Air quality meters for recreation rooms:

Many people spend most of their time inside each day. Depending on the furnishings of the room and the amount of use, hazardous concentrations of CO2, formaldehyde and volatile organic compounds can be rapidly obtained from solvents. When it comes to infectious diseases that can be spread through the air we breathe, the risk of infection is also much higher inside than outside. The ability to monitor levels and, if necessary, ventilate in a timely manner, is provided by an air quality meter. To regulate air quality in living rooms, workplaces, schools and other similar areas, recommend air quality meters that identify the lowest carbon dioxide concentration, as well as indoor air temperature and humidity. The amount of carbon dioxide in the air we breathe can be used as a benchmark for hazardous compounds. If the CO2 level exceeds the specified guideline value, ventilation should be used to bring it back down. This is true for both ventilation-system-equipped and window-ventilated spaces. If the CO2 value often exceeds the allowable maximum amount despite automatically controlled mechanical room ventilation, the ventilation system needs to be checked and replaced.

iv. Air quality meters for measurements outside buildings:

In addition to natural processes, significant amounts of air pollutants are created by transportation, heating systems, industry, agriculture and other sectors of the economy. In some places, special air quality meters measure their concentration and dispersion. If certain threshold levels for ozone are exceeded, the public becomes alert. If other observed values are consistently or repeatedly exceeded, geographically constrained actions, such driving prohibitions for some automobiles, may be taken. These measurements should result in an improvement in the measured values over time, which would indicate their effectiveness.

3. CONCLUSION

Although the concept of air pollution monitoring is old, it is still highly relevant today. However, as everyone needs access to clean air, various techniques have been employed to monitor air quality, some of which are very helpful in providing real-time air quality data. Methods for monitoring air pollution range from old methods to the most advanced computers. The purpose of this study is to describe some of the methods that are used to monitor air pollution, how successful it is and what significant research has been done in this area. Monitoring aids in quantifying pollution with reference to ambient air quality requirements. The standard is a legal requirement to define the goal of ensuring clean air and reducing pollution. Strong surveillance alerts individuals and initiates the process of taking preventive measures against serious incidents. These are mobile monitoring devices that can continuously track various pollutants. The sensor's poor sensitivity makes them mostly useful for detecting hotspots near point sources and on the edges of roadways.

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CHAPTER 8

COMPREHENSIVE STUDY OF VIRTUAL REALITY (VR) AND ITS DEPLOYMENT IN THE HUMAN PERCEPTION

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***ABSTRACT*:**Virtual reality (VR) now has new chances to deliver an effortless user experience anywhere at any time thanks to a cellular-connected wireless connection. The quality-of-service for wireless VR must be carefully considered in order to achieve this aim defined to take into account the needs of human vision. In this paper, the author first outlines the main uses and motivations for VR systems usage examples the study of perception-action has a lot to gain from the use of virtual reality (VR). In the instance of the outfielder problem study is given as an illustration of how VR has contributed. The results shows the comprehension of perception-action, as well as to the advantages and disadvantages of adopting VR throughout this job. In this paper, after many literature reviews study the author finally conclude that the greatest benefit of adopting VR is the fact that the experimenter has total control over the virtual environment, which Powerful hypothesis testing is made possible by the ability to explore scenarios that do not exist outside of virtual reality. The future potential of this paper is it can be used in the future for the enhancement of the VR.

KEYWORDS: Training, Technology, Virtual Reality.

1. INTRODUCTION

Virtual reality (VR) is widely used. Its applications go beyond gaming; they include helping therapists treat patients with post-traumatic stress disorder (PTSD), training pilots for simulators, and engineers to create better mechanical experiences. Manufacturers must do extensive study on several fronts to provide a true and authentic experience. They must comprehend how seeing and perception really function in daily life. The human eye is continuously inundated with sensory information. The eye receives messages from electromagnetic radiation that carries important information including color, depth, and contrast. The flat retina's photo-receptors transform the light that is received into electrical impulses. The brain serves as a filter, enabling us to see the vivid, multicolored, and three-dimensional world that we are familiar with [1]–[3].

The use of computational technology to recreate a projected world is known as virtual reality. Users are immersed in and able to engage with three-dimension (3D) environments rather than watching television in front of them. The original goal of those who developed virtual reality technology was to clarify the boundary between a person and a machine. In virtual reality (VR), the user's consciousness is transferred into a whole other world, offering them a brand-new experience to explore and become used to. This is one of the reasons why the majority of research in the field of foreign psychology is devoted to studying the virtual world and the "pedagogical agents," or virtual characters whose purpose is to improve the efficiency of VR-based training [4]–[6].

Through the creation of highly interactive virtual components or worlds that traverse geographical borders, virtual reality (VR) will alter how individuals engage with their environment. This vision served as the impetus for the commercial launch of a number of hardware products, open access standards, and Application Programming Interfaces (APIs)

by numerous multinational corporations, including "ARK it from Apple, HoloLens from Microsoft, the Oculus series from Facebook, and Vive series from HTC".

Indeed, it is predicted that the size of the worldwide VR industry would reach $80.7 billion by 2024, driven by a wide range of VR services and equipment that aim to activate our five senses with accurate input. Virtual reality (VR) is a new kind of service that immerses users in very lifelike virtual worlds by creating a fabricated virtual environment that resembles the real world. In fact, VR will provide consumers with creative methods to engage with their surroundings for a variety of goals, such as personal amusement and social relationships. In fact, VR will have a wide range of applications, including remote control and tactile Internet, social sharing in congested places, and six degrees-of-freedom multimedia streaming. Figure 1 embellishes the different applications of virtual reality.

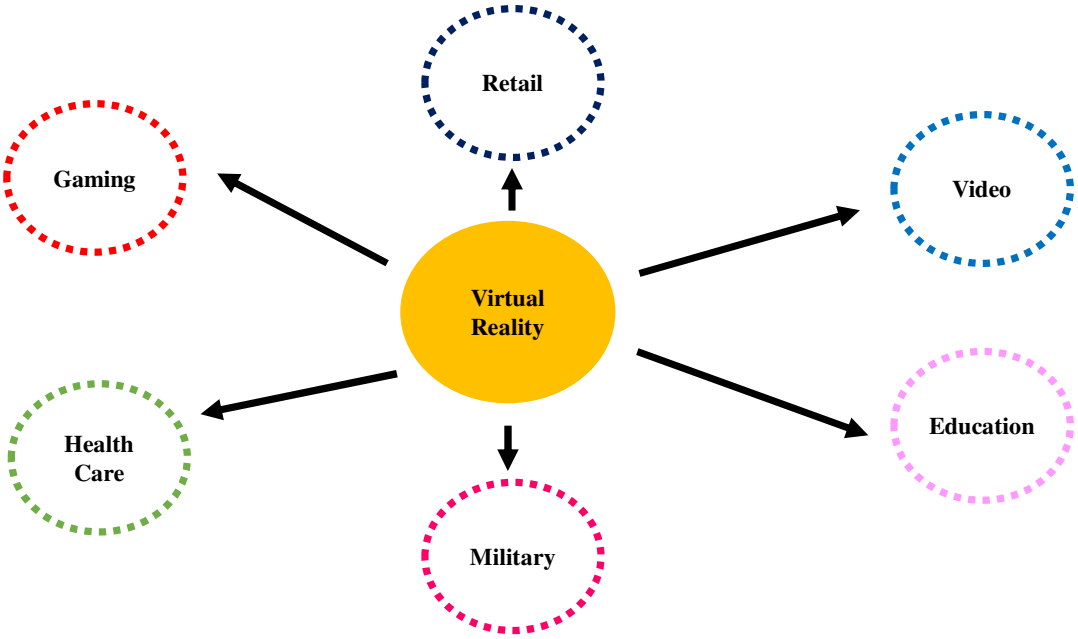

Figure 1: Embellishes the different applications of virtual reality.

The everyday lives of humans are now inextricably linked to computer systems, which are continually becoming more sophisticated and complicated. In addition to a number of positive outcomes, a study has also looked at the negative consequences of using modern technology. The uncanny valley theory (1970) by Japanese artificial intelligence engineer Hiroyuki Mori is a significant contribution to this field that demonstrates how the complexity of human clusters such as robots and digital animations) can generate feelings of horror if they approach a slightly elevated degree of reality while still containing minute flaws.

Despite the fact that the model's fundamental presumptions have largely not altered in more than 40 years, the success and development of digital technology have ensured that it remains relevant. The study of uncanny valleys has also moved outside the realm of academia as big-budget entertainment media and sophisticated robots continue to demonstrate the economic possibilities of their respective fields. The main purposes of Wearable or Shoulder displays are to simulate vision and to create an immersive 3-D world. VR headsets isolate all interaction and remember a time from the outside world by projecting a screen in front of the eyes. Seen between the screen and the user's eyes are two autofocus lenses that automatically adjust depending on the user's eye movement and location. Using a cell phone or an HDMI connection linked to another device, the on-screen images are played.The integration of technology and the human senses has expanded thanks to virtual reality and the usefulness of

virtual reality, especially in the hospitality industry, has received minimal investigation despite the growing interest in embodied technology in gaming, entertainment, education, etc. VR allows us to create our own worlds and free-form environments, which helps us create a variety of experiences where we can sharpen our perception and function effectively in the actual world.

In this paper the author elaborates the number and quality of errors made during training in several risky areas including surgery, nuclear physics, manufacturing, and many others, virtual reality technology is quickly emerging as simulations. The investigation demonstrated how the online environment has improved both their specialized and general scientific understanding. The studies mentioned above show that google glass is an excellent tool for raising user motivation. They've found a link between VR engagement and consumers' actual emotional attachment to virtual characters. Although virtual reality has many uses, its greatest promise is in the provision of instruction in a variety of areas that might enhance human perception.

2. LITERATURE REVIEW

Renganayagalu et al. in their study embellish that Virtual reality (VR) has reemerged as a significant technological trend during the last ten years. This is large because of recent investments made by IT firms, which are enhancing VR systems while raising customer access and interest. In this paper, the author applied a methodology in which they stated that among the various uses for VR, education is one that has a lot of promise. The results show the most recent iterations of readily available, extremely immersive, and user-friendly "helmet-mounted display (HMD)" systems enable the immersive, experiential learning that virtual reality (VR) offers. The author concludes that VR training tools have been used in a variety of scenarios with varying degrees of effectiveness. A current review study that examines the efficacy, benefits, constraints, and viability of employing VR HMDs in training is lacking, nevertheless [7].

Feng et al. in their study illustrate that the ability to investigate pedestrian navigation behavior in multi-level buildings is made possible by VR. Although VR is being used more often to research pedestrian behavior, it is still unknown how various VR technologies will impact how people behave in a multi-story structure. In this paper, the author applied a methodology in which they stated that by examining the variations in commuter-orienteering behavior and user experience, the research examines the adoption of various VR technologies for pedestrian guidance studies. The results show that HMD VR or Desktop VR, research on way finding was done with two participant groups. In this paper, the author concludes that through the VR system, passenger locomotion scenario data was gathered, and a questionnaire was used to capture user data.

Syamimi et al. in their study embellishes that although VR will be around for a while, it has only lately gained attention. This paper, acts as a metaphorical scalpel from an industrial standpoint to examine the many use cases and enterprise systems of VR in India. In this paper the author applied a methodology in which they stated that the development of VR before investigating the Indian market. The results shows the market value for training is now growing at a faster rate than that of VR and augmented reality, which is driving this increasing trend. In recent years, VR has also developed quickly in India. The author finally conclude that some of the steps taken by the Indian government to encourage the commercial use of VR in the country's digital economy is quite effective in the domain [8].

In this paper, the author elaborates the VR systems that allow immersive, hands-on learning are easily accessible, very immersive, and user-friendly "helmet-mounted display (HMD)"

systems. The author comes to the conclusion that different situations have employed VR training tools to differing degrees of success. There is currently a gap in the literature about the effectiveness, advantages, limitations, and practicality of using VR HMDs for training.

3. DISCUSSION

The integration of technology and the sentient senses has expanded thanks to virtual reality and the usefulness of virtual reality, especially in the hospitality industry, has received minimal investigation despite the growing interest in embodied technology in gaming, entertainment, education, etc. VR allows us to create our own worlds and free-form environments, which helps us create a variety of experiences where we can sharpen our perception and function effectively in the actual world. In order to reduce the number and quality of errors made during training in several risky areas including surgery, nuclear physics, manufacturing, and many others, virtual reality technology is currently emerging as simulations.

The investigation demonstrated how the online environment has improved both their specialized and general scientific understanding. The studies mentioned above show that google glass is an excellent tool for raising user motivation. They've found a link between VR engagement and consumers' actual emotional attachment to virtual characters. Although virtual reality has many uses, its greatest promise is in the provision of instruction in a variety of areas that might enhance human perception. Figure 2 discloses the motion tracking framework and frame transmission in the system.

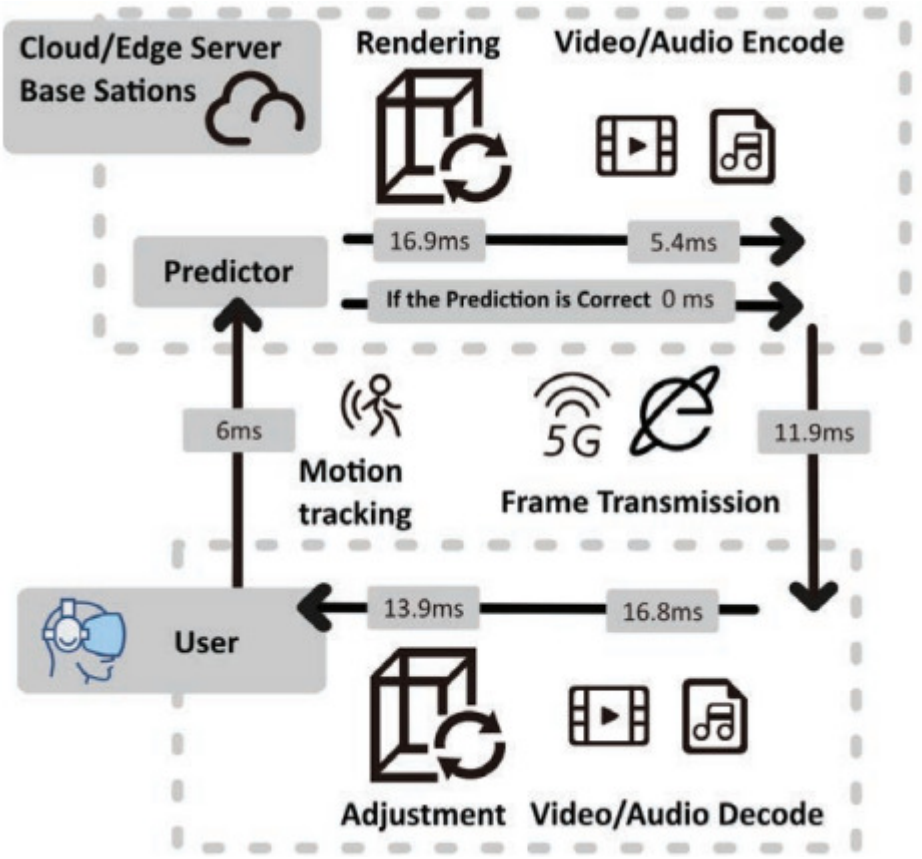

Figure 2: Discloses the motion tracking framework and frame transmission in the system [9]**.**

The poor mobility of wired Oculus rift and the absence of real-time, high-quality content support on all-in-one VR devices are two major obstacles to the mainstream financialization of these VR applications. Figure 3 embellishes the head mounted display and the game contents.

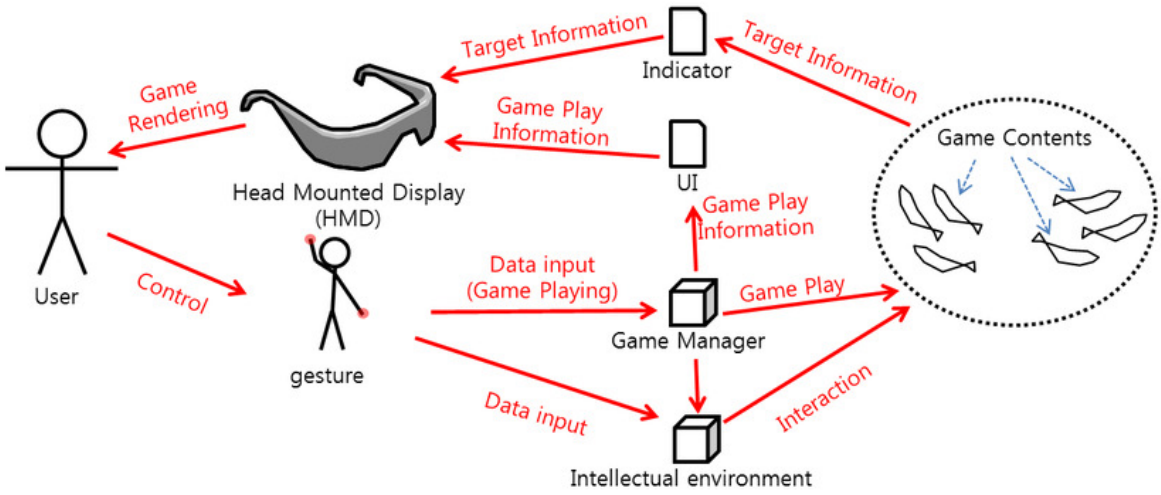

Figure 3: Embellishes the head mounted display and the game contents [10]**.**

VR is often utilized for therapeutic or rehabilitation reasons. It has been used to treat posttraumatic stress disorder and phobias including a fear of heights, flying, and spiders (PTSD). Since it has been discovered to be successful in an academic context, many commercial organizations are now able to provide patients with this kind of treatment. The computer-based simulations offered a number of benefits over the live training, despite the fact that it was discovered that employing consumers or customers for such training was more realistic.

Their goal was to expose more people to realistic emergency scenarios to enhance performance and decision-making while lowering psychological stress. There is still more need and potential in the medical field, however. While conventional training still exists, the usage of VR in nursing training gives the field a significant advantage. It may provide an insightful picture of real-world events while visualizing and interacting with complex subjects. This technique makes the instruction more engaging and generates more desire so that the pupil may understand it quickly and conveniently.

To get over these restrictions, it is possible to enable VR devices with portable cellular connections, which may provide a ubiquitous mobile experience at any time and in any location.

This has the potential to unleash a variety of unique VR applications. Even while cellular VR has a lot of promise, there are a lot of particular problems that cellular VR systems and traditional wireless video streaming systems do not have to deal with. Maintaining the symmetric and related traffic in the transmission and reception, delivering real-time VR content service, overcoming changeover problems for mobile VR users, and offering flawless service across unstable wireless channels.

In this paper, the author discuss how virtual reality technology may help to clarify the behavioral control mechanisms that underlie perception-action coupling. Because control tactics vary depending on the job at hand, the author concentrate on one specific kind of issue moving to intercept a ball before it touches the ground. This paradigmatic problem not only

exemplifies the theoretical debate that has been going on for a while about how our interactions with dynamic environments are structured, but it also boasts a sizable body of past and present experimental research that uses both real-world and computer-generated environments.

While the conversation is restricted to the issue at hand, it does provide the promise and drawbacks of employing virtual reality (VR) a context within the context of a recognized scientific issue. Figure 4 discloses the evaluation phase VR. Figure 4 discloses the evaluation phase VR.

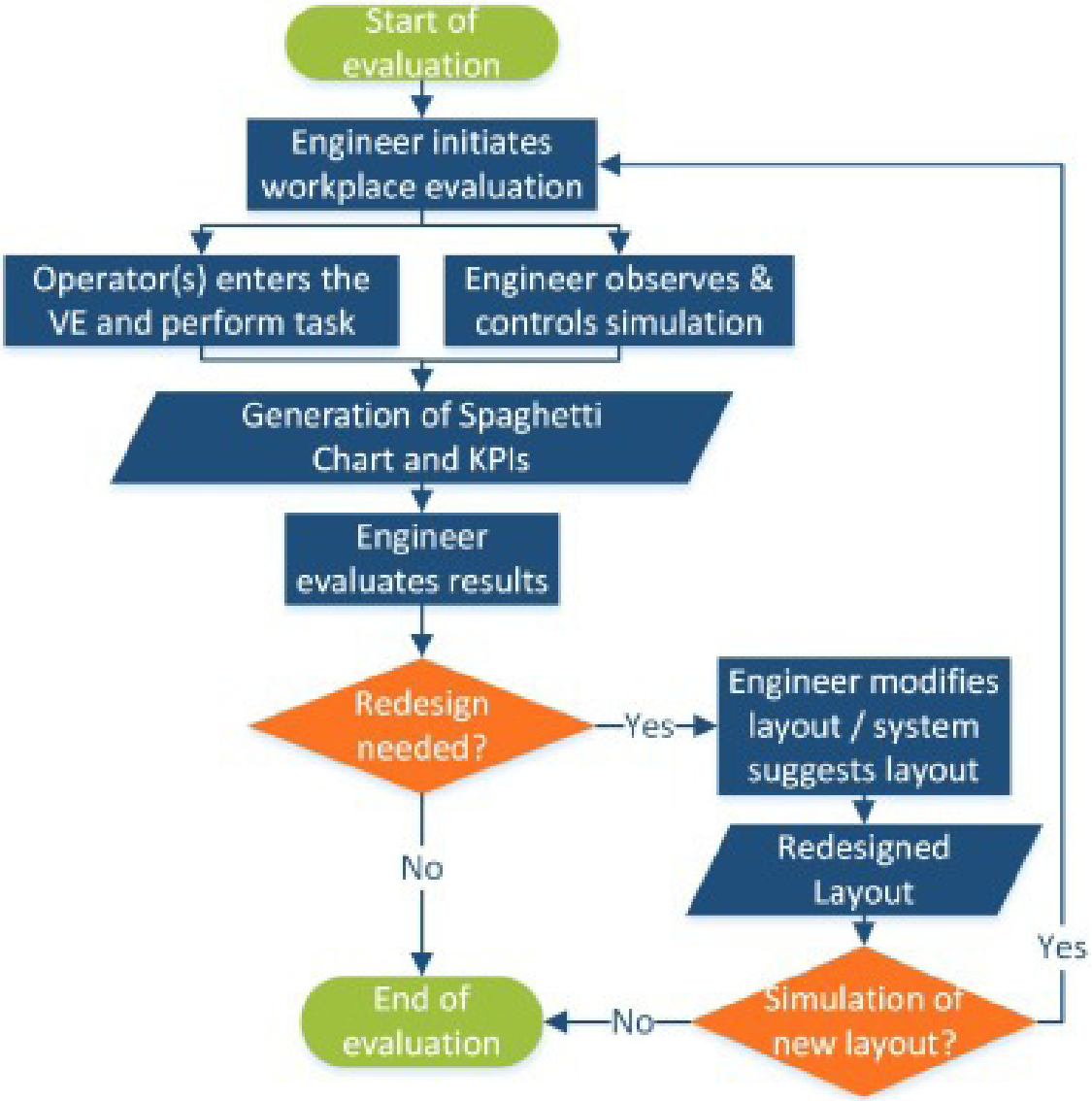

Figure 4: Discloses the evaluation phase VR and the redesign structure [11]**.**

It is possible to determine if behavior seen under "natural" circumstances is compatible with the results that may be drawn from a certain hypothesis. If we wish to ensure that investigation in a specific (laboratory) environment generalizes to the domain of natural behavior, these types of reality check is not simply helpful but also required. Figure 5 discloses the system of the VR in the composition. Figure 6 discloses the different industries and its percentage of using VR.

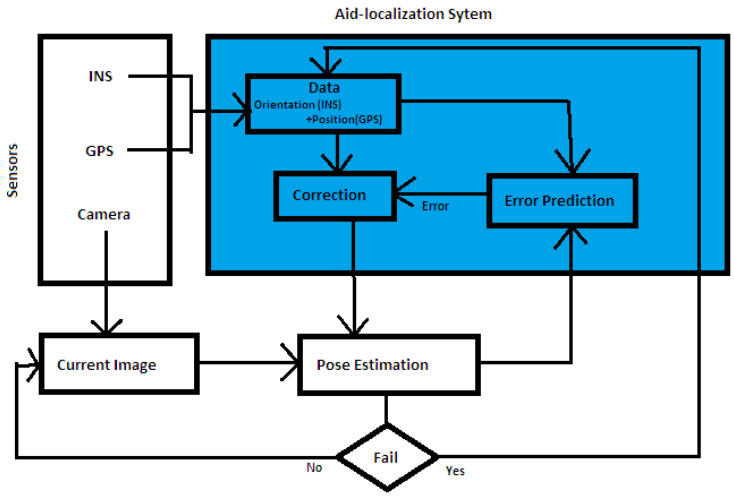

Figure 5: Discloses the system of the VR in the composition [12]**.**

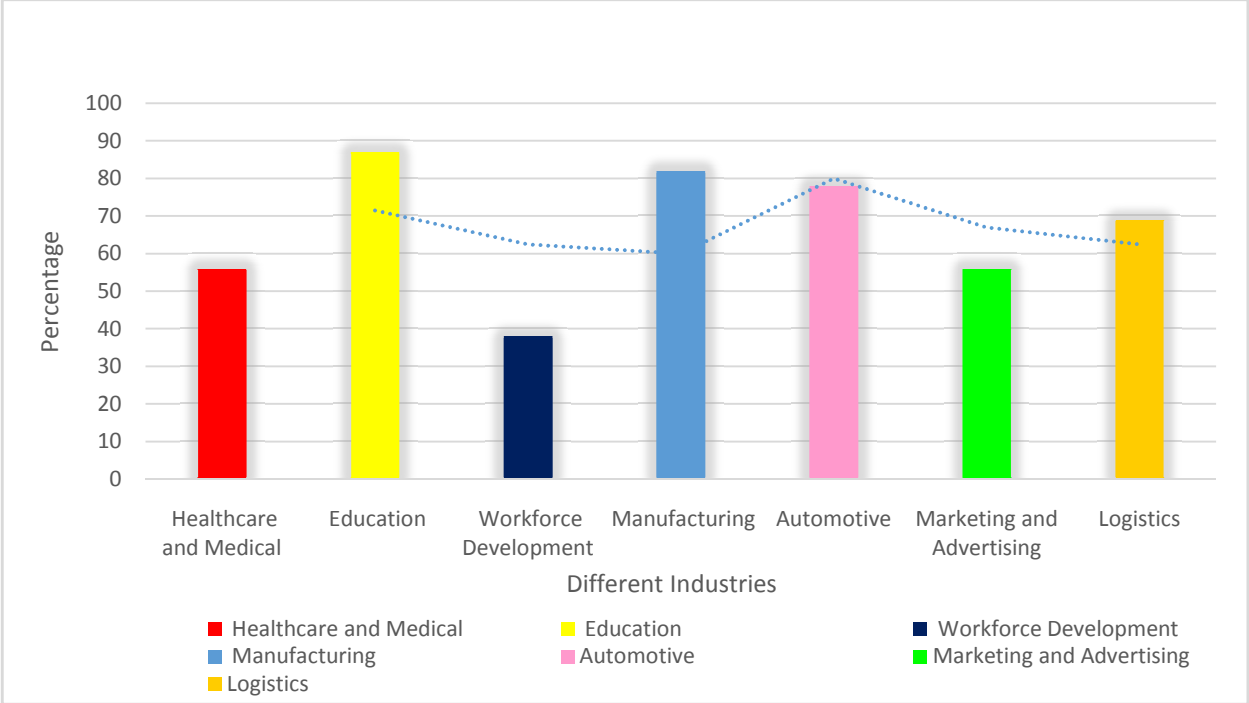

Figure 4: Discloses the different industries and its percentage of using VR.

4. CONCLUSION

The entertainment or gaming industries are where virtual reality first gained popularity, but surgery—and especially laparoscopic surgical training—is where it finds the majority of its uses. In these domains, accuracy and realism are crucial components, not only for the user's comfort but also for ensuring that no wrong handling will be learned and that the real-life stressful situations will be duplicated.

Virtual reality (VR) simulators have the potential to create this environment and show certain benefits when employing them, including the low cost per usage, the lack of ethical concerns, and the safety compared to training on real patients. Additionally, it is possible to acquire higher complexity and variety in the methods. Despite the quick advancements in VR/AR technology, the realism still falls short in accurately simulating the operating room circumstances due to the high cost of purchase and maintenance. However, it is still useful in

certain circumstances, and given its future potential, much more work has to be done before VR technology is ready to have a significant impact on the medical industry. The purpose of this study was to explore how the development of virtual reality (VR) may improve human perception and what sector it can be used to and benefits the most from, namely the medical profession. Given its potential, VR has many applications, and this is only one of them. We simply need to investigate them and consider how they may help society or individual human growth.

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CHAPTER 9

AN ANALYSIS OF THE WIRELESS POWER TRANSFER (WPT) SYSTEM AND DEPLOYMENT OF ITS TECHNOLOGY

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ABSTRACT:The creation and use of battery-powered devices are confronted with previously unheard-of technological difficulties as a result of restrictions such as poor power density, high cost, heavy weight, etc. In this paper, the author discussed that wireless power transfer (WPT) gives a brand-new method for acquiring energy for electric-driven gadgets, reducing an over on the battery. WPT is a fresh pattern of energization. Magnetic resonance-based WPT is a technique that might relieve people from obtrusive cables. The results show that WPT uses the same fundamental concept that has been researched for at least 30 years under the name inductive power transfer and WPT technology has recently advanced quickly. In this paper after many literature review studies, the author finally concludes that microprocessor-based systems, pharmaceutical industries, consumer electronics, etc. may all profit greatly from (WPT), a new technology that enables electricity supply transmission over short distances without physical touch. The future potential of this paper is the remuneration topologies for the distributed systems transformer.

KEYWORDS: Battery,Power, Transmission, Vehicles, Wireless Power Transfer (WPT).

1. INTRODUCTION

Wireless power transfer (WPT) is a ground-breaking technology that remarkably makes it possible to move energy cordlessly. This mystical technique may modify our customary methods for using energy in a variety of uses, including implanted portable electronic devices solar-powered spacecraft, integrated circuits, medicinal devices manned aerial vehicles (UAVs), electric vehicles (EVs), and so forth. By meaningful definition of its exceptional qualities of The WPT technique's flexibility, position-freeness, and movability has been considered the best technological remedy for electrifying inside this near future, certain selected places will have electric-driven equipment development, notably for applications in smart homes [1]–[3].

For more than a lifetime, engineers have fantasized about transmitting electrical power wirelessly over the air. The idea of wireless or inductive power transmission, which is the foundation of contemporary wireless power transfer (WPT), as well as electrical engineering, was originally put out shortly after the suggestion of Faraday's law of induction. Figure 1embellished the transmitter and the receiver section for the wavelength.

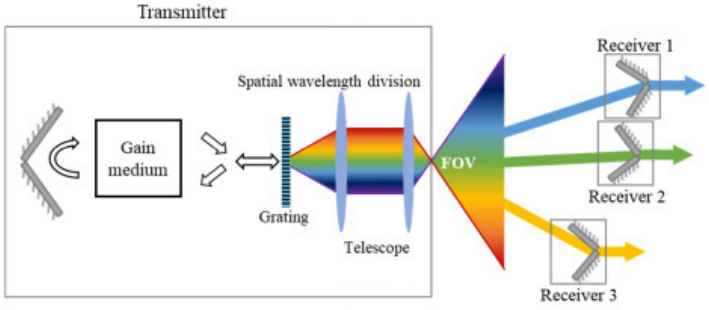

Figure 1: Embellished the transmitter and the receiver section for the wavelength [4]**.**

The inventor of WPT technology, Nikola Tesla, aggressively proposed utilizing his Tower to wirelessly transport useable quantities of electrical power across the globe in the 1910s. His importance to the wireless transfer of energy has never diminished, even though his plan to fulfill this aim was unrealistic and ultimately ineffective [5]–[7].

The electrification of transportation has been going on for a long time for reasons related to energy, the ecosystem, and many other things. Electric locomotives have been successfully developed for many years in railway networks. On a set track, a train travels. Pantograph sliders make it simple to get electrical power from a concertmaster rail. For electric cars, therefore, the great amount of flexibility makes it difficult to get electricity comparably. Figure 2 discloses the rectifier and the secondary coil system.

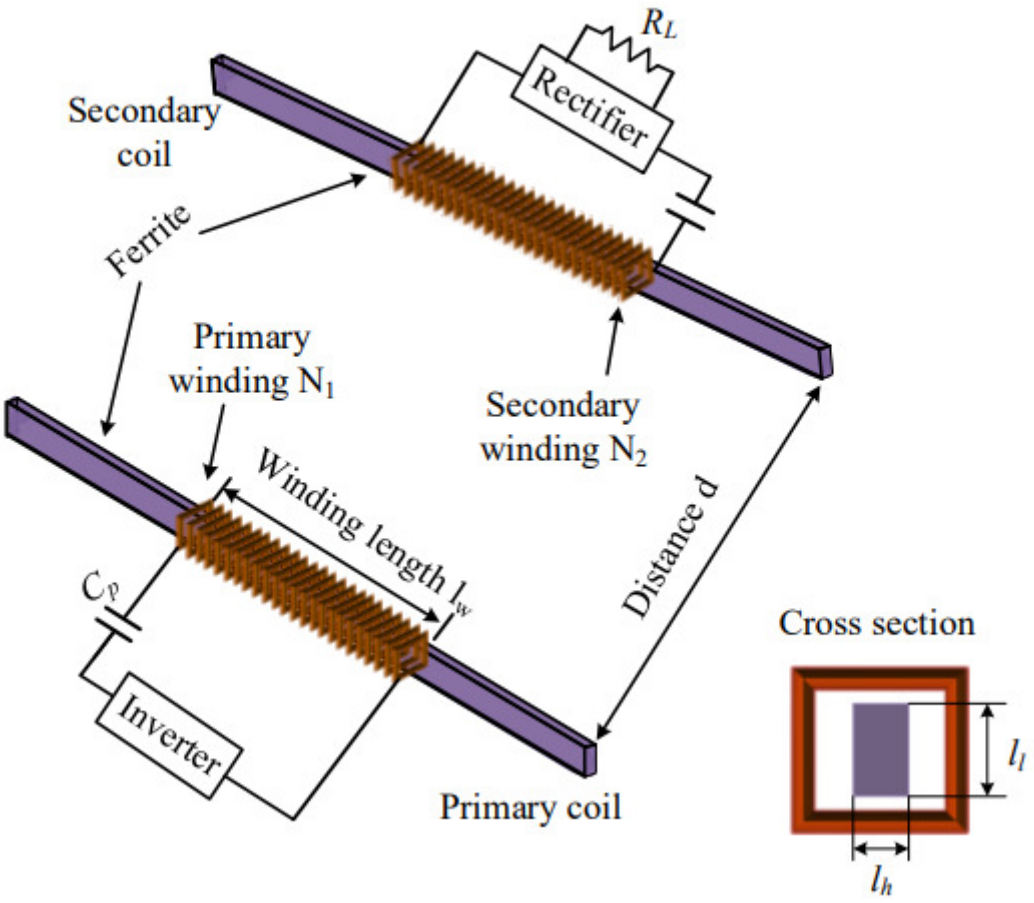

Figure 2: Discloses the rectifier and the secondary coil system [8]**.**

Instead, an EV is often fitted with high power and a big capacity battery pack as a storage of energy to enable it to go a sufficient distance. Even with several government incentive schemes, consumers do not now find EVs to be very appealing. One way to raise the market dominance of EVs today is via government subsidies and tax breaks. The only issue with an electric car is the power storage technology, which necessitates a battery that is currently the constraint owing to its subpar energy density, short lifespan, and high cost.

Nowadays, the global market for wireless power transmission has reached $5 billion. This technique has found usage in the wireless power supply for implanted devices, the trying to charge cell phones wirelessly via a required-to-charge platform, and the charging of household items like electric toothbrushes. Examples of this technology that need medium- to

high-power range from continuous power transmission to people movers to contactless charging processes for moving actuators or electric vehicles (EVs) [9], [10].

A loosely linked transformer with a significant distance between the main and the secondary windings is necessary for power transmission without physical contact. It possesses a comparatively significant leakage inductance, as well as enhanced proximity-effect and winding resistances, because of the wide winding spacing. The magnetizing inductance and mutual inductance are also much lower as a consequence of the large reduction in the magnetizing flux.

Short battery life and high initial expenses are two basic issues with battery-powered gadgets that prevent their widespread use, which is why WPT technologies are so important. Consider electric vehicles (EVs) as an example. Although several automakers advertise that their vehicles can go more than 420 km on a single charge, most EV drivers only venture to travel approximately 900 km. On the other hand, the driving range of EVs may be increased to over 800 km by greatly the number of includes knowing, but the accompanying initial cost becomes expensive for the general public. Figure 3 discloses the receiving and transmitting circuits.

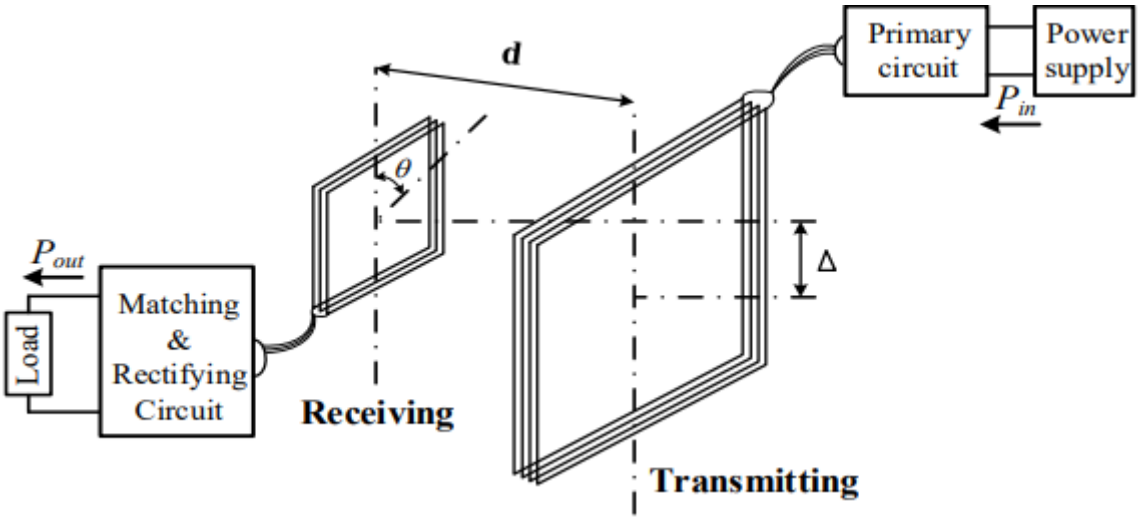

Figure 3: Discloses the receiving and transmitting circuit [11]**.**

Rather than just waiting for an advance in supercapacitors, the WPT approach, a novel energization method, is gaining interest as a means to get around the existing technological limitations of batteries. Battery-powered gadgets may use the WPT approach to collect wireless electricity from the electromagnetic field in the air and then renew their charges cordlessly even while they are in motion. Their issues with short battery lives caused by insufficient energy storage or high starting costs caused by the installation of several batteries may be substantially resolved by this revolutionary charging technique.

To generate the corresponding tanks in both the main and secondary sides for coils of a WPT system operated at a frequency much below their self-resonant resonance (SRF), extra compensating capacitors are required. Several older wireless circuit designs use single-sided correction. Since single-sided compensation has fewer modifiable resonant parameters and cannot give appropriate permutations to meet all WPT system design objectives, it has been replaced with double-sided compensation. The compensated structures for the Transmission line and their applications are reviewed, contrasted, and evaluated in this work [12]–[14].

In this paper the author elaborates on the conventional cables to transmit energy to the target, the WPT technology may do it via the air. The far-field and near-field transmissions are the most typical components of this innovative energy accessing approach. The use of the acoustic, optical, and toaster oven as the energy carriers allows for the realization of the far-field WPT. The focus of this study is on the closest approach, which also makes use of the sympathetic underlying relationship of non-radioactive electrical currents, including all the inductance processes.

2. LITERATURE REVIEW

Barbruni et al. in their study embellish that wireless power transmission is an effective approach in neurostimulation to get around various issues with existing clinically utilized medical devices. In this paper, the author applied a methodology in which they stated that over time, many techniques for wireless power transmission were created. The three most important approaches for ultra-miniaturized implanted neurostimulators are reported and discussed in this review paper ultrasonic coupling, inductive coupling, and capacitive coupling. The results show the physical working concept of each powering technique. The author pays special attention to the difficulties presented by the development of embedded microchips and the associated ad-hoc wireless power transmission systems. The author concludes that wireless power transfer plays a huge impact in the formation [15].

Triviño et al. in their study illustrate that the increased usage of electric vehicles necessitates new processes to make charging easier, more user-involved, and more autonomous. The methods used to wirelessly charge electric vehicles are examined in this research. The author applied a methodology in which they stated that concentrates on induction-based technologies, capacitive-based technologies, radiofrequency-based technologies, and laser-powered technologies in particular. The results show that the criteria placed on the wireless power transmission determine how convenient each approach is. The author concludes that important factors that must be considered when choosing a technology include the transmission power, the distance between its propulsion system and the electric vehicle, whether the transfer is carried out while the vehicle is moving or not, and the cost [16].

Zhang et al. in their study embellish that the creation and use of lead-acid devices are confronted with previously unheard-of technological difficulties as a result of constraints such as poor operating voltage, high cost, bodybuilder, etc. in this paper the author applied a methodology in which they stated that the wireless power transfer (WPT) gives a brand-new method for acquiring energy for electric-driven gadgets, reducing where over on the battery. The results show the WPT is a fresh pattern of energization approaches with a focus on the technical difficulties, met materials, and traditional applications. The author finally concludes that future development patterns and elaborates on significant current research areas with a focus on WPT systems [17].

In this paper, the author elaborates that excitation wavelength decoupling, inductive entanglement, and capacitive coupling are all covered in this review article. The findings demonstrate how each powering strategy physically functions. The challenges posed by the fabrication of embedded microchips and the related ad-hoc wireless transmission line systems are given particular focus by the author. The author concludes that wireless power transmission has a significant influence on the development

3. DISCUSSION

It is possible to change impedance to increase the energy efficiency of transmission. Utilizing effectiveness for the remotely comparable WPT system's assessment approach, a maximum

suggested optimization point traceability control method while controlling output voltage, to enhance energy efficiency about the variable load and bonding effect. In constant frequency tank was also successful in ensuring the monitoring of the highest level of efficiency while controlling output power about different loads, a cascaded boost-buck The DC-DC inverter topology was designed to make sure that For WPT systems, the ideal impedance matching, For instance, 13.26-MHz WPT systems are capable of a general 80% system effectiveness But in actual applications, the difference between practical

3.1.Reduced Rating and Increased Power Transfer:

To supply the reactive power necessary for the inductances to create an appropriate magnetic field, a compensating capacitor must fundamentally resonate with the main and secondary inductance. As a result, the major purpose of compensating for the armature conductors of a loosely linked transformer is to reduce the input-output current or the power supply's VA rating. To optimize transfer capacity on the output windings, the compensator cancels the secondary coil's inductance. Figure 4 embellishes the magnetic field and the receiver resonant tank.

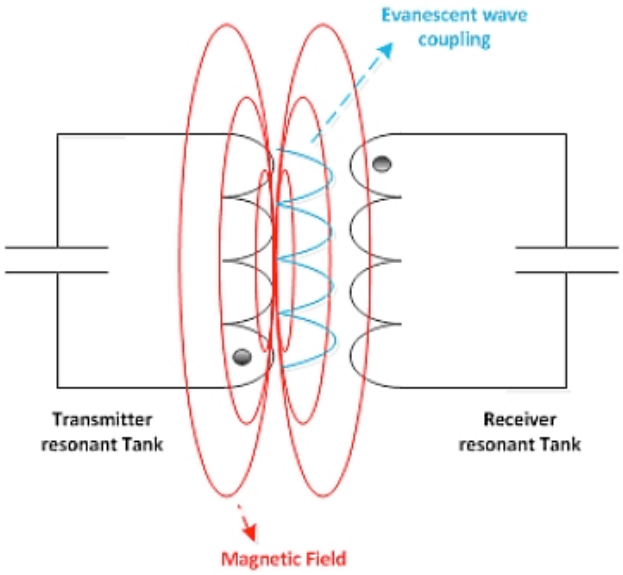

Figure 4: Embellish the magnetic field and the receiver resonant tank [18]**.**

3.2.Constant Current:

Numerous WPT system settings are dynamic and subject to change. "For instance, a "transcutaneous energy transmission system "(TETSair)'s gap adjusts in real-time when the patient breathes. When a highway vehicle's inductive power transfer (IPT) system is charging, the number of loads may alter. To handle parameter fluctuation, a WPT system should have high controllability. To provide excellent controllability, compensation topology may be used to implement and support (or load-independent) a recent or reliable supply of electricity without a microcontroller.

3.3.Effectiveness:

The bonding value and the quality characteristics of the windings are the only two criteria that determine the highest attainable efficiencies of a WPT system, according to the research. However, to reach this maximal effectiveness, sufficient compensation is required. Soft switching also ensures high efficiency. The modulation of Voltage levels to drive the resonant circuit is often accomplished using a fifty or full-bridge converter. The converter

may derive from taking zero voltage switching (ZVS) if MOSFETs are employed as mentioned in the section by operating at the above resonant frequency, where the acoustic current is trailing the voltage regulated by the dc link.

The switched-mode converter was implemented in the portal of entry and regulated based on the minimal input power operating point to simulate the ideal load value. By adjusting the output voltage's amplitude and the active rectifier phase shift, the equivalent load

The maximum efficiency is always impacted by the load ad resistance tracking plan. In light of this, an On-Off Keying-based a was put forward to accomplish better precision within a broad-range lower it does not need a lower the impedance of a DC-DC power converter the loss of switching. Furthermore, by accounting for the In an integrated dynamical system, a variant of the loosely coupled effect an estimate method for coupling coefficients was presented for the tracking for best effectiveness. Additionally to adjusting the output voltage, there are various efforts for the equivalent load impedance that track for optimal efficiency. For illustration, a multicycle Q-modulation can change the receiving coil's Q and dynamic load impedance optimization, which seeks to maximize the efficiency of the power transfer. Figure 5 discloses the charging system in the different angles of the dynamic and stationary charging.

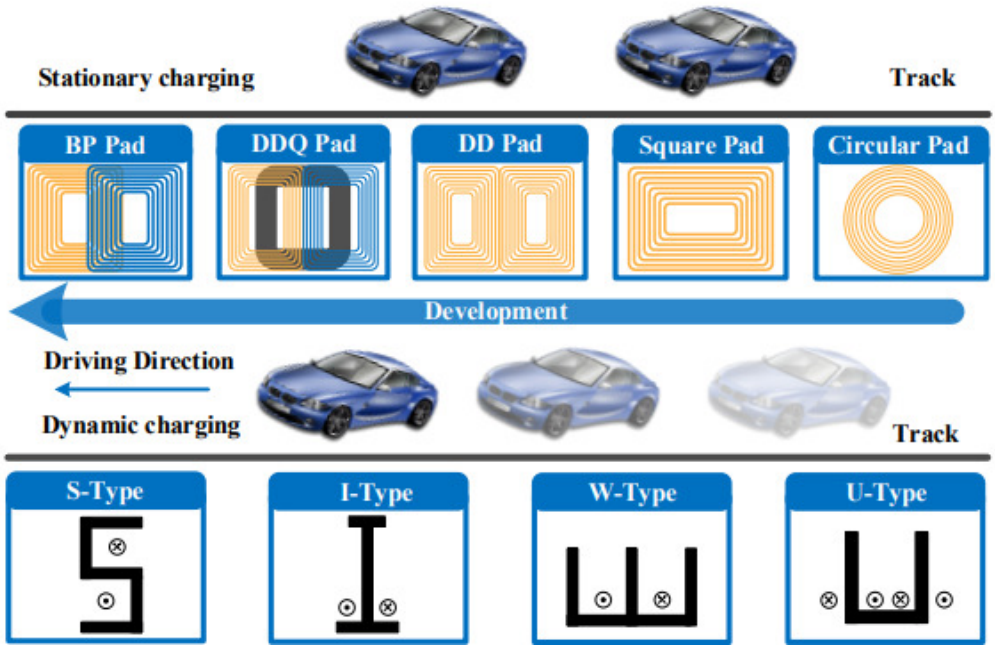

Figure 5: Discloses the charging system in the different angles of the dynamic and stationary charging [19]**.**

The current and economic requirements for the MHz frequency operating are difficult to achieve only when WPT is utilized for EV charging. Using cutting-edge power electronics devices, it is inefficient to translate a few to a few several kilowatts of electricity at MHz frequency level. Air-core coils are also very susceptible to ferromagnetic nearby objects. When an air-core coil is connected to a vehicle, the magnetic field lines will enter the chassis, leading to considerable eddy current loss and a significant alteration in the coil's specifications. Ferrite is often used in the coil design as an eddy currents guide and an aluminum plate serves as a shield to provide it more feasible for EV charging.

The WPT system is identical to the long-established inductive power transfer (IPT) technology due to the frequency reduction to less than 100 kHz and the usage of ferrite. In

actuality, there is no distinction between the WPT and the conventional IPT, which is based on permanent magnet coupling between the receiving and the transmitting coils. The WPT is known as the none and near-field electromagnetic. The IPT system has previously been suggested and used for a variety of purposes, including underwater vehicles, resource extraction systems, cordless robots in automated manufacturing lines, and the charging of electric cars.

The power transmission distance at kilowatt power levels has recently increased from a few millimeters to a few hundred millimeters due to the necessity for EV charging and technological advancement. The Partners with Advancement Transit and Highways (PATH) study was carried out at UC Berkeley in the late 1970s as a proof-of-concept for a highway inductively driven EV. Two powered portions of a 213 feet long track were used to test a 60kW, 35-passenger bus. Figure 6 discloses the magnetic field and the power management.

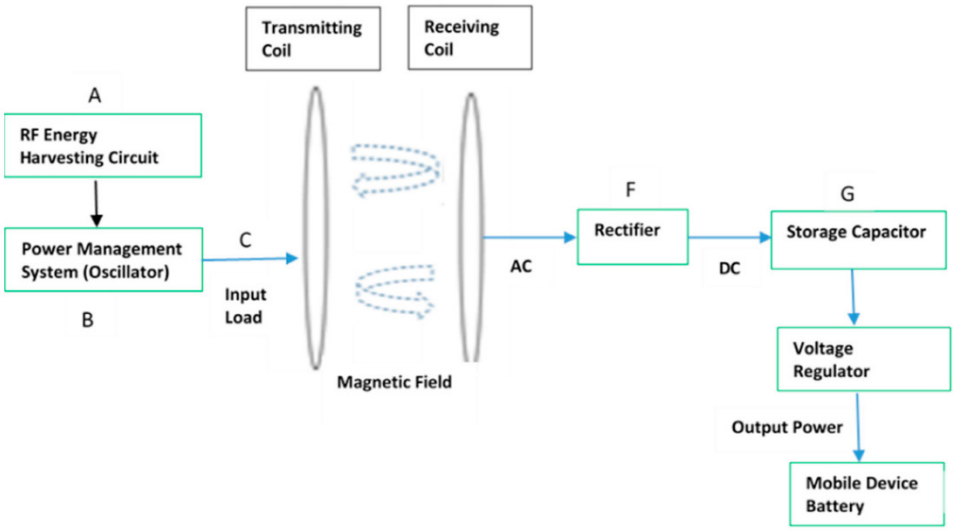

Figure 6: Discloses the magnetic field and the power management [20]**.**

1200A, 400Hz AC was applied to the bipolar main track. The pickup's distance from the main track was 7.6 cm. Due to the restricted semiconductor technology, an efficiency of around 60% was achieved. Researchers at the Graduation Level have been studying the inductive supply of electricity of moving objects for the last 15 years. It is noteworthy that they recently succeeded in creating pads for EV stationary charging. It has been stated that a 766 x 578 mm pad can provide 5 kW of electricity from over 90% efficiency across a distance of around 200 mm.

4. CONCLUSION

This study provides an overview of the WPT approaches with a focus on their basics, technical difficulties, met materials, and common applications. In terms of the basics, this research first described how IPT systems function, then contrasted four representative sensitive recompense networks, and last expounded on the permanent magnetic coupling. An analysis of wireless charging for electric automobiles was published in this research. The need for car electrification is evident given the problems with the environment and water resources. Compared to wired charging, the power bank will provide several advantages. The basis for EV mass market acceptance, regardless of battery type, will be laid when highways are electrified with wireless charging capabilities. The wireless charging of EVs is a possibility as technology advances. Shortly, further research is still required in the fields of topology, control, transformer designs, and safety of people.

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CHAPTER 10

USING THE SENSOR LESS VARIABLE SPEED OF BRUSHED DC MOTORS AND VEHICLE ROLLOVER PREVENTION MOTOR SPEED CONTROL METHOD

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ABSTRACT: To determine the propeller rapidity from a recorded motor present, a signal analysis of the brushing DC motor present was created. A signal with a speed inversely correlated with the rotor speed is present in the brush DC motor current. This signal results from a commutation process that takes place in brushed DC motors and is known as a ripple component. Since the measured motor has a fixed number of ripples per spin regardless of the rotor speed can be calculated. The key development was discrete high pass filters with a variable bandwidth in the signal processing process. To extract a frequency, a novel understanding of the bandpass filter was applied to observethe motor current's ripple component's frequency.The material about the projected propeller rapidity was gathered using this frequency. The projected speed was assigned as an input data to a feedback control structure in order to provide sensor-free rapidity regulator. The benefits and constraints shown in this study are illustrations of this tactic. Simulated and experimental results showed that the planned sensor-less rapidity regulator is correct, dependable, and capable of operating at a wide range of speeds. Driving safety is a crucial performance metric for cars, and active safety controls for electric cars still have a lot of space for improvement. When overtaking at a high speed or making sudden curves, vehicles are prone to rolling over. This work suggests a real-time motor control technique to enhance the antiroll over the safety of electric vehicles (EV). Primarily based on the collection of vehicle position data and ongoing tracking of the vehicle's functioning condition.

KEYWORDS: Automobile,Commutators, Dc Motors, Sensors, Speed Control.

1. INTRODUCTION

The extensive usage of electric motors in several applications is a result of technological and automated advancements. Several industrial fields and a large variety of purchaser goods, including pump, space fans, and other items, employ brushed DC motors. These drives are frequently employed as auto starters and winches in the automotive sector such as down lifters and windshield wipers. Brushless DC motors, however, need extra care owing to the brushes and commutator's upkeep. This device's mechanical commutator the most susceptible part of these motors is also their biggest practical issue[1], [2]. This piece of DC motor's top speed may potentially be restricted by distinctive elements due to its robust mechanical design. An electromechanical detector fastened to a drive shaft is required to acquire data. Nevertheless, installing such a device, which is prone to failure in industrial settings, significantly raises the entire cost of a Constant current drivetrain. In trial conditions, the ambient conditions have a significant impact on the sensor's dependability conditions that the sensors are subjected to, including temperature, vibrations, pollution, and dust[3], [4]. The expense and associated problems can be reduced by using sensor less speed or location estimates coated with a DC drive system’s sensor.

The major benefits of eliminating such as using a sensor less algorithm to reduce drive volume and maintenance cost fewer connections, fewer users, and a lower overall system cost. However, these characteristics are not fixed and change depending on the operational circumstances such as those involving temperature. Then, due to varying factors, there is

uncertainty in an estimate of speed. However, these characteristics may be dynamically calculated, although this strategy typically results in a nonlinear model, which is more challenging and complex[5]. It takes time to compute a motor that is indirectly modeled by several methods by using the Kalan filter or neural networks. The use of neural networks in conjunction with sliding mode control was utilized [6].

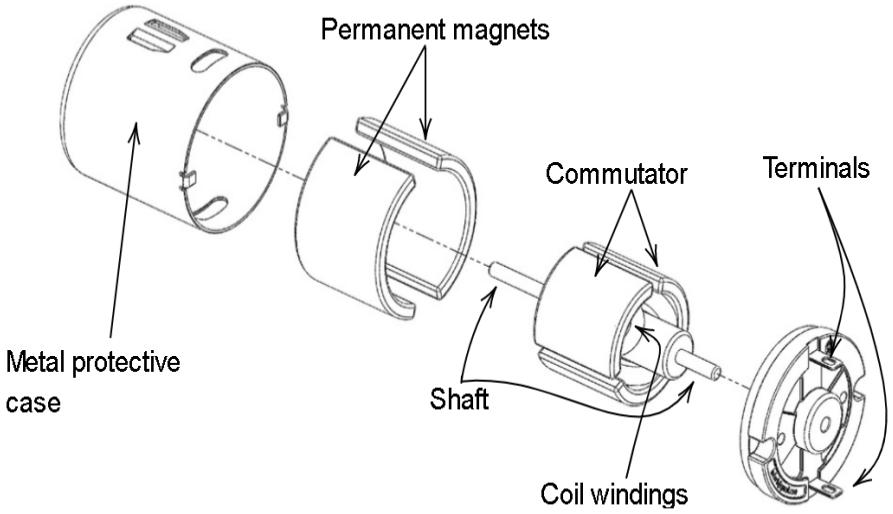

Figure 1: Illustrates the Structure of DC Motors [Google].

Without any previous knowledge of the parameters of the motor, the rotation speed may be calculated using techniques founded only on the undulation constituent of the motorized present. This is so because this information is already present in the motor current. Two components make up the majority of the motor speed being measured: a DC component and an AC component that is sometimes referred to as the ripple element. The duty of providing torque to the motor rests with the DC output[7], [8]. Aware that the AC element has a ripple, whose relationship to rotor speed is straightforward. Figure 1 shows the structure of DC Motors. The Adaptive Line Enhancer adaptive filtering was used in to calculate the rotational speed (ALE). The study contains simulation analyses of the ALE, however, these studies lack experimental validation. In their paper, the authors claimed that they would want to investigate the range, precision, and load impact of the predicted speed in actuality. The supported vector machines were used, and the rotation speed was estimated the location was mated using the anomaly score between the observed pulses, and approximated by totaling up all pulses that were found[9]. It displays promising findings, yet there is no explanation of why the findings for the slower revs weren't supplied, notably under 501 rpm.

Due to the numerous mathematical processes, the intricacy of the suggested solution also necessitates a microprocessor with higher processing capability. The technique that involves calculating the inductive points produced when the motorized is off was suggested in the predicted rapidity served as a value for feedback to the meanwhile the speed was recorded in steady condition, using a speed controller. The writer claim that having a study of dynamic characteristics and how to improve would be interesting for a speed limiter. When assessing a vehicle's performance, safety on the highway is a crucial performance factor. Serious safety incidents involving vehicle rollover frequently occur. Information for 2019 from the National Road Traffic Safety Administration demonstrated that rollover collisions account for 20% of all road deaths. Currently, research is being done by several universities both domestically and internationally when a car rolls over. When the vehicle approaches a curve,

an automatic steer reverse control algorithm generates a reverse roll angle, hence enhancing the anti-rollover capacity of the vehicle.

The use of active steering technology readily has an impact on the direction control, leading the driver to veer off the intended path. It cannot be utilized to avoid obstacles in an emergency, and there is still some danger involved. Road adhesion ratio and brake pressure have a significant impact on differential braking technology high-speed braking is dangerous since it can lead to wheel locking.

Active suspension technology has a low real-time performance and a comparatively large latency obvious. The majority of the time, active stabilizer bars are utilized to limit how much a vehicle rolls, while driving, and rollovers have a low control ability. In-wheel motors have not yet been widely utilized in electric cars due to their high cost, and some of the rollover warning and management systems now in use for these vehicles are either difficult to implement or have significant practical costs in actuality.

Consequently, based on the most widely used centralized-drive electric cars this work investigates rollover stability for motors. Additionally, deadly rollovers happened in areas in which the speed limit was 55 mph or more. There are two types of rollovers that might happen while a vehicle is traveling dynamically the first is overturn, which happens whenever the vehicle hits a curb or another obstruction. It is challenging to provide a computational formula for this category that captures the mechanism of such rollover. The non-tripping form of rollover occurs when the steering wheel of the vehicle is twisted. Significantly while the vehicle is traveling at a high rate of speed or near its service limit, resulting in traveling.

In comparison, because the drive engine controlled the traffic density, management strategies to prevent truck overturn immediately by controlling the drive speed of motor has received less consideration in research for electric automobiles. It has interesting science ramifications for the development of the modern fully electric industry to improve the energetic security of electric cars by reducing their instabilities using engine regulate methods aspects relating to the body layout of hybrid vehicles and performance enhancement of electric vehicles.

The vehicle speed is continuously and effectively performed using an elevated ground control motor drive, decreasing the possibility of vehicle overturn from its fundamental source thus effectively avoiding the potential risk for rollover crashes. Six-axis angle monitors are used to provide electronic controls.

To stop vehicle rollover, precise and real-time rollover indexes are crucial. A dynamic indication can demonstrate how quickly and how the vehicle status responds. Typically, maximum rollover angle, and current indications, are used to determine rollover, lateral force transfer rate, and lateral acceleration. Given the ease of lateral load transfer the threshold was flexible and portable, the vehicle model was not a restriction, and the generality has demonstrated improved real-time warning performance and has good performance [10]. It serves as the management individual's renewal indication (Figure 2).

The longitudinal drive speed, the horizontal motion pedal, and the yaw rate—all in line with the vehicle dynamical system—all work together to figure out the shifting of the centers of the vehicle's mass. Whenever a vehicle's transverse driving speed decreases, the displacement of the entire vehicle's centered mass may be immediately reduced from the source to meet the goal of avoiding the roll or stopping the vehicle form tipping over. The safety threshold is determined using the calculated rolling evaluation index, and the operational index is determined using active input data that is obtained. To carry out timely

early combined effective control and warning functions, the sensors and the vehicle's current driving status are evaluated.

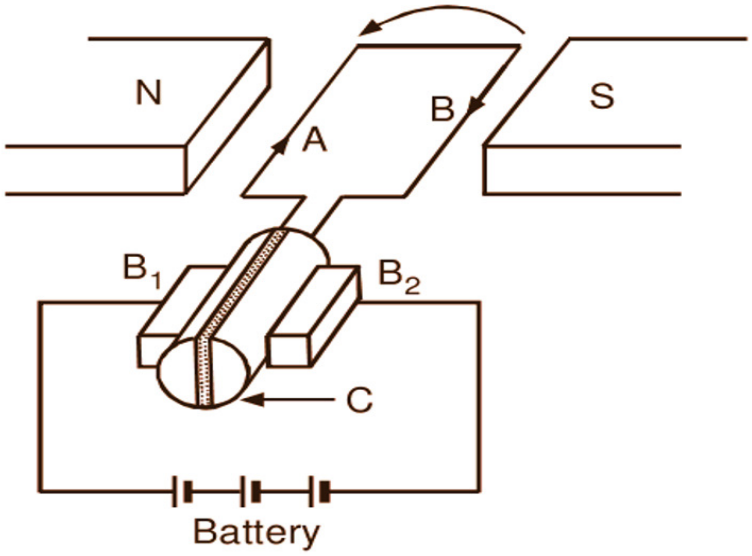

Figure 2: Illustrates the working Electrical workbook.

2. LITERATURE REVIEW

In, Fuhuai Jiang et al. have to proceed experiment on the dataset in Carsem contains a vehicle motion model called Rollover Steer Input: Unstable that lacks rollover stability control. Additionally, Carsem's Libraries' Batch function enables simultaneous comparing two or more models. Rollover steering input. This research strategy's unstable model and EV Rollover Standardized protocol are chosen to contrast the left's and right's structural load, rollover angles, and rollover rates tires put through the fishhook test. The rate of the car's lateral tilt angle motion after 5 seconds, there is a modest uptick in the models under this control technique up and down swings. It remains at zero after 6.5 seconds, indicating that the vehicle is moving steadily.

In [11], Michal Vidlak et al. have proceeded to experiment on the DC motor nonlinearities to blame for this phenomenon. There are frequencies at greater speeds that are extremely near to the wavelength of the ripple in the current caused by the communicate procedure. As a result, the separate band-pass filter's output is a dirty AC indication. This detail means that the comparator's pulses will have various distances. The timer measures these distances, which results in the existence of the variation in the predicted speed. However, the ripples in the anticipated price can be reduced by the speed by selecting the suggested filter's narrower bandwidth. Notwithstanding this, it is not true since the actual rotation speed, a required criterion, does not display rippling. In most drive uses, the burden is coupled to the drive shaft or has its quantity altered while the running. This finding suggests that the recommended spectator method is suitable for these applications. The Hal Effects sensor is a physical detector that's also utilized in vehicle window lifter operations, which is the main driver of the test.

In [12], Jesus U. Liceaga-Castro et al. Electric motors having a single voltage source and a field winding coupled in parallel with the rotor circuit are known as series DC motors or series universal motors. This show a motor with this connection has a huge starting torque. However, when the speed increases, torque declines as a result of an increase in the counter-

or back-electromotive force. Series Electric motors have poor power control. In other words, a motor's speed tends to slow down as its load increases. This, in turn, decreases back EMF and boosts torque to support the weight. These motors' drawback is that for the majority of their uses, the sensation of rotation is fixed to alter the rotation's and the torque's direction.The uses for the suggested observer-based technique are Pumps, fans, and other devices that require speed control would benefit greatly from this and so on. The suggested observer-based method's position control might increase uses for the automobile sector, including window lifters and seat such things as placement and sunroofs. Using a multilevel inverter and neuro-fuzzy approaches, a more intricate speed control scheme is provided, however, it is only applicable to digital simulation. nonlinear controlshave also been taken into consideration a sensorless for a series, control as well as a nonlinear observer the DC motor is suggested. It becomes single, nonetheless, when there is no current. The outcomes are also restricted to digital simulations.

In [13], Karol Kyslan et al. have proceeded with the course used for the fishhook test has two steering after continual acceleration from a stop to 50 km/h, the wheel twists. For the test of two shifts before commencing the binary change course, a goal rapidity of 120 km/h is set. When the circumstance the automobile moves at a predetermined goal speed under the examination scenario without anti-rollover control and the pace remains constant while traveling. The course used for the fishhook test has two steering after continual acceleration from a stop to 50 km/h, the wheel twists. For the test of two shifts before commencing the double shift course, a goal speed of 120 km/h is set. When the circumstance the vehicle moves at a predetermined goal speed under the test scenario without anti-rollover control and the pace remains constant while traveling. When anti-rollover control is in place, whenever the LTR is over the safety limit, a controlled deceleration is carried out resulting in two control curves for the system. Although this is in actuality, several industries continue to employ PMDC device applications ranging from modest household appliances to manufacturing machines equipment for robotic, medicinal, and photovoltaic applications. Frequently utilized as supplementary drives in automotive applications since current automobiles have a DC grid, and they are particularly appropriate for battery-powered devices.

In [14], Patxi Alkorta et al. The Model Predictive Control (MPC) technique unites several controllers that calculate the best control signal based on the system model and known future references. The calculation is the predictive control's operational tenet the system's needed control signal is known in advance when it is known which future input reference will be used ahead of time. In this way, the system is capable of responding to the input reference, foreseeing its alterations, and preventing the impacts of system response delay. There are several industrial applications where the input standard is known such as machine tools and robotic devices in the past.

Predictive algorithms are the result of a substantial study into the use of predictive controllers in electric drives competing with other cutting-edge control methods such as nonlinear, fuzzy, and sliding mode controls. The implementation of predictive algorithms often involves two or additional GPC blocks to manage multiple electrical circuits coupled in a cascade arrangement to a machine. Most often, there is just one predictive controller for the control of the machine's key variable put into practice, such as position or speed whereas the remainder of the variables is often managed by conventional algorithms Hysteresis and PI/PID comparators.

In [15], Tan Jiawan et al. Ultrasonic motors offer the benefits of being light, having a high torque at a low speed, being quiet, self-locking when the power is turned off, and not being

affected by magnetic fields. Ultrasonic I n many different types of study, including there are several control systems used in optical autofocus, hospital instruments, robotics, instrumentation, and military equipment methods for ultrasound motor in several domains of application, such as FPGA-based computational, state control loop, adapt back-stepping motion complementing control, second-order sliding-mode control based on Hermit neural networks, and sensor-less control. Every control strategy offers special benefits of its own. The key element of many of the aforementioned disciplines is the ultrasonic motor and its operation.

3. DISCUSSION

According to the automobile wave equation, the yaw, vertically drive velocity, and crosswise travelling bandwidth all contribute to the movement of the balance of the vehicle's mass. Whenever a driver's transverse traveling speed decreases, the deformation of something like the entire vehicles center mass can be immediately lowered from the sources to meet the goal of halting the roll and protecting the car from tipping over. Using dynamic input information recorded by, the operating index has calculated the sensors, and the current driving situation of the vehicle is assessed, the calculated rollover assessment index is applied to define the safety threshold. This allows for the implementation of appropriate early both intelligent controller and warning. During the fishhook skill test, the steering is quickly turned in the other direction. While the double lane change procedure test simulates a car fast passing another one, the second turn's angle is half as great as the initial turn's. The ability of a vehicle to roll over is typically evaluated using dual and lane-change tests. It is a replica of the ideal test, which also includes a double 120 km/h highlights the effect shift test and a fishhook test at the constant 50 km/h speed. The course used for the fishhook test has two steering after continual acceleration from a stop to 50 km/h, the wheel twists. For the test of two shifts before commencing the binary change course, a goal rapidity of 120 km/h is set. When the circumstance vehicle moves at a predetermined goal speed under the test scenario without anti-rollover control and the pace remains constant while traveling. When anti-rollover control is in place, whenever the LTR is over the safety limit, a controlled deceleration is carried out resulting in two control curves for the system. Figure 3 shows the Series Connecting of a DC Motor.

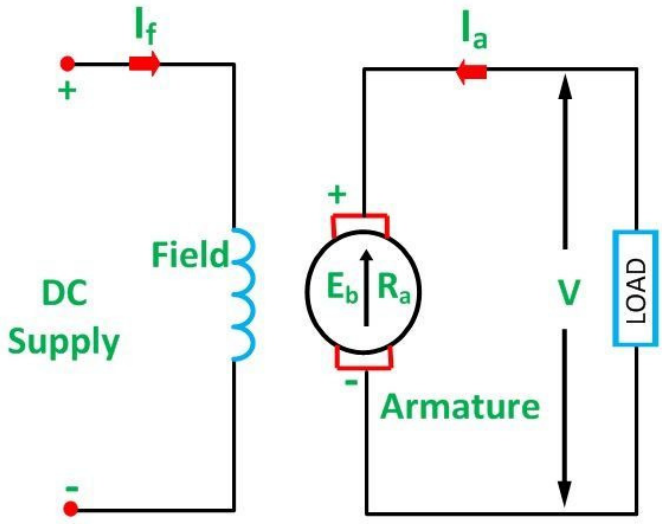

Figure 3: Illustrates the Series Connecting of a DC Motor.

The open loop supplied a motor start-up the estimated rapidity is adjusted as an input value to the supervisor at a speed of 700 rpm. The primary drawback of this approach is that it is ineffective at speeds below 700 rpm. The cause is that the present ripple's frequency is sufficiently low below this speed. Consequently, the measurements' information on the rotor speed is insufficient for the control algorithm uric current can offer trustworthy speed control. It is comparable to a sensor with a few sources existing on the rotation speed per spin. The average inaccuracy is around 1.907 rpm or 0.032%. In light of the outcomes, this technique performs as expected in a tested environment 700 to 6000 revolutions per minute (rpm) was the speed range. The examined range displays 88.333% of the range of possible speeds. It is important to note that this technique has the potential to be trying to operate with DC motors running at extremely high speeds.The experimental approach needs the creation of a real system, and the necessary experimentation can only be carried out on the assumption of a full control system, which also influences the experimental approach. Being less effective than simulation in the study of the command structure. The simulation approach is to create for the ultrasonic, a full mathematical or empirical model a built-in model, and a motor control system to mirror the actual performance of the system. Using the simulation approach, it is not only practical and inexpensive to analyze the real control system safely but also serves as a useful design reference and the creation of new, more effective products. Figure 4 shows the DC motor Parts.The tuning settings used by the two contemporary PI regulators are identical. The current loop dynamics speed up with the greater bandwidth these controllers are chosen. However, in reality, the bandwidth of any practical system is restricted physically. On the experimental platform being used using the induction motor mentioned. The 4000 rad/s limit up to this number, the platform results in the annoying chattering phenomena of mechanical vibrations that are harmful and can harm the machine.

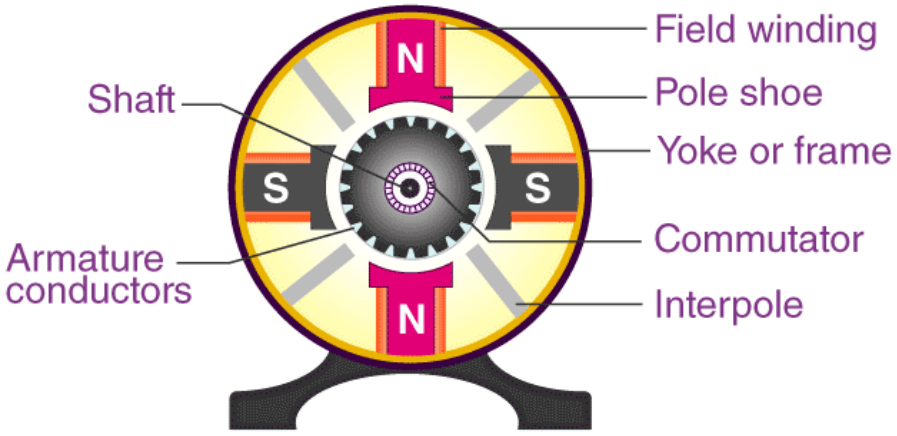

Figure4:Illustrates the DC motor Parts [Google].

4. CONCLUSION

The introduction of a broad real-time rollover control approach reduced the probability of an electric automobile rolling over. The motion condition of the automobile was ascertained using attitude sensors, and elevated ground was used to manage the determination vehicle rapidity drop when the car tended to roll over, considerably reducing the likelihood of the accident. The results of the integrated simulation curve demonstrated the viability of the suggested method for Simulation result and Carson. This study suggests a true anti-rollover control mechanism that, during the double carriageway test and the treble hook test, demonstrated excellent stability in two operating situations with variable driving speeds based on research on the, this study linked driving speed control and car accident for the first

time. The idea behind this procedure and its validation is a fresh technical support channel for the next technological development and research on safety in electric vehicles. Electronic control has grown more prevalent in the modern vehicle industry crucial technology in the broad technical progress and invention of automated driving, automatic assistance when driving, and an intelligent cockpit the primary method for regulating the numerous structural reactions of vehicles.Although the anti-rollover control system for electric cars was the focus of this study, and its viability was confirmed by simulations, there are still certain shortcomings and difficulties because of the time constraints and objective conditions. Due to the model's simplification, some effects, such as tire location torque and suspension, e.g., air resistance. The model should be further optimized in subsequent studies to increase the control precision and take into account additional non-linear effects; this study only focuses on the test vehicle's DC motor's control design. Nevertheless, this control approach is extensively applicable to various electric vehicle drive motor kinds and is used as a routine feature of a driver aid system.

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CHAPTER 11

ROLE OF ARTIFICIAL INTELLIGENCE IN TRAFFIC CONTROL MANAGEMENT

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ABSTRACT: Traffic control management is the term used to describe a set of actions that work together to maintain traffic capacity and enhance the overall security, safety, and dependability of the road transportation system. The paper describes how artificial intelligence (AI) is useful in controlling traffic management. Due to rising population rates, one of the most critical issues in cities is traffic congestion. Intelligent signal light systems that respond to loads and timing can help ease traffic congestion. Smart traffic lights can adapt to the patterns of bustle at junctions and other important road traffic places based on the number of vehicles, data from queue detectors, and images from cameras the AI is helpful for that. The paper has assisted in considering how traffic control may be accomplished using Artificial Intelligence. This study helps reduce the withdrawing vehicles or minimize the accident risk. To find and identify vehicles that are breaching traffic laws and to provide real-time notifications to the Central Command Center, an Intelligent Traffic Management System integrates artificial intelligence with cameras placed at traffic connections.

KEYWORDS: Artificial Intelligence (AI), Network Traffic, Traffic Management, Traffic Control, Traffic Analysis.

1. INTRODUCTION

The technique of identifying customer requests, communication, and networking protocol patterns moving between networks is known as network traffic analysis. Security concerns, invasion recognition, declining server performances, arrangement mistakes, and delay issues in several network mechanisms can all be found via traffic analysis [1]. The complication and variety of system traffic exploration have significantly expanded as the effect of the quick development of new online applications and the widespread use of mobile and Internet of Things (IoT) devices. Furthermore, the addition of additional safety necessities in contemporary networks, such as packet inscribes and port complications, has increased the difficulty of categorizing network data [2], [3]. The most recent Cisco prediction states that by 2022, there will be 12.3 billion more mobile devices linked to mobile networks than there are people on Earth.

Due to the widespread use of the Internet made possible by the enormous number of smart gadgets, there has been an increase in traffic and application usage. As a result, network architecture has become more resource-hungry and can provide tough problems for network operators. As a result, managing the network manually while precisely processing a lot of data on time is not viable for network administrators. Artificial Intelligence (AI) is a tremendously potent tool, but only if humans can correctly harness it. Learn how AI features may be used to track things that are challenging to quantify owing to human error. Humans are typically unfocused, drowsy, and incapable of multitasking effectively when it comes to monitoring and keeping track [4]. However, AI overcomes all of these shortcomings, and on the plus side, AI never gets tired. Traffic and vehicle monitoring systems employ a variety of technologies that can be united to launch the project. The majority of the technology required to complete this work on a small scale is already at disposal [5].

1.1. AI-Powered Cameras:

Any traffic monitoring system will need cameras, but AI-based computer vision cameras will allow us to follow vehicles considerably more effective than any other system currently in use. Machine learning cameras that operate automatically according to the situation will replace motorized, infrared cameras that are operated manually. Based on picture pattern analysis and image recognition, about 7,500 cameras with multidirectional infrared and colorless laser sensors will count the volume on all arterial routes.

One of the most crucial undertakings in transportation engineering has long been efficient traffic monitoring. The majority of traffic monitoring centers still rely on human operators to monitor any event on the roads and monitor the nature of traffic flows. Manual traffic condition monitoring procedures can be laborious and time-consuming. Humans are sensitive to errors and weariness; hence some disparities are frequently present in the results. Therefore, it is in everyone's best interests to create automated traffic monitoring technologies to reduce the workload of human operators and boost output efficiency [1]. The key to this solution is to suggest a traffic signal that can detect areas of high traffic and emphasize a timetable of which lane is congested and at what times. The next stage will be to analyze the data and determine a logical and practical schedule for applying intelligence. Traffic lights can communicate once a proper congestion schedule [5]. Congestion can be lessened through this communication. Visualize an indication in the middle of an intersection where transportation is flowing from four different roads at once. Therefore, a traffic signal that can operate following the information and adjust itself to display green, red, and yellow lights to ease mobbing [6].

Due to technological advancements during the past century, a significant population shift from rural to urban areas has occurred in several countries. As a result, many cities have experienced significant population growth, which has led to a variety of societal issues, including traffic congestion. Additionally, rising traffic congestion was greatly influenced by falling vehicle prices and an increase in consumer demand [7], [8]. In fact, because of inadequate infrastructure, the problem of traffic crowding is other pronounced in third-world countries. Traffic jams result in excessive fuel consumption, which not simply raises communication expenses but also degrades the background. A significant number of working hours are lost and manufacturing costs go up as a result of traffic congestion [5]. The capabilities of the human psyche can be mimicked and even improved by technology thanks to AI. With the introduction of self-driving cars and the growth of digital assistants like Siri or Alexa, AI is becoming ever more common in daily life [5]. Because of this, many IT companies from many industries are investing in AI technologies. The broad topic of AI in computer science is concerned with creating intelligent machines that are capable of doing activities that typically require human intellect.

Competition for a limited and highly valuable resource leads to traffic bottlenecks. In the age of driverless cars, they still, compete for the most fundamental upgrades to a managed traffic system. Traffic signals are a reliable method of controlling intersections in the daily traffic world and efficiently reducing traffic congestion [6]. With the emergence of smart cities that employ technological advancements, it is now possible to fight this issue by rerouting traffic from more congested roadways to less congested ones utilizing satellite and computer technologies. Additionally, technology is moving toward a smart society where widespread usage of driverless autonomous vehicles is possible. These vehicles are typically equipped with clever gadgets to gather the necessary information on the volume of traffic on different roads, enabling these means of transportation to wisely choose the best ways to take to spread the terminus [4].

The paper is divided into four sections the first section of the paper describes the use of artificial intelligence in traffic control management, and artificial intelligence cameras and after that literature of the previous study are discussed in the literature review section, and then the discussion section discusses transportation jamming analysis in smart cities, transportation and the role of artificial intelligence, issues in traffic and finally study end with a conclusion section that explains the outcome and future of this study.

2. LITERATURE REVIEW

Ahmed Abdelmoamen Ahmed and Gbenga Agunsoye [8] studied the complexity of traffic analysis has risen as a result of the spread of new online applications and the ubiquity of network data. Network managers typically use well-known static ports to categorize the traffic moving through their network. Up-to-date network transportation, however, utilizes active ports and is sent using safe application-layer rules like HTTPS, SSL, and SSH. The present design by the author is about Net Scrapper, a flow-based network transportation analyzing for virtual uses, which is designed and put into operation. To integrate the 3 models with the Flask Graphical User Interface (GUI), developed a middleware pipeline. Last but not least, the assessed Net Scrapper was based on a variety of performance indicators, including categorization accuracy and prediction speed.

Doanh Kim Luong et al. AI-based transportations-aware dynamics control employment in (Software-Defined Networking) SDN-based aviation network Multiple dispersed controllers have been employed in software-defined networks (SDNs), where the controller assignment continued constant throughout time, to promote flexibility, scalability, and dependability. However, aircraft mobility hampers Aeronautical Telecommunication Network (ATN) operations since it leads to a time-varying and uneven physical distribution of aircraft. That study demonstrates how dynamic mapping between SDN switches and controllers enhances system flexibility and effectiveness under varying traffic loads.

A. B. Ahmad and T. Tsuji [9] researched on System for Checking Traffic based on seismic data, deep learning, and assessment techniques for recognizing and categorizing cars using seismic data. Because of interference from multiple noise sources, identifying vehicles from seismic data is thought to be a challenging task and used various AI approaches to excerpt features from three different-sized vehicles like buses, motorcycles, and car seismic noise, and speech recognition systems and looked into using Recurrent Neural Networks (RNN), Convolutional Neural Networks (CNN) and Deep Neural Networks (DNN) to categories cars using seismic data from the vertical component captured by geophones. The author's research demonstrated seismic approaches, which are more cost-effective and efficient than current techniques, that are employed for transportation checking and safety needs without invading the confidentiality of car occupiers. Other modes of transportation, like boats and airplanes, might benefit from a similar strategy.

Yu Fuet al. [10] studied the novel aspects of 5G wireless network traffic and talk about the difficulties they provide for 5G traffic control. A novel framework for an AI assistant content retrieval method as well as distributed and lightweight ML algorithms are explored as possible resolutions and study instructions for the managing of 5G transportation. A brand-new architecture for an AI helper content retrieval algorithm has also been presented to optimize the data traffic in the content retrieval services of upcoming 5G networks. Future 5G networks will present numerous additional opportunities for the employment of ML and AI approaches.

Umesh Kumar Lilhore et al. discussed an ML implementation and design and Smart Cities IoT-Based Adaptive Traffic-Management System. The method used by the author is IoT and

is based on an ML Adaptive Traffic Management System. The system was designed for the infrastructure, vehicles, and events. The suggested ATM resolution decreases traffic jams and vehicle wait times, lessens collisions, and enhances the entire travel experience. The author concluded that the recommended ATM system would be a pioneer in transport planning for smart-city-based transportation schemes and would perform considerably better than the conventional traffic-management strategy.

Rusul Abduljabbar et al. [11] reviewed the uses of artificial intelligence in the field of transport. According to the author, traffic safety, traffic management, public transit, and urban mobility are the primary areas where artificial intelligence is used to address transportation issues globally. In that study, the author employed the AI methodology. The author identified several application areas that are anticipated to have greater influence in cities in the future, including autonomous cars.

Vishal Mandal et al. [12] researched a system for monitoring traffic with Artificial Intelligence. The research findings that were obtained throughout the process of creating models that operate as an integrative system for a transportation checking system with AI are described by the authors. The recommended solution automates numerous traffic monitoring requirements by utilizing a variety of cutting-edge deep learning approaches. The findings show that the suggested framework functions admirably in a variety of situations without being significantly harmed by environmental risks like foggy camera views, dim lighting, rain, or snow.

Aaron Chen et al. [13] researched the introduction of intelligence into communication networks has been the subject of extensive research to improve network performance. Wired and wireless communication networks are constantly growing as other devices are being associated with the Internet. Machine learning is used for using it to build cognizable network are introduced. Then, go over statistical and machine learning methods for traffic forecasting, dividing each into long-term and short-term uses. Methods are further divided into those that are more useful in local or WAN. To encourage additional applications in actual networks, that study tries to compile and provide an overview of existing methodologies.

Previous studies discussed several methods for managing and controlling network traffic are explained in this section. Additionally, methods for managing network traffic using artificial networks that are calculating established are also explained. The above study shows the traffic problems, artificial intelligence in transportation, and analysis of traffic jams in smart cities.

3. DISCUSSION

Network traffic control in computer networking refers to the practice of regulating, lowering network traffic, or controlling, especially Internet capacity, for example, through the network scheduler. Network administrators utilize it for latency, and packet loss, and lessen traffic. If the smart traffic light uses a wireless communication channel to manage the signal lights and chooses the closest way with the least amount of congestion, traffic junction dangers will be reduced. All of this is done to shorten the time a rescue truck has to transport a patient to a medical facility at the perfect time. Systems for wireless communication have been used to transfer data between terminals. Global System for Mobile Communications (GSM), which is widely used, is an option. This is due to dependability as well as ease of access and movement within the covered area. The file is used to collect information and also to deliver different reports upon the manager's request. In the proposed system, computations that are run at the server observe, track, and direct the ambulances [6].

The technique of identifying networking protocols, user functions, and designs of communication moving through a network is known as network traffic analysis. Security concerns, intrusion detection, declining server presentation, arrangement mistakes, and potential issues in network elements can all be found via traffic analysis [10]. The variety and complexity of network traffic analysis have significantly expanded as a result of the quick development of new web apps and the widespread use of mobile and IoT devices. Furthermore, the addition of additional safety necessities in contemporary networks, such as package encrypting and port complication, has increased the difficulty of categorizing network data [8].

The IoT concept supports making the Internet omnipresent. The Internet of Things (IoT) ecosystem comprises readily available communication channels between a wide range of objects, including security cameras, automobiles, actuators, and monitoring sensors. As an outcome, IoT encouraged the creation of a wide variety of applications for offering a variety of services to both the public and private sectors, resulting in smart cities. Smart industries, smart hospitals, smart grids, smart campuses, and smart homes are a few examples of such services [4].

3.1.Transportation Jamming Analysis in Smart Cities:

The world's human society is rapidly expanding, particularly in urban areas when compared to rural ones. One significant factor in this regard is the migration trend to metropolitan regions. Out of the 7.4 billion people residing in the world, 4.1 billion live in cities, according to the 2016 World Population Report. According to projections, 6 billion people will live in cities out of a total population of 9 billion shortly [4]. The population is expanding dramatically, which raises the need for transportation and drives up the number of automobiles. As a result, one of the biggest issues with the infrastructure of large cities worldwide is traffic management. Some of these issues include heavy traffic, accidents that typically waste a lot of time, property damage, pollution of the environment, and even fatalities.

3.2.Transportation and the Role of Artificial Intelligence:

Since the adoption of AI technologies in the transportation industry, a lot of things have gradually changed as a result of the various advancements AI has brought.

- Many businesses utilize artificial intelligence (AI) to forecast collisions based on the environment and other parameters. AI is being used to anticipate accidents.
- The merging of artificial intelligence with electric vehicles is another fantastic advancement (AI). Since they emit fewer pollutants, electric cars significantly help to reduce environmental pollution. Connect Transit, which uses electric buses equipped with AI, is a perfect example of this.
- Additionally, the development of self-driving automobiles with traffic detection capabilities is thanks to artificial intelligence (AI). Because self-driving cars can recognize the pathways of pedestrians and bicycles thanks to artificial intelligence (AI), fewer traffic incidents will occur. This significantly improves road safety.
- Artificial intelligence (AI) can be used to alleviate traffic congestion on roadways, resulting in smooth traffic flow. Many smart cities across the world utilize AI traffic management systems to monitor traffic flow, and with the use of AI, drivers can be alerted about hazardous areas on a given road or route. AI is also capable of foreseeing traffic jams and potential security issues.

- Although it is still in its infancy, artificial intelligence (AI) in transportation has the potential to completely transform the industry. The adoption rate of AI in this field has been impacted by the trust. The lack of effective regulation, certification, and standardization of AI tools in the transportation industry exacerbates the lack of trust. However, the use of AI in transportation will come once policy-making on AI has fully developed since safety will be ensured and thus, trust will be restored.

Every kind of traffic congestion on the roadways results in financial losses. As a result, traffic management needs to be improved immediately. It is crucial to have scheduled technologies-enabled growth in substructure as well to improve mobility in cities. Consequently, the advantages of implementing the IoT present a fresh opportunity for the growth of intelligent traffic [4]. Any traffic monitoring system will need cameras, but AI-based computer vision cameras will allow us to follow vehicles considerably more effective than any other system currently in use. Machine learning cameras that operate automatically according to the situation will replace motorized, infrared cameras that are operated manually. Based on picture pattern analysis and image recognition, about 7,500 cameras with multi-directionally ultraviolet and colorless laser devices will calculate the capacity on all major highways [5].

There are numerous approaches to implementing control measures and actions. In a metropolitan traffic region, the actuators may be highly diverse, including traffic lights, varying message signs, intellectual onboard systems, direction advice, and transportation laws and regulations. However, as traffic lights are required signals and have a direct impact on traffic dynamics, they provide the most effective control actions. The arrows in Fig. 2 connect the previously described sections (blocks) of the control process. However, it is also possible to define the output and input signals of the system that is being presented. In addition to the management activities outlined above, the control system also receives information from the continuously fluctuating traffic flow entering the network's perimeter [14].

Furthermore, the disruption effects result in the formation of a third input type. Signals that cannot be controlled or even measured are referred to as disturbances in the control theory. Disturbances may taint the controlled system's model, leading to erroneous control actions. The special control is required in cases of large disturbances, such as when applying a robust method to deal with model uncertainty. The systems are represented by states varying such as transportation speed, volume, etc., or by other presentation metrics, including the whole journey period or the network's quantity capability.

3.3. Issues in Traffic:

Numerous times, several variables can happen simultaneously. Traffic congestion factors can compound one another, Issues Traffic related are listed below.

3.3.1. Emergency Vehicles in Traffic:

Await the passing of the emergency vehicle. Keep an eye out for multiple emergency vehicles as they approach. Before reentering traffic, make certain the road is clear and also the traffic signal. If all tracks are closed on a multi-track roadway, an emergency vehicle frequently uses the shoulder.

3.3.2. Decrease the 4-Way Junction Traffic Data:

Picture for explaining Reduce the statistics on the traffic at the 4 Way Junction. Two stages make up the four-way traffic light circuit. The timing and counting phases make up the first one. The light stage is indicated by the other one. The light stage indicator should be suitably

positioned on four lanes. While traffic enters and leaves from each way, it is said to be at a four-way intersection. It was difficult to picture a path and understand how it operated. Connected sensors are necessary for a sideways to generate data. Using a reliable algorithm, the central server manages the 4-way junction.

3.3.3. Location of Central Server:

Each traffic signal has a connection to a sensor, which provides data to a centralized server. The decision of whether to place one massive server in a single location or several servers distributed geographically is problematic.

3.3.4. No-cost Smart Traffic System:

AI-based traffic management scheme or a humanoid should be in charge of monitoring it.

Limiting bandwidth for some applications, ensuring minimal bandwidth for others, and categorizing traffic as high or low priority are all necessary for handling and supervisory network traffic. The slowest section among the basic and the desired destination determines the maximum bandwidth. Information is transmitted in separate packets on a network that uses packets, like the internet. The routing algorithm chooses the route that a packet takes as it moves across the network. In addition to network monitoring and accounting, system administrators can spot several potential issues in the network. Traffic flow can be used to examine and improve a network's overall operational efficiency [3]. In a traffic model for a smart city, roadside fixtures like traffic signals, electric poles, and traffic signs are fitted with IoT devices that collect data on traffic, including the numeral of transportation using the roadways, the amount of congestion, the average speed, any anomalies in the traffic pattern, and the presence of ambulances, fire trucks, or other law enforcement vehicles [4].

4. CONCLUSION

A summary of AI's applications to several transport-related issues is provided in this study. Transportation systems and cities produce more instruments and provide crucial information for the development of AI applications, variety of uses is anticipated to rise. Assessment concentrated on a few use area that is anticipated to have more effect in the city in the future, such as public transportation, autonomous vehicles, disruptive urban mobility, automated incident recognition, future traffic position estimate, and traffic management and control. Wireless and wired communication networks both continue to expand in size, complication, and intellect. The introduction of network intelligence will help the network better manage high-volume scenarios and guarantee service quality. This study has reviewed numerous publications that are pertinent to predicting network traffic and has categorized them based on whether they are used and applicable in the long term or near term. The effectiveness of these approaches in local against wide area networks has also been assessed.

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CHAPTER 12

MEDICAL ROBOTS AND CURRENT SYSTEMS FOR REMOTE ULTRASOUND SCANS

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ABSTRACT: Since their introduction to medicine in 1985, robots have had a big impact on laparoscopy, neurosurgery, orthopedics, emergency response, and many other fields of medicine.On this website, you may learn about the development of robotic operation and the potential of the most recent mechanical medical equipment. It highlights a few major research initiatives while mostly concentrating on technologies that are now available for purchase. Studying automated systems across time and in many fields reveals patterns that will influence future surgical robots capabilities, such as increased perioperative imaging application, improved physical arm construction, and haptic to assist the operator. This paper examines cutting-edge tele operated machines for ultrasound scan operations, offering a thorough examination that takes into account current developments brought on by the COVID-19 pandemic. Methods. The inclusion of physicians' experiences highlights the significance of their input toward the creation of better medical robots. From this vantage point, new classes using medical robots as the foundation are presented in terms of cutting-edge technical techniques and Results. A survey of pertinent literature is conducted from the perspective of system engineering, and the debate is organized based on the primary technical focus of each work.Conclusions. Our contribution is to promote new research to produce findings on remotely operated robotics for ultrasound diagnoses more swiftly to address the tremendous demand caused by the ongoing epidemic.

KEYWORDS: Medical Robots, Ultrasound, Technical, Operation, Pandemic.

1. INTRODUCTION

Medical robots have caused a paradigm shift in therapy. The most popular robotic surgery, the Intuitive Surgical da Vinci system, has received approval from the US Food and Health Directorate and has been discussed in over 4,000 scientific papers. Eighty percent of severe tumor-shrinking surgery done in the USA in 2008 employed the technology, which was introduced to the market nine years earlier. Medical robotics is expanding so quickly as a result of some factors, including technological advances. Even in the early stages of development, medical robots are regularly used for novel applications.[1]–[4].Robot of America, a business group for the industry, defined a robot as "a reprogrammable, multifunctional manipulator that can move materials, parts, tools, or other special tools through several programmed motions for the performance of a range of tasks" in 1979. Such a definition eliminates everything stationary (like image analysis systems), anything with a single purpose (like a stapler), and examples of such application processes.

Robotics are so commonly proposed for activities requiring preconfigured movements, especially when such movements must be swift, powerful, precise, fatigue-free, perfect, and/or via complicated articulations. High costs, a lack of available space, and rigorous user training are common drawbacks. Robotic surgery has made the biggest impact during surgery. Radiosurgery and cell handling in the acute setting are improved by the quality and precision of the motions of the necessary tools. The effects of robot assistance on long-term results are currently being investigated but it has the potential to enhance surgical outcomes, lessen patient trauma, and decrease hospital stays.Since the 1990s, medical robotics has been discussed in several studies. Many of these assessments are industry-specific, concentrating

on robotic surgery, urology, the spine, and other areas for a survey of urologic mobile robots and the underlying science of medical robotics. A recent Medline met review on the outcomes of urologic, gynecological, and abdominal laparotomy cyborg surgeries should be provided, [5], [6]. All of these articles are focused on surgery.An impression of the effects of automatons in several medicinal fields is given in this study. The revised analysis of several robotic systems in this study improves on the earlier reviews by addressing system upgrades (scientific and regulatory) and shifts in manufacturers as a result of corporate takeovers. In addition, this study, to the author's knowledge, covers a wider range of medical fields that benefit from robot help than any other single publication, giving readers a broad perspective on how robots are advancing the medical industry.

While it is focused primarily on commercially available clinical robotic devices and the background that underlies their advancement, this research encompasses a number of the next technologies and deliberates their possible implications on the destiny of the medicinal industry. In order to reach a hidden target encircled by delicate tissues during multiple surgeries, robots has to be able to make exact and accurate movements depending on the children's anatomic medical images. As a result, a cerebral biopsy using a geographical frame and a tomography image was the initial human procedure to involve a robot, which was reported in 1985. A robotic system set the course for biopsies in that research by keeping the probe's attitude toward the biopsy objective as the surgeon modified the approach.

A preoperative CT scan was registered with the automaton using a geodesic edge fastened to the enduring's head to identify this orientation.That project was abandoned when the robot firm was acquired because the new owner's company mandated safety requirements for the robot arm (54 kg and able to move at 0.5 m/s) was solely made to function in a barrier-free environment away from people. Target tracking is possible even if the surgical changes in brain material swell, sag, or change thanks to real-time picture guiding. Due to the single-dimensional intrusions' limitations and the requirement for real-time CT, Minerva was abandoned in 1993.The objective of the present neurosurgical robots, which is image-guided positioning or orientation designed for easy or other instruments, is comparable to that of earlier systems.

The Neuro Mate is now being deployed in the FDA clearance process, and the previous version was certified by the FDA in 1997. In addition to these various treatments, the device is advertised for biopsy, neuromodulation, spatial evoked potentials, functional magnetic resonance imaging, radiation therapy, and neuro endoscopy. [7].The robot positions the tool after the surgeon sets a target and path on a preoperative medical picture with events that occurred in precision. The device is reportedly used for directing drills to create burr holes and needles for biopsy. The Major Robotics-produced Medici system of the first generation, formerly known as Spinal Assist, has acquired FDA clearance (2011) as well as CE labels for spine surgery and brain surgery (2011).The system is made up of a soft drink robotic that's also directly linked to the spinal and offers tool guiding based on previously developed software for a variety of treatments, including fixing abnormalities, obtaining samples, conducting invasive operations, and inserting electrodes. Current laparoscopy C-arms may be upgraded with a picture add-on from Modern.Accurate and precise bone excision is the anticipated orthopedic advantage of robot aid. Robotic systems can be improved by effective bone excision. To optimize functional results and implant durability, the implant should be aligned with the bone and its contact area should be increased [8]–[11].The machine was Robocop’s immediate rival. Based on a preoperative plan created using CT data, bone drilling was automatically carried out. 2008 saw the release and FDA clearance of the MAKO Surgical Corp. RIO robotic arm, originally known as the Sensory Guidance System.

Orth robotics have focused mostly on replacement or refinishing bones in the knee and hip, in additional to a Medici gadget and its use on the spine. All procedures employ bones screws or pins to identify the surgical site, unlike early treatments that needed bone joints to be set in situ. The surgeon designs bone crushing with the aid of a robot and Ortho Doc, a surgical planner, using preoperative CT. The patient's leg is secured to the dinosaur's pedestal during the surgery, and a secondary clamp locates the hips joint to stop the robot any moving if the leg moves. The RIO is used for patellofemoral arthroplasty, as well as the insertion of medial and lateral asked us to send knee components. The surgeon and the RIO are holding the surgical instrument together in a move away from independent robot actions.The surgeon can manipulate the instrument with ease while back-driving the arm's joint motors thanks to the arm's low friction and low inertia design. The arm's role throughout the milling process is to serve as a haptic device, opposing actions outside the intended cutting area by pushing on the surgeon's hand. Figure 1 shows the diagram of surgery robots.

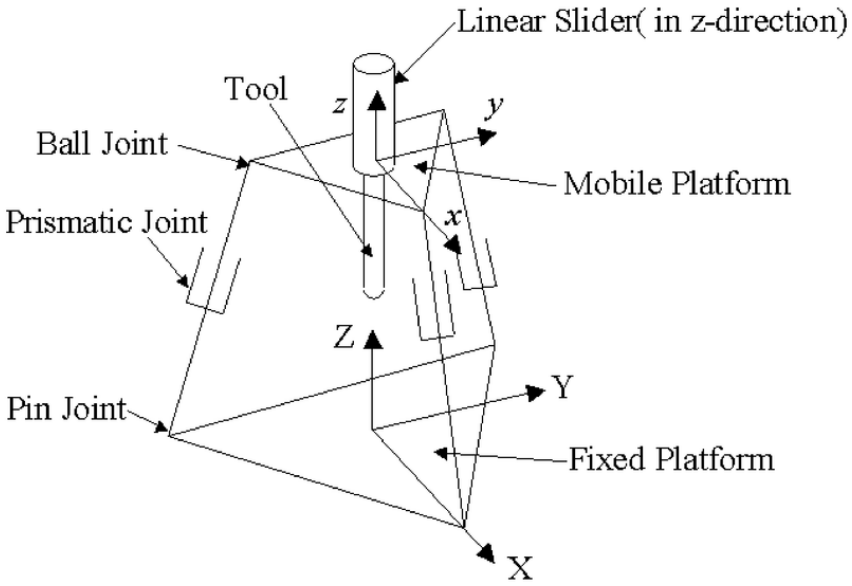

Figure 1:Illustrates the Diagram of Surgery Robots [Google].

In contrast to conventional surgical methods, the RIO uses a video network to supervise bone pins and surgical tools while the patient is hospitalized and to signal the predicted cutting area to the patient. In contrast, some surgical techniques need the bones to be fixed in place. In this form, the technology demonstrates promise as a teaching aid for physicians. FDA approval has been given to the inlock, a robot cutting tool that has even less robotic impact than the Praxiteles of the previous generation from Praxis Inc., a subsidiary of Orthopedic Synergy Inc. In 2010, a computer cutting guide for total knee replacements was released. Unlock, which is a tool used by the surgeon to manually perform plane cuts in line with a preoperative design, aligns a cutting guide.

The Stanmore Sculpt, a synergy system with active limits to maintain the surgeon in the specified workspace, is analogous to the RIO. The company's "Savile Row" technology develops personalized epicondyle knee implants again for the client, including a 3D model of the surgery planning interface for that device, The technology has been used in Britain even though the Government has not yet cleared it [12]. The researchers concluded that using an automated machine in the operating theatre during neurosurgery was unsafe. An industrial robot was originally used to aggressively eradicate tissue after transurethral of the prostate. The experience was the source of inspiration for the research model Robot, which had the

same objective. In 1995, Computer Motion used Aesop and three tool-holding automation systems to create the Zeus system. With the use of the instrument controls (sometimes referred to as "masters" arms or analog sticks) at the physician console, the Zeus' tele operated tool arms followed the surgeon's motions.

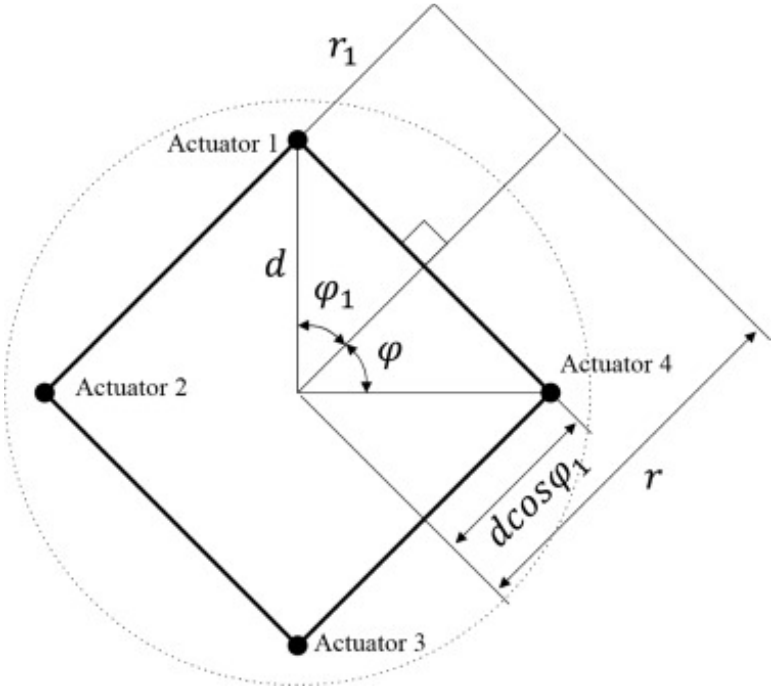

Figure 2:Illustrates the Application of Flexible Robots [Google].

2. LITERATURE REVIEW

In [13], B. Roberts Clinical need is such that a sizable laboratory may process between 125 000 and 150 000 samples annually or around 2 million test findings. There might be 100 distinct sorts of exams presented. Workload changes result from two different factors: first, a general increase in known tests, which is often absorbed into automatic equipment already in place; and second, the addition of additional tests to the laboratory's toolbox. These are frequently complicated in character and, at least initially, are completed in a few numbers. The usage of robotic preparatory units would be most advantageous and effective in this situation. The likely interaction between manual, robotic, and specialized instrumentation is depicted in Figure. The difficulty of a given situation. According to the definitions used, 90% of laboratory effort is already fully automated, 3% is only somewhat automated, and 7% is not automated at all manual. 2% of the total number of manual tests in a subset are acceptable for robotic applications; these are denoted by an asterisk. It will be clear that all of these tests require a significant amount of preparation, and experience using the Mark robot to determine free thyroxine suggests that the best results would come from using the robot for preparation work overnight, handling up to 50 samples, including celebrants and quality control. An extensive work-study revealed that employing the robot reduced operator time for the same amount of specimens from 73 to 23 minutes, which is a significant reduction.

In [14], Jialun Yang et al. Around the last three decades, academics from all over the world have been paying more attention to the study of humanoid robots. Additionally, hypotheses are developing quickly and technology, humanoid robots now possess far greater capacities. May infer from the evolution of humanoid robots that the day when humans and these machines can coexist in the same space is rapidly approaching and that the jobs that these machines must perform will become more challenging. For humanoid robots to be

successfully implemented, motion planning is crucial, especially when the jobs that the robots must perform are challenging. Numerous approaches have been put out thus far, some of which have been employed in robot manipulator platforms before. Human dancing motions have been recorded using a motion-capturing device. The fundamental arm and leg postures are extracted from the recorded movements via abstraction. The humanoid robot can mimic human dancing moves and keep its balance on its own after further motion data processing. Reaching, swinging, and lifting both light and heavy things with the forearm, among other motions cavemen have been depicted and stored.

In [15], Huan Tan et al. Robots, however, find it extremely challenging to learn new abilities or behaviors completely from scratch without any prior experience. According to their "birth," robots must learn both in first and prosocial behaviors. Therefore, it seems to sense that robots would have some fundamental starting understanding of motion primitives or some fundamental initial abilities to explore the world and acquire new abilities to live or fulfill jobs. People can teach machines more complicated behaviors or skills to carry out far more complex jobs once they have this foundational knowledge and abilities. It is currently believed that imitation learning, also known as learning from demonstration and programming by demonstration, is a potent method for sharing knowledge among robots, especially humanoid robots.

In [16], Hsiung-Cheng Lin et al. A considerable likelihood exists that a task will be completed more quickly by a group of mobile drones working in parallel than by a single robot. There are two necessary components to achieving this goal: Issues must be resolved the initial challenge is to allocate jobs to robots in a collaborative team environment to finish the assignment more rapidly. The second challenge is mapping the environment for mobile robots and route planning in uncharted territory. As was previously noted, an ego map-based feature may be applied to dynamically distribute jobs to several connected devices while attaining real-time collision-free robot pathways through environmental sensor evaluation. The creation of an algorithm for millirobot systems tracking control is therefore essential. A region may be searched significantly more successfully if the correct search strategy is used. Individual capabilities of swarm robots are confined. Local sense and reduced, random searching are the main search strategies used in swarming robots. Non-linear movement and Levy flying, which both mimic the self-organized role of social insects, are the two most often used random-walk approaches. Both strategies have some limitations when used with mobile robots since having your bots search continuously might result in incredibly unproductive searches. This study examines the characteristics of swarm robotics exploration to determine a better RW technique based on the concentration of robotics in the environment.

In, Maide Bucolo et al. To complete difficult and delicate duties associated with teleoperated medical operations, advanced robotics are essential. The bot must be at a level suitable for both the remote monitoring of a doctor doing the cesarean section and a completely automated process to provide effective and trustworthy performance under review. Communication latency, sensor power, and user interfaces all influence precision. Remotely controlled medical device design must take place within a larger context of emerging technology. In reality, such an issue necessitates a thorough worldwide analysis spanning a range of diverse fields and their associated advanced subjects. Consequently, the goal of this analysis is to create a more comprehensive perspective on cutting-edge initiatives and ongoing research. The scientific contributions examined in this publication offer remedies ranging from early models and prototypes to currently existent medicinal therapies physicians

In [17], Ryan A. Beasley The focus is on specific situations where existence of technical as well as sanitary experts is required at the physician site; some of these situations necessarily require the existence of fully competent staff, while others may allow for the placing of robotic surgery without the need specialist skills explain each optimizer requirements for clinical outcomes in detail as necessary. The firm's "Savile Row" technology applies active constraints, combines the three - dimensional model of an implantation into the surgical planning interface, and builds a bespoke knee replacement again for the doctor. A complementary device like the RIO is indeed the Advertising Sculpt.

3. DISCUSSION

Needles, sources of air, and probes are used in non-catheter percutaneous treatments for cancer surgery, drainage, and medication administration. Accurate targeting during the surgery may be compromised by soft tissue deformations that result from changes in the patient's position, tissue forces used during the insertion, or patient breathing. Tissue modeling for needle steering and three-dimensional intraoperative imaging are two methods for directing a needle to its intended target. Sadly, tissue modeling is overly complicated. In animation, a robot arm created to function within a CT or muri scans imaging (MRI) equipment, follows the latter strategy. The arm is operated for MRI compatibility, and MRI-compatible encoders are used for joint sensing.Various conditions are diagnosed and treated using vascular catheterization. Cardiovascular and vascular conditions, such as atrial fibrillation ablation, direct pressure measures, and biopsies and angioplasty for blood artery obstruction. A blood vessel is entered using a catheter, and the section catheter is moved via manipulation outside of the patient. Whereas fluoroscopy offers a picture and tip to the surgery site guidance. Catheters only because the supporting tissue generally needs three degrees of freedom: tip flexion, tip rotation, tip deflection rotation, and depth of insertion. Robot-driven catheters may result in quicker operations and less force. The catheter tip's force on the vasculature increased teleoperation (reducing human error) and catheter placement accuracy radiation exposure to the doctor. The sheaths are controlled remotely by an operated pulley system. Force sensing with IntelliSense enables by softly pulsating, the contact forces are continuously estimated.Figure 3 shows the self-designed medical assistive robot.

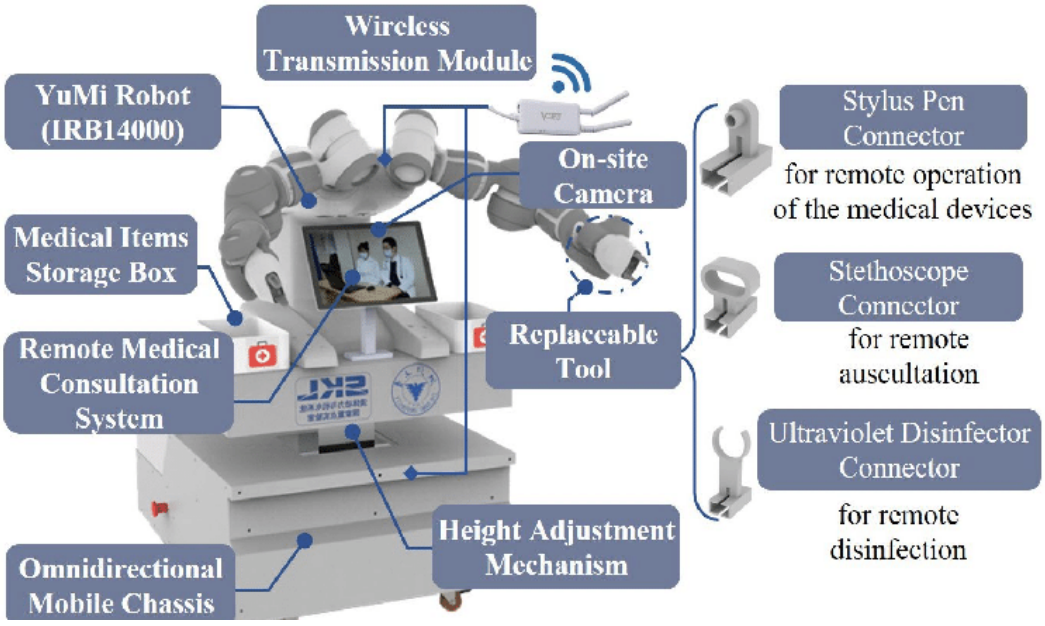

Figure 3:Illustrates the Self-Designed Medical Assistive Robot [Google].

To measure the forces at the front portion of the inner sheath catheter, the steerable catheter is moved a little amount in and out. It Corah 200 from Corinda's is a major rival to a Sensei X while it is not yet sold, and further expresses these pressures graphically through vibratory input to the doctor's hand just on the operating table, the "3D joystick." The magnetism on either end of a radiography table is created by two magnets housed in housings. A joystick is used by the surgeon to direct an operation. Under computer control, the magnets' locations, which in turn affect the magnetic field, can alter depending on the direction of the catheter tip. The catheter's advance and retraction are controlled by a different joystick. Provide the existence of a strong improvement in surgical results.High-dose irradiation is supplied to the cancer while the epithelial lining receives significantly less radiation by passing a laser thru the cancer at different angles. Prior real-time tissue monitoring, radiosurgery procedures for the brain were essentially restricted to the use of orthogonal frames screwed into the skull. Devices are marketed as having real-time cell capabilities.

Despite the fact that the two simultaneous postoperative X-ray pictures are insufficient to accurately describe the malignancy, they are used to produce a postpartum CT scan of excellent quality. The robotic arm may then use a range of angles to deliver the preplanned radiation dosage. The optional synchronizing system may link the motion of the basal membrane with that of surrounding radio opaque, including anticipating target motion continuously, and visually following the tissue surface of the target that moves throughout treatment (for example, due to breathing). Tracheostomy implantation X-rays are linked to CT scans similarly to Cyber Knife, and epidermal fiducials are continually checked visually. A cbct CT is also a part of the production in order. The person is lying on a robotic sofa with six freedoms of movement in their ideal position. The main distinction between Weird Expertise and Fiction is that the former can twist the wavefront and promises to have reduced the in dose, whilst Cyber Knife has more freedom in how it may be orientated.

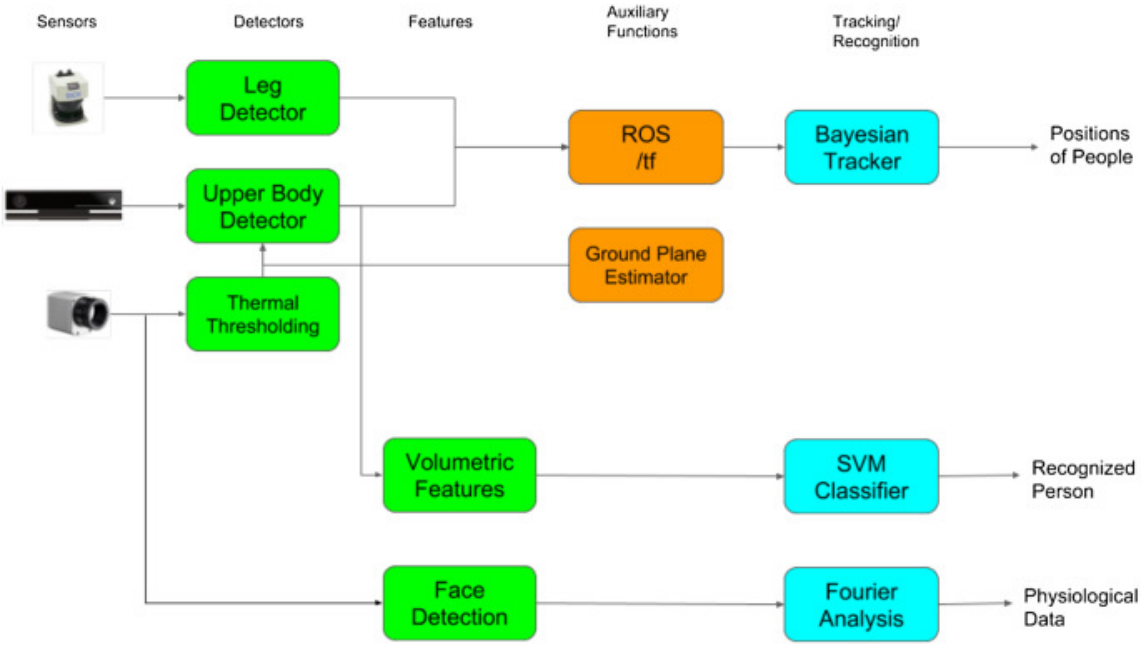

Figure 4:Illustrates the Perceptron and Interaction of an Assistive Robot [Google].

4. CONCLUSION

Given the epidemic waves that characterize the modern era, remote diagnostics is emerging as a critical component of modern medicine. Our inquiry was mostly centered on the literature. Real-world comparisons of the solutions that have been proposed, envisioned, or

put into practice in various fields related to this broad topic have been made, showing that there are many different points of view on the subject and that these points of view can all be categorized using a non-reductionist framework based on the theories of complicated systems. Additionally, concentrated on the essential factors that limit the effectiveness of remote ultrasound scan treatments compared to locally performed operations. Particularly, the absence of inexpensive artificial bodies that replicate the tissue features of actual human body components. Given the epidemic waves that characterize the modern era, remote diagnostics is emerging as a critical component of modern medicine.Our inquiry was mostly centered on the literature. Real-world comparisons of the solutions that have been proposed, envisioned, or put into practice in various fields linked to this broad topic have been made, showing that there are many different points of view on the subject and that these points of view can all be categorized using a non-reductionist structure based on the theories of complicated systems. Additionally, concentrated on the essential factors that limit the effectiveness of remote ultrasound scan treatments compared to locally performed operations. Particularly, the absence of inexpensive artificial bodies that replicate the tissue features of actual human body components. Although the latter is directly related to the pandemic circumstances that are still present, we believe that the need for greater management and computer vision is a convergent objective. In light of completely autonomous diagnostic robots, contemporary and efficient control methods are examined. Technologies designed to interact with patients on their own and operate in the surrounding environment. Therefore, there are two methods to improve on-board machine vision: first, by enhancing the ultrasonic scan image quality placed above white network signals, which may be sluggish or unreliable, particularly during the wartime and in rural areas, and second, by integrating an improved vision system into a fully autonomous machine so it can move through diverse areas whilst also abiding by stringent safety regulations.

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CHAPTER 13

ANALYSIS OF KEY PERFORMANCE OF DIGITAL MARKETING COMPONENTS

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ABSTRACT: To interconnect with probable consumers, marketing experts use digital marketing as a form of electronic communication. Digital marketing, which is effective across all industries, is the way for a business to communicate with its customers when they are online. Consumer attractiveness and the opportunity for them to engage with the item through digital media are the major objectives of digital marketing.In conclusion, marketing thought is the idea that each occupation should evaluate its customers' expectations and take the required actions to meet those expectations. Furthermore, this might enhance positive customer interactions. The customer can quickly and simply search for a product that meets his needs and requirements with the aid of digital marketing. To support the business and its goods and services, a corporation may use any gadgets, including, smartphones, tablets, TVs, media, social media, computers, email, and several other devices.

KEYWORDS: Digital Marketing, Internet, Media, Promotion, Social Media.

1. INTRODUCTION

Business advertising is a dynamic, ever-evolving, and dynamic movement. A variety of crises, comprising war and terrorism, resource and energy constraints, rising costs, economic catastrophes, rising unemployment, dying organizations and sectors, and the repercussions of rapid technological breakthroughs in specific industries, have had a substantial effect on the advertising function [1]. A structured process of compiling accurate and timely data about consumers, items, the marketplace, and the atmosphere at large is now required due to these changes, along with the internet, which has forced today's advertising executives to become more market-based in their strategic decisions [2]. Using a webpage to market and sell products or services is known as online marketing. Internet marketing advertises & sells products by utilizing the probable of digital trade. Any online marketplace is referred to as engaging in electronic commerce. Electronic commerce makes it feasible to buy, sell, and trade goods and services online. Electronic commerce is a type of internet marketing. Online marketing has started to gather a lot of momentum as a result of the increase in internet usage [3]. It is asserted that text-only webpages that provided product information were the first to advertise Internet marketing services at the start of 1990. Due to the expansion of the internet, it is now utilized not only for the transaction of commodities but also for the distribution of information about those goods, the sale of advertising space, stock trading, auctions, software, and matchmaking. The manner that marketing may be done online has been changed by a select few businesses, including Google, Alibaba, YouTube, Amazon, and Yahoo [4].

Internet marketing referred to any type of advertising that uses digital technologies, principally the Internet but also marketing services, mobile devices, and other internet media. As internet technology becomes more interwoven into marketing tactics and everyday life, as well as when more customers select to use internet gadgets rather than visit offline stores,

online advertising actions are becoming further common & successful.Digital marketing is the term used to describe all marketing campaigns that involve technology or the online in some form. Businesses communicate with their potential and present clients via digital platforms like social media, search engines, email, and their sites. This can also be referred to as online marketing, web marketing, and internet marketing. Digital marketing, which makes use of a range of digital techniques and platforms, is a way to interact with clients online, where they spend a lot of time [5], [6].

The phrase digital marketing covers a broad range of strategies, including digital advertising, online catalogs, and email marketing. Internet advertising is the technique of promoting goods and facilities using digital knowledge, mostly online but also display ads, mobile phones, and other online media. Technology advancements have led to an increase in the popularity of online marketing strategies such as campaign marketing, social media optimization, search engine marketing (SEM), SMM, content marketing, content automation, search engine optimization (SEO), data-driven marketing, and influencer marketing, as well as e-books, optical discs, and video games. Today, digital marketing includes channels that don't use the Internet to provide digital material, like callback services, mobile devices (SMS and MMS), and on-hold ringtones [7].

1.1. Need for Digital Marketing:

If a business is thriving, it is expanding. The business's revenue is growing quickly. The business's owner is ecstatic, and its staff members are happy. It's great to be responsible for increasing business. The importance of online marketing for businesses' success in the modern day cannot be overstated. Use online marketing strategies to promote the business on the web. Attempt to make the complicated world of digital marketing simpler. Hub Spot defines digital marketing as any marketing technique utilizing the Internet or a technical device. Any marketing that happens online is considered digital marketing. There has been an increase in interest in online marketing over the past few years [8].

1.2. Concept of Digital Marketing:

Businesses employ a range of online platforms including search engines, e-mail, social media platforms, SMS, websites, and MMS, to engage with their present and potential customers. This includes any marketing initiatives that involve the internet and an electric component. Merely conducting business online. The promotion of a business, radio, brand, or other entity through a range of media, such as the Internet, TV, podcasts, mobile devices, and other comparable platforms, is known as direct marketing (DM). The foundation of many businesses' entire promotional campaigns, and a key component of some promotional programs, is internet promotion [9].

2. LITERATURE REVIEW

Juan José L. G. et al. [1] studied the aim to identify the essential tactics for utilizing digital marketing to draw in and retain customers. In-depth interviews were integrated with the Delphi method in that examined methodology. The study's conclusions emphasize the significant factors while omitting others that are irrelevant to optimizing conversions in B2C organizations, such as session time and rebound percentages.

Ms. A.Lavanya and Mrs. M. Radhikamani focus on the numerous procedures it can take, how it varies from traditional marketing, its benefits, and limitations, as well as its importance in the present world, it was discussed that digital marketing had a quick introduction. Digital India's main objective is to promote digital media. Companies must transition from traditional

to digital marketing tactics since clients can use digital platforms whenever they want, wherever in the globe.

Dr. Aditi Banerjee et al. studied the results of online marketing and its significance of it for both consumers and marketers and give a brief overview of digital marketing in that paper before highlighting its numerous channels, analyzing its varies from traditional marketing, and then talking about its benefits, drawbacks, and current applicability.

Dr. Mrs. Vaibhava Desai [7] mostly concentrated on conceptual understanding of digital marketing, how it helps contemporary businesses and a few examples from the real world. The author examined the shift in marketing from traditional to digital: Examples of online marketing techniques and how they might benefit present-day companies include: The following elements need to be considered for a digital media campaign to succeed.

Rajiv Kaushik [10] discussed Digital marketing which is rapidly growing in India. Many Indian firms gain from the usage of digital marketing. A marketing campaign's success cannot be assured by digital marketing alone. Instead, for any marketing initiative to be effective, it must make full use of the many marketing strategies that are accessible in both traditional and contemporary marketing. Startups that used digital marketing frequently failed. That study illustrates the steps that need to be followed to effectively employ digital marketing to tap into its immense promise for sales growth.

Zenith Raval et al. [11] introduced the globe to fresh concepts with a contemporary flair and displayed a vast array of opportunities and amenities. India ranks third globally in terms of internet consumers, which is also fueling the country's rapidly expanding online shopping trend. Many small and medium-sized businesses are finding the rising popularity of online shopping to be a blessing in disguise, giving them amazing opportunities to expand and prosper their operations as well as partner with significant Indian online portals to promote their services and exhibit their goods. The pursuit of a new universe where all queries go to one location can be summed up as online shopping.

Yazdanifard R. et al. [12] discussed digital marketing, a topic that particularly interests marketing academics. It's a novel way to introduce a product or service to a specific global market. That paper offers a creative approach to digital marketing in online trade, showing why marketers need that advancement for their industry. Furthermore, that frees up marketing managers to focus on other valuable tasks, such as developing marketing plans for the expansion of the organization.Luis Matosas-López [13] Provided a summary of the DMS used by social network services (SNSs) in Europe and America. Even though interactions and engagement with the organization's intended spectators should be the cornerstone of every SNS digital marketing effort, the significance of that aspect can differ by continent. The outcomes show considerable differences in the management approaches adopted on these different continents.

3. DISCUSSION

3.1.Various Components of Digital Marketing:

Digital strategy is a constant in today's marketing initiatives. This is because customers are online now, and marketing goals usually center on how the business can draw in new customers, retain existing ones, and increase sales. Engagement with customers through their preferred channels has made digital marketing one of the most effective means of communication. But it might be difficult to choose where to focus with so many digital

marketing options available. Effectively contacting and interacting with potential clients is crucial for businesses looking to stand out in the market (Figure 1).

3.1.1. Advertising:

Online advertising includes placing bids and buying pertinent ad portions on other websites, such as banner ads on blogs, groups, and other related websites. Textual ads, pop-ups, movies, banners, images, and more formats are all possible. A key element of online marketing is retargeting. To keep track of new site visits during retargeting, code that adds an anonymous browser cookie must be used. Then, when they visit other websites, show them adverts for goods or services. The marketing efforts will be focused on persons who have shown attention to the corporation.

Figure 1: Illustrating the Various Component of the Digital Marketing.

3.1.2. Video Marketing:

Businesses can more effectively engage their audience visually and interactively by using video marketing can highlight brand-new product releases, noteworthy announcements, and events in addition to providing instructional resources and customer reviews. The most popular websites for sharing and promoting videos are YouTube and Vimeo. Another method for digital marketing managers to connect with viewers on video platforms is through pre-roll advertisements, which play for the first 5 to 10 seconds of a video.

3.1.3. Social Media Marketing:

Promote the brand's identity and content on social media platforms to enhance lead generation for the company with this tactic. Use Instagram, Twitter, Facebook, Snap Chat, LinkedIn, Google+, and Pinterest as social media marketing channels [7].

3.1.4. Email marketing:

Businesses use email marketing as a way to communicate with their customers. Email is routinely used to promote events, promotions, and exclusive material in addition to sending customers to a business's website. use email marketing to nurture customers by sending advice or similar message series, newsletters for blog subscribers, emails to site users who

download anything, welcome emails for consumers, and seasonal incentives to loyalty program followers [7].

3.1.5. Paid Search:

Paid search enables businesses to submit bids on particular terms and buy advertising space in the search results, which enhances search engine visibility. Only those who expressly search for the terms provided will see advertisements. PPC and CPM are the two main types of paid search advertising CPM. PPC will only charge when a customer clicks on one of the advertisements. The number of impersonations determines CPM fees. The utmost well-known paid search advertising tool is Google AdWords, though sponsored programs are also available for other search results, such as Bing.

3.1.6. Search Engine Optimization:

Positioning a website effectively in search results based on key terms and phrases is known as search engine optimization. It is categorized as digital marketing. SEO enables online presence in organic search engine results. Search engine terms like Google, Yahoo, and Bing are the main factor. TRS Tech, one of Canada's most successful companies, offers the top digital marketing operations in Toronto. The method of creating web pages that are easy to crawl, find, and categorize. Making business stand out to consumers amid a sea of competing options is the goal. Any strategy for digital marketing must involve SEO.

3.1.7. Mobile marketing:

Mobile marketing, a comparatively recent branch of advertising, is the use of mobile devices for two-way advertising contact between a business and its consumers. For the website, mobile devices, apps, and contents are being modified. Since more people are using mobile devices every day, mobile marketing is the most effective tactic [4].

3.1.8. Affiliate Marketing:

Affiliate marketing is a presentation-based advertising tactic that rewards newspapers behalf of sending customers' way. Conversions, including sales, leads, or promotions, could affect performance. It's possible that would like to take part in the affiliate program provided by other publishers. In essence, the producers will provide space on their page to promote businesses and encourage conversions, and will pay them through the compensation scheme. Use an affiliate network to access a large number of editors and have access to other profits like following and analyzing software. Affiliate marketing may be quite advantageous for startups because it will provide more visitors to their websites through well-known websites. In essence, affiliate marketing creates a condition where together publishers and merchants gain. Websites including eBay, Amazon, Link Share, and Flipkart provide affiliate programs. The vast majority of highly visited websites operate their affiliate networks [4].

3.2.Significance of the Digital Marketing:

- Digital marketing is incomparably more conservative than any offline marketing tactics. It has the simplest method for getting the most people's attention.
- Advertisers in the digital space keep track of information like what is viewed, for how long and how frequently, what material is productive and unproductive, and so on. The platform most closely linked to digital marketing may be the internet, but other platforms include mobile apps, and cutting-edge TV, and radio stations.
- Results in digital marketing may be readily tracked and managed with the help of various monitoring software. Without spending money on costly and time-consuming

client research, businesses can rapidly examine how customers react to their products and periodically evaluate the performance of their marketing initiatives [7].

- Due to its being logical, targetable, and measurable, organizations utilize it and advertisers embrace it.
- Collecting customer feedback is easier in comparison to more traditional marketing methods like radio, TV, or billboards. With the help of an online marketing website where clients can easily provide feedback on any goods, an entrepreneur can quickly remodel and alter themselves in their specific domain.
- It helps a business advance online because of its portability and easy access to a large audience of clients. Web-based marketing strategies are being used by both small and major firms to finance their operations abroad.

3.3.Digital Marketing Benefits:

The ability to target a specific demographic affordably and measurably is the main advantage of digital marketing. Digital marketing will improve brand loyalty and online sales, among other factors. A website might aid in market research and worldwide trade, as shown in Figure 2, at a very low expenditure. With a well-thought-out and targeted online marketing policy, the target audience may be reached for a lot less money than with traditional advertising tactics. Results that can be monitored and evaluated It is easier to assess the performance of any online marketing effort with the use of analytics tools and other measurement tools. Learn in-depth information about how users engage with websites and respond to advertisements. If the customer database is connected to the website, personalization enables to welcome of website visitors with useful offers. As customers make more purchases from the organization, users may be capable of more precisely identifying the target market and market to them. SM participation and intelligent use can help attract clients and establish an image of being approachable. Social currency: By utilizing content marketing techniques, can create effective campaigns using the social value in digital marketing [14].This group's image, and videos, can go virus-related and earn social money, therefore it's important to make sure that all of the staff members have the knowledge and abilities necessary for effective engagement in digital marketing.

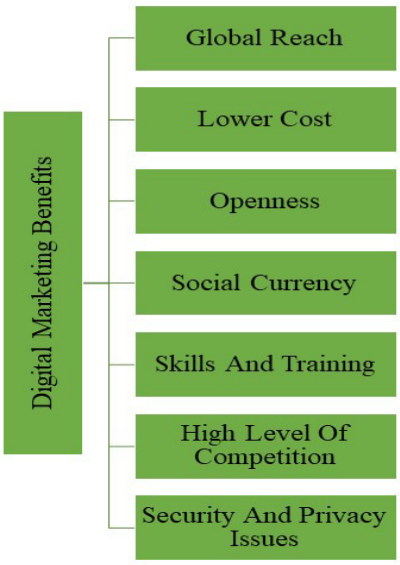

Figure 2: Illustrating the Benefits of Digital Marketing.

Platforms, trends, and tools are subject to rapid change, therefore must adapt. Things like optimizing internet advertising operations and producing marketing content might take a long period to finish [10]. There will still be competition on a worldwide scale even though internet marketing gives businesses access to a global audience. Getting noticed and standing out from the crowd in the sea of customer communications available online may be difficult. The gathering and use of customer data for the sake of digital marketing are fraught with several legal issues, including difficulties with safety & privacy.

3.4.Challenges Facing Digital Marketers:

- While using digital marketing to sell products and services has numerous advantages, some challenges must be solved. Among the difficulties of digital marketing are some of the following:
- A sizable quantity of information is left behind each time a person visits a digital channel. It is very challenging to decipher and find precise data in the expanding information volume that can assist the consumer in making the best decisions.
- Since digital marketing is accessible to all small firms and substantially less costly than traditional marketing, it fosters intense competition.
- Customers use a wide range of digital channels and devices, and those gadgets have a wide range of digital channels, which promotes the growth of digital channels. Finally, marketers experience difficulty choosing platforms and audiences.

3.5. Benefits and Drawbacks of Digital Marketing:

With digital marketing, businesses can see exact results right away. When advertising is printed in a newspaper, it can be difficult to tell how many readers switched to that page to read the content. It is impossible to say for sure whether or not that advertisement led to any transactions. Digital marketing, however, could assist in thoughtful the marketplace for things or facilities, cooperating with probable clients, having a worldwide reach, and directing promotion [15]. However, internet marketing has several serious drawbacks. Digital marketing relies heavily on the internet since users' internet connections may be spotty or certain locations may not have access to it. Because of this, marketing professionals find it difficult to stand out from the competition and inspire consumers to talk about just a company's name or goods. However, having many competing goods and services that employ the very same digital marketing strategies may be a disadvantage [16]. Some clients might have a negative opinion of some firms as a result of the abundance of ads that appears on website and SM that could be viewed as deceitful. The reputation of a brand can be harmed by even one individual or a small group of people. Potential buyers, the bulk of whom lack the authority or power to make purchases, are just informed using digital marketing. So it is questionable when digital marketing boosts sales [17].

4. CONCLUSION

Customers may instantly find product information and compare it to competing products when they want to buy anything online, all while sitting in their own space and on their schedule,without going to the mall or store. It proves that people are more likely to buy things online than they are in actual stores. As consumer purchasing ways change, productions must modify their promotion campaigns & switch to online platforms for marketing. The study's initial objective was to investigate several marketing-related categories. Communicating with customers is the most important aspect of digital marketing, according to the dialogue. The study also revealed that for firms to utilize online marketing effectively, they have a platform that functions efficiently. It has shown how important it is to interconnect all technologies

with the digital platform in the current environment. One illustration of the current digitalization trends is the transition of newspapers from print to online versions.

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CHAPTER 14

SURVEY ON IMPACT OF VIRTUAL REALITY TECHNOLOGY IN MARKETING AND PRODUCT PROMOTION

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ABSTRACT: Businesses are undergoing significant transformations within corporate operations as a result of the implementation of modern technologies for price-reduction along with enhancement in business infrastructure. Hence, to comprehend its function as just a hybrid concept as well as provide an orderly architecture, the investigation of virtual reality technology must take into account a multidisciplinary assessment. Agencies may utilize digital experiences, including such already-recorded clips or auto-guided virtual reality visits, as a promotional platform to advertise for diverse product sales. This study presents a comprehensive review of the impact of virtual reality technology in marketing as well as product promotions for improving target sales. Virtual reality technology is a new information technology (IT) breakthrough that has a significant impact on customer habits including brand impression. The study looked at how virtual reality may affect people's perceive messages as well as how they feel about certain proposals. To give users realistic surroundings that transport people through the physical realm into the imaginary realm. To accomplish this objective, several researchers have been engaged in developing novel systems, tools, and solutions in recent years, however, there is a vital possibility of further research on virtual reality adoption in marketing and product promotion.

KEYWORDS: Advertisement, Business, Marketing, Product Promotion, Virtual Reality.

1. INTRODUCTION

A notion of electronic advertising has lately been described as "a flexible, technology-rooted procedure through which companies coordinate with clients as well as associates to collectively start creating, interact, produce, and uphold valuation for those relevant parties." Electronic data as well as communication innovations had already substantially enhanced advertising investigations in current times, resulting in advances across numerous other disciplines. This significant impact that new platforms, like the Web as well as online networking, have made on sales promotion has been examined throughout several investigations. E-commerce, commonly referred to as e-retail, represents among the greatest interesting yet effective uses of online advertising. E-commerce seems to be the practice of buying as well as trading products as well as activities utilizing computerized platforms, most notably Online. As seen by the global expansion of something like the retailing business, there has been a considerable increase in-store involvement towards e-retail operations throughout the previous decade. In contrast to the faster development witnessed inside emerging industries, it grows relatively quickly in established marketplaces [1], [2].

People gain knowledge regarding items via both primary as well as secondary encounters while using conventional advertising strategies. Immediate engagements are indeed the user's in-person encounters with goods as well as other items. This immediate engagement between items as well as dealers entails a rich multimodal interplay. Businesses, equipment (including such workstations as well as cell phones), and mainstream press telecommunication-mediated routes, which include a promotion, as well as electronic content are just a few examples of secondary promotional interactions. Creating the best possible purchasing environment for

the customer via machine-mediated interaction, primarily the Web, is among the greatest crucial objectives of every online business [3], [4].Figure 1 illustrates the classification of virtual experiences in marketing.

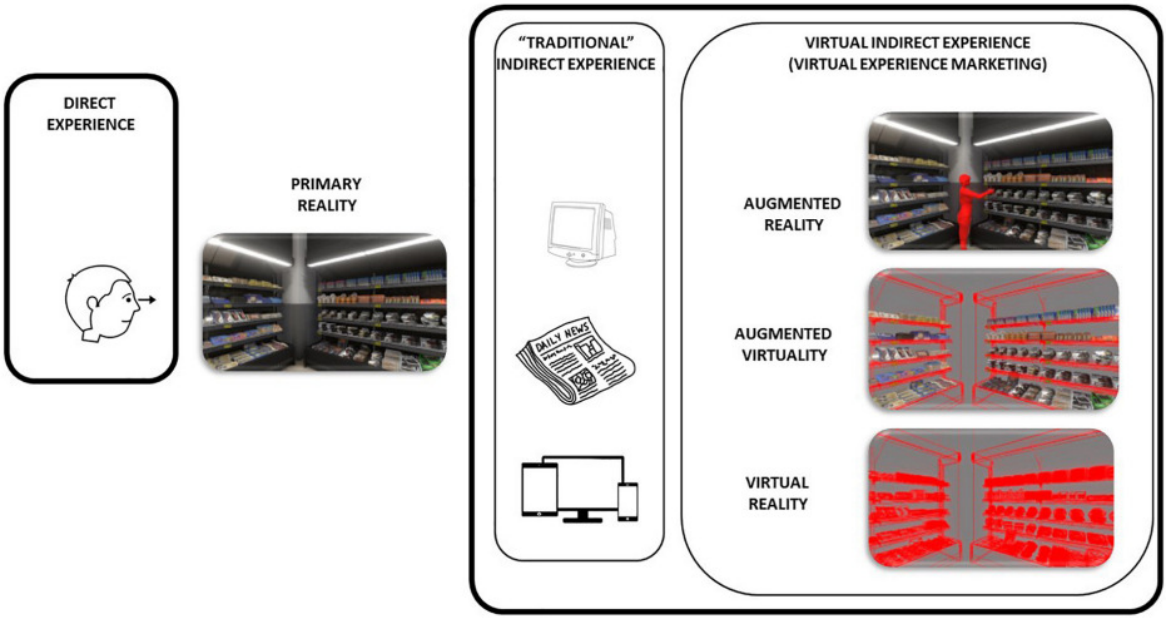

Figure 1: Illustrates the classification of virtual experiences in marketing [5]**.**

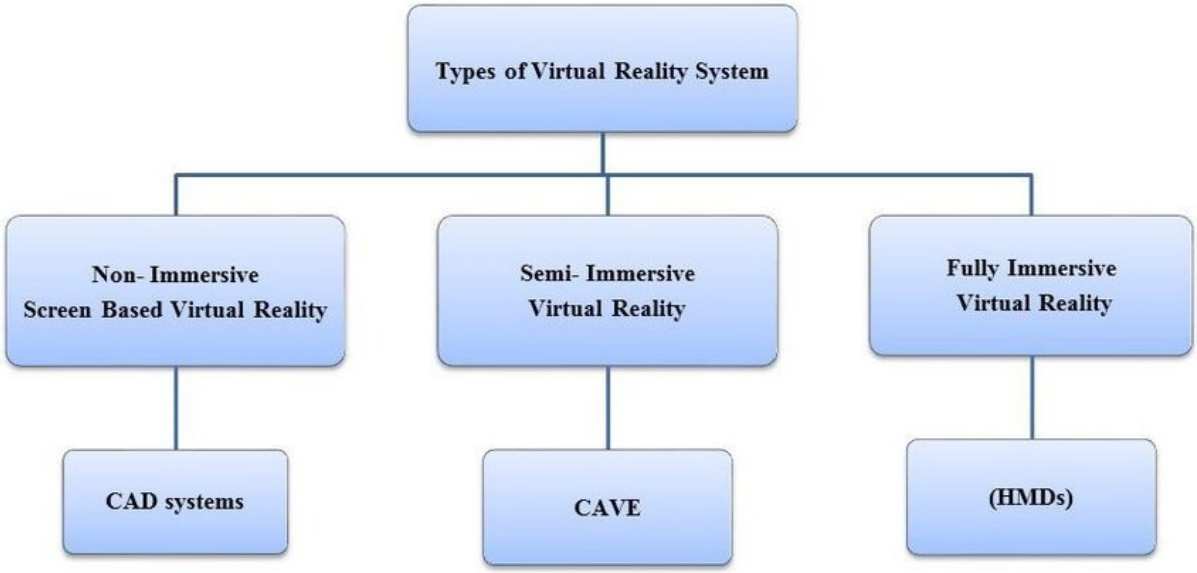

Figure 2: Illustrates the classification of virtual reality-based systems [6]**.**

To improve visibility as well as visitation to something like a residence, real estate professionals for homes employ a range of marketing strategies. Expenses, as well as labor associated with various advertising tactics, range from uploading their images including other remarks to hiring a photographer to make directed touring. The expenses of increasingly costly advertising methods cannot be passed straight onto purchasers inside a competing marketplace by representatives in the shape of increased compensation fees. To make up for the greater advertising expenditures, representatives should instead anticipate increased sales pricing that will result in larger monetary rewards. People contend that

representatives utilize extra expensive advertising tactics, like guided reality, for characteristics that seem to be harder to demonstrate because of operator or contractor availability. This is because representatives favour enticing purchasers with negligible advertising attempts as well as selling assets with as slight advertising costs as conceivable to maximize one's gross compensations [7].Figure 2 illustrates the classification of virtual reality-based systems.

An inhabited house restricts the regularity as well as convenience with whom a house may be viewed among potential purchasers, therefore, necessitates agencies to invest extra effort in scheduling showing sessions amongst the various participants. This stands in contrast to an empty estate which is accessible anywhere at moment. We would hypothesize that digital journeys affect the selling cost of challenging-to-show residences both straight as well as obliquely. Firstly, employing online touring has a significant impact on selling pricing since it enables additional prospective purchasers to see a home distantly, which might result in much more proposals being made as well as an increased sales value. Secondly, such usage of online touring implicitly influences selling values by reducing overall cost-time on marketplace relationships as a result of both the capacity to draw greater visitors to something like a house throughout such a marketing agreement, whether locally or from outside the marketplace [8], [9].Figure 3 illustrates the commercial virtual reality device.

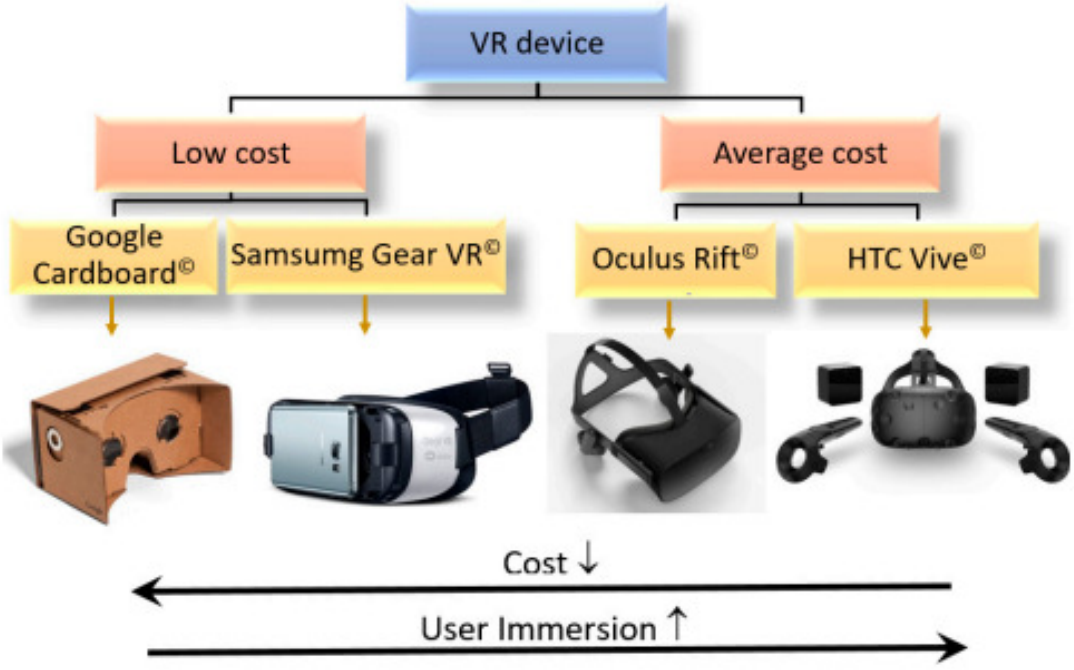

Figure 3: Illustrates the commercial virtual reality device [10]**.**

The selling rates of unoccupied properties, which are simple to display to potential investors, are not much affected by online demonstrations. Virtual tour value impacts for inhabited properties vary depending on pricing range as well as tenant category. Digital touring enables real estate professionals to boost selling rates for inhabited low-priced properties. The cost relationship for renter-occupied properties is moderated throughout this category, compared to shareholder-occupied dwellings. A renter-occupied house with such a digital tour may sell for less money the lengthier it stays on the marketplace. It shows how the detrimental price impacts of renter vacancy cannot be offset by mere online touring. Utilizing digital versions does have an adverse cost link with the selling rates of inhabited houses for properties inside the elevated-price sector [12].

Guided tours are instruments that brokers may use to market houses, boost site visitors, as well as draw in additional prospective purchasers. Guided tours are generally expensive as well as need greater work versus conventional advertising tactics like images including feedback. Researchers suggest that sellers who are concerned with maximizing overall net profits are greater inclined to select digital versions for residences that seem to be challenging to exhibit because they are occupied by the proprietor or even a renter since these enable agents to raise selling pricing [11].Figure 4 illustrates the navigation processes as well as sub-processes.

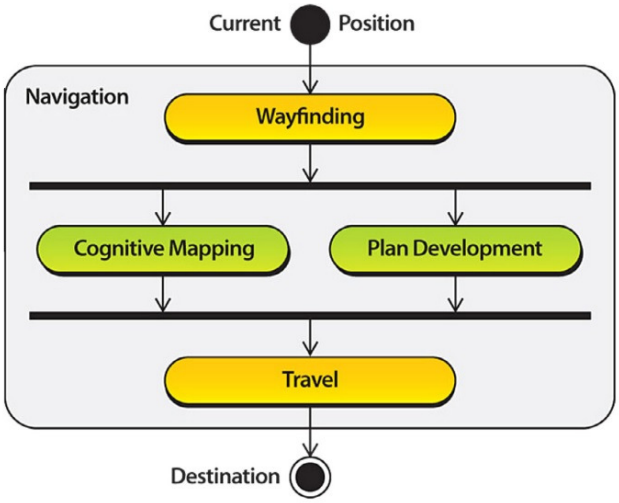

Figure 4: Illustrates the navigation processes as well as sub-processes [12].

2. DISCUSSION

A genuine world may be mimicked using virtual reality innovation, a computerized-rooted technology that gives the consumer the impression of actually being there (Figure 5). A machine or even another media-created world where the viewer's senses are involved is how virtual realism is frequently defined. According to the second research, virtual reality incorporates digital representations of surroundings which users encounter while wearing connected equipment including head-mounted vision glasses, allowing them to engage within true three-dimensional (3D) settings.

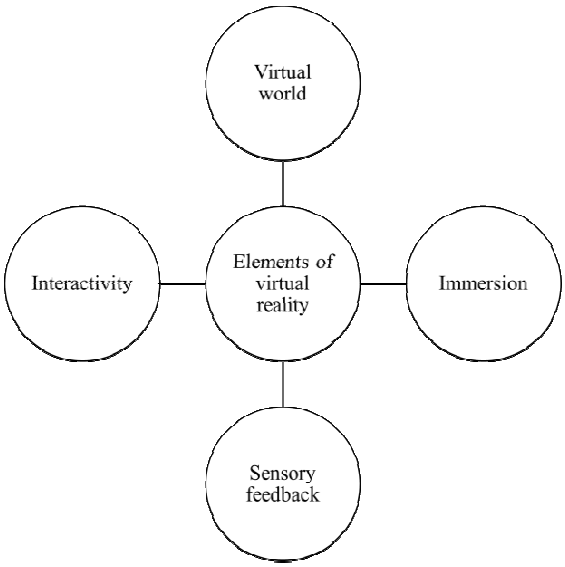

Figure 5: Illustrates the elements of virtual reality.

Approximately to 172 million people might have been actively using virtual reality around 2022, with 29 million of those consumers prepared to cash for the available stuff. This same capacity to flee from physiological actuality as well as fully immerse oneself in a digital thing, as well as the elevated level of relevance of virtual reality technologies in these kinds of sectors as multimedia amusement, live shows, schooling, sales, property investment, the army, medicine, as well as technology, have made this all likelihood. Even though customers are not required to purchase costly technology to enjoy basic reality material, users only want to add attachments that turn existing cell phones become virtual gadgets, it is anticipated that this movement would expand more quickly than it did with the mobile web as well as cellular digital phones [1]. Figure 5 illustrates the elements of virtual reality.

The strategy, as well as the execution of advertising messages, are both touched by the growing phenomena of automation in telecommunications. Effective use of advertising messaging necessitates not just a thorough understanding of sociological events including economic dynamics, but additionally a working mastery of the tools as well as the technology of data exchange. One primary prerequisite for advertising messaging's success, according to mainstream advertising theorists as well as operators, is indeed the unification of all available channels. These messaging efforts must be synchronized across timing as well as location, and overall substance must be constant. Businesses that use current advertising messaging techniques, as well as technologies, can communicate with customers swiftly [13].

Among the most exciting technological advancements in the industry includes virtual reality innovation worldwide. It has attracted the interest of marketers as just a novel method of promoting goods as well as branding since it is now increasingly widely available to customers at reasonable pricing. Virtual reality has applications in the travel as well as leisure sector (enabling travel to different locations), experiential advertising (enabling consumers to live cultures linked with certain businesses), as well as different product testing. There are not enough investigations that have looked at the efficiency of such technology throughout this particular setting, considering the increasing awareness regarding the implementation of virtual reality within actual property promotion. Yet, prior research found how raising an estate's exposure via a variety of mediums, such as opening residences as well as virtual touring, led to better sale costs.Figure 6 illustrates the 3D virtual reality innovation and the development of the 3D advertisement.

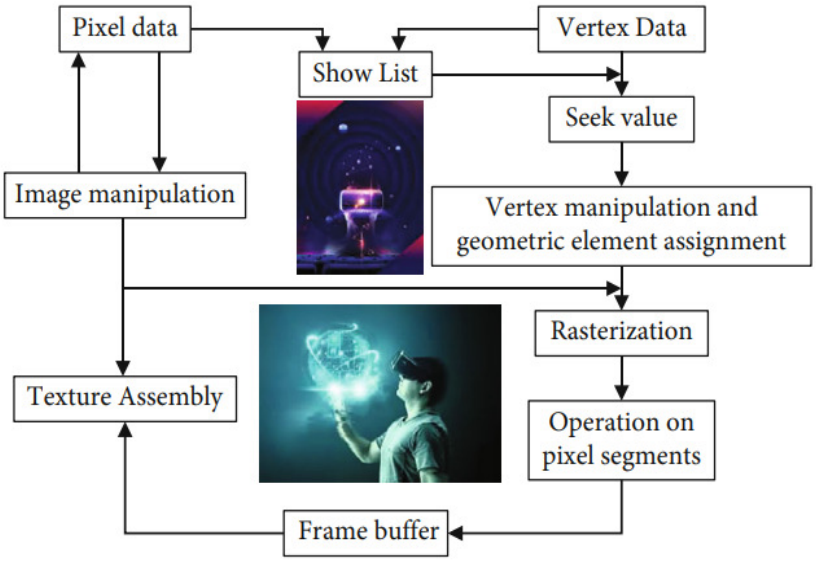

Figure 6: Illustrates the 3D virtual reality innovation and the development of 3D advertisement.

Virtual reality is an innovative breakthrough that has a significant impact on customer activity and also how people perceive the things they were introduced. Due to an engaging marketing encounter, virtual reality innovation has indeed been researched before as well as proven to positively affect company impressions and buying inclinations. Through the use of technologies, digital depictions may provide customers the chance to more thoroughly explore goods and products like apparel. To interact with consumers as well as increase user involvement using their goods as well as services, businesses are progressively turning to digitalization. Although the majority of businesses employ Web 2.0 portals as part of the overall advertising combination, there is less agreement on best practices for using simulated worlds, particularly Virtual Reality technology. In actuality, businesses face a unique series of issues as a result of the introduction as well as the growing use of Virtual apps. Earlier, these requirements for infrastructure including computing placed significant restrictions on participants. Such restrictions are gradually fading away thanks to significant historical technology developments as well as the introduction of various commercialized Virtual helmet-attached gadgets, allowing companies to fully use as well as appreciate the artistic possibilities embodied in such cutting-edge innovations.

In practically every part of our everyday life, electronics are utilized. This definition of incompetence is gradually shifting beyond a lack of reading and writing abilities to a lack of technology literate. Regarding financial options, amusement, reading, and socializing, one might claim that individuals with a strong command of computing have an edge over individuals with less computing abilities. Virtual reality is frequently employed in regular daily routines as well as has a significant part in the present transformation in software as well as computing. Virtually realism may presently be used and benefited inside a wide range of fields, including entertainment, construction, measurement, defense, industry, medical sector, education, and numerous other areas. Throughout the previous 40 years, virtual reality innovation has developed. Although computing technologies were developed, the idea of virtual realism as well as, in especially, the imaginary realm, were employed throughout many applications. Figure 7 illustrates the 3D virtual reality media evolution procedure.

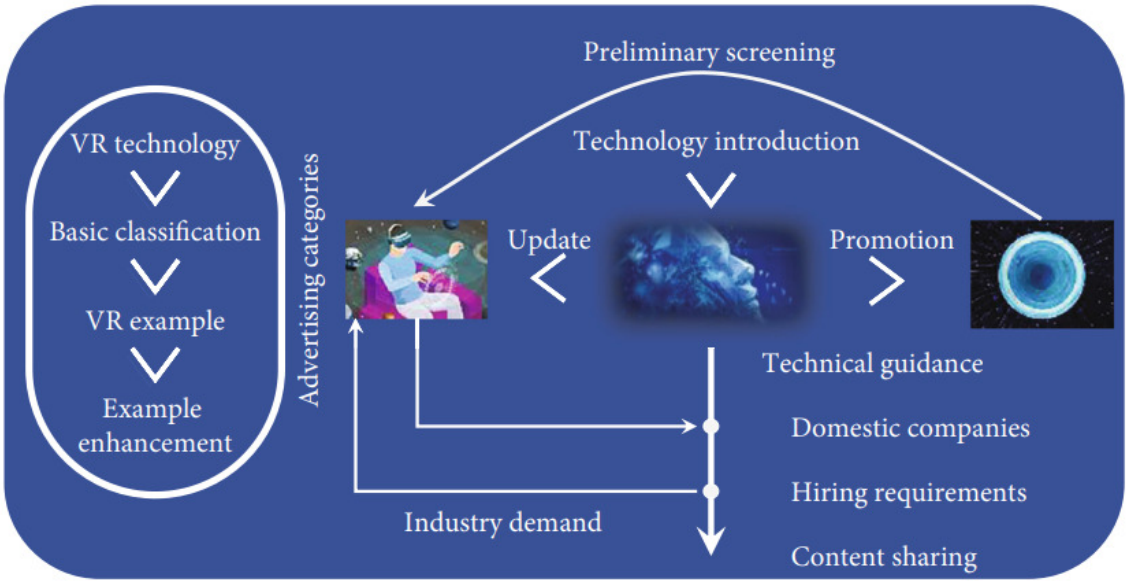

Figure 7: Illustrates the 3D virtual reality media evolution procedure.

Ever since enthusiastic academics including professionals have focused mostly on developing as well as using virtual reality innovation in many areas. The development of something like the virtual world environment we employ nowadays has been influenced by mathematics,

biochemistry, physiology, computer programming, computing animation and microelectronics, as well as other fields of study throughout time. While creating, examining, but also researching virtual realities, professionals paid close attention to how well humans see. These three sensations of vision, listening, as well as a contact are increasingly receiving more attention. These sensations of flavour, as well as aroma, have also been the subject of several scientific studies.

Computational researchers divide the concept of simulated realism divided two sections: semantics of digital as well as reality semantics. There have been used immersive virtual reality platforms while defining this same word. People subsequently integrate the multiple meanings into a single to arrive at its unique intellectual interpretation of the virtual world. According to mainstream definitions, the term "virtual" refers to everything that is not present in physical form. In contrast, the term "reality" designates an actual, as opposed to an imaginary, entity that possesses the quality of becoming genuine. Some academics as well as academics provided their unique definitions of virtual reality based on the possessed fields as well as scholastic credentials.

Virtual reality innovation has developed distinguishable promotional reasoning, as well as its expansion but instead, expertise throughout the sector of marketing assimilation better integrates exploration, as well as special assistance into the sector of branding, proving its distinctive buyer characteristics, that are published as a buyer characteristic of interaction. Yet, as information continues to improve as well as mature, modern contact mediums may emerge. When every other medium replaces an older one, it puts humans to a severe test. User desire and behaviour are altered by Virtual content. Many customers inside the period of conventional paid media would assume as there are no issues with the information displayed just on goods. Whenever customers have to purchase marketing products, people would learn more through the commercials since marketing products as well as trademarks are frequently identical to advertisement firms. However, with said arrival of something like the age of intelligent advertisements, innumerable resource advertisements spread on a wide range of news have decided to enter the period of pervasive marketing.

In particular, with said discounts of visual display commodities, the pricing of adverts is decreasing every day, as well as buyers have begun transforming their previous traditional advertising reading habits, shifting first from the initial stage of acquiescence of adverts to taking the action to comprehend adverts and therefore effectively capable of resisting it. using smart content, A sensation of involvement inside the actual environment is created through Virtual reality technology. Marketers are more likely to give greater time, resources, and focus to adverts if they paid great consideration to and possibly foresee the strong growth of marketing as well as media. Since Virtual is indeed a completely multisensory intimate encounter that combines the benefits of combining interaction as well as 3D marketing, enabling users to join a complete immersion virtual reality environment, customers may perceive adverts greater profoundly as well as accurately, drawing inside a wide audience. Younger individuals are more engaged inside as well as dependent on the usage of intelligent information than other forms of communication owing to the fast advancement of digital items' capabilities.

3. CONCLUSION

Since virtual reality technology was initially developed around the year of 1960s, this innovation has been widely used in a broad range of industries. Virtual reality innovation has recently been employed extensively across many disciplines, particularly in computer programming, construction, healthcare as well as marketing sector for product promotion and

sales improvement for meeting the target in a faster manner. An amazing potential venue for public advertising is predicted to be made possible by the latest influx of virtual reality innovation developments, which also aims to universal the technique. There is presently a lack of knowledge on how Virtual reality will affect new marketing strategies. This paper provides a comprehensive review of the significant impact of virtual reality technology in marketing as well as effective product promotion. It focuses on the essential roles of appearance, customer Virtual interactions, as well as recent activities in causing shifts in buyer involvement. The study investigates the types of interactions provided as well as uses many recent instances of the usage of the virtual world within promotional activities to demonstrate the potential benefit of Virtual reality innovation within advertising.

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CHAPTER 15

INVESTIGATING THE IMPACT OF AUGMENTED REALITY IN THE FOOD INDUSTRY: A COMPREHENSIVE REVIEW

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ABSTRACT: The majority of sectors start embracing augmented reality (AR) innovation as just a weapon for business promotional needs. This is a novel developing innovation in the marketplace. It has been used by everything from restaurants to multifarious retail shops globally because of its significance. Many use that AR technology offers multiple advantages and makes human lives simpler every day in terms of less work. With so numerous businesses inside the food commercial enterprise embracing AR technology for their logistics, advertising, as well as a variety of other aspects nearly every day, there's no question that AR would eventually be employed throughout the foodstuff sector in great strength. This paper investigates the key impact of AR in the food industry. Further, inside the study, the use of AR across the fields of the foodstuff industry as well as foodstuff marketing through goods as well as sales are discussed. Among the most vitally significant economic areas is the foodstuff corporation. For providing foodstuff significant protection for public eating, it must be handled, prepared, as well as transported with great care.

KEYWORDS: Augmented Reality, Business, Food Industry, Marker Less AR, Marketing.

1. INTRODUCTION

One sector which had significant development regardless of expected moments is indeed the foodstuff corporation. It's merely because there is always a need and there is always a production. The overall worldwide marketplace for food, as well as drink, is anticipated to increase at a compound annual growth rate of 8% and approach $8165.62 billion throughout 2026, as per the reports. Several businesses inside the foodstuff sector now considering incorporating AR into all business activities including solutions due to the growing need, competitive environment, as well as need to make up for the losses the outbreak caused. Here are multifarious advantages AR gives to the foodstuff industry including marketing and product promotion as well as an effective process of making required foodstuff.

The innovation known as AR is increasingly pervasive and has an impact on many aspects of human daily life. Inside the food-related research, AR is indeed prominent as well as in use in areas like food standards, component assessment, and retraining procedures inside the culinary processing industry, including advertising as well as selling of eating goods, as either stand-alone items or as menus via cafés. With findings across publishing enterprises, computer programmers, as well as foodstuff-related businesses, a similar tendency has already been growing throughout previous decades. The opportunities of just utilizing AR inside the restaurant industry, particularly during fresh produce manufacturing as well as security, have also been examined [1]. At businesses as well as on corporate brochures, controlling foodstuff inventory, especially providing nutritious details for consumers regarding a meal. Furthermore, another study investigates how the viral COVID-19 epidemic has caused an increase in AR usage inside the foodstuff industry. These possibilities of AR within culinary advertising, education, including client service are indeed explored. Inside the restaurant sector, issues about retailing administration are extended to include nutritious

problems about culinary safety when it comes to product advertising, and ingestion in cafés, especially digital ordering. Through data regarding the place of stock, immediate acknowledgment of various ingredients, equipment, as well as readiness zones along with situation-specific data, as well as identification of threatening nutrition scenarios in which food security has indeed been damaged, AR innovations have the potential to revolutionize the restaurant industry [2], [3].Figure 1 illustrates the key use case of AR in the food industry.

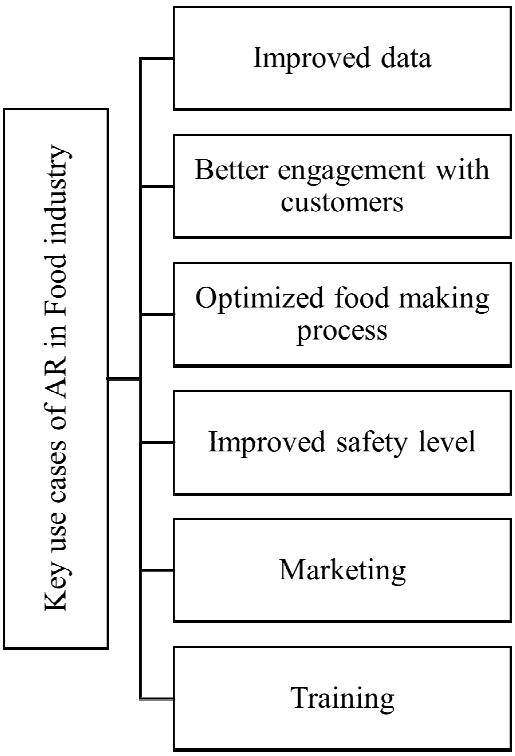

Figure 1: Illustrates the key use case of AR in the food industry.

Whenever people glance just at the menu card at a cafe, people are all perplexed regarding what to order as well as exactly the meal can seem as well as feel. Humans won't be able to decide based on one picture. Several cafes have used AR to provide guests with an interactive atmosphere, raise their interest, as well as aid in improved culinary decision-making. Using AR innovation, customers may swipe a barcode just on menus to see 3-dimensional pictures of actual meals directly there in before of their faces. People would be better able to comprehend the items' textures as well as constituent parts thanks to AR [4].

No matter the business, hiring fresh personnel is indeed an expensive yet time-taking procedure. Several repercussions might result from workers failing to maintain existing talents, not gaining the requisite abilities, or not knowing the proper approach to accomplish something. These risks are just as great inside the restaurant as well as in the wine industry as they are in any other labor-intensive industry. Production line mistakes may lead to damaged goods, unhappy customers, and even more. Workers may learn innovative immersion instructional techniques using AR to hone existing abilities. Within a year of learning, firms using AR-rooted instruction had a worker turnover percentage of over 80%.

A quantity of foodstuff has to be properly cooked since improper preparation might be quite harmful. Stomach issues and eating illness are just a couple. This use of AR by restaurants throughout the stages of meal creation ensures they don't miss a step while doing so without detracting significantly from current jobs. Individuals all across the world are had been using it to place digital orders for anything. This improves consumer involvement as well as

business recognition while also serving as an effective advertising strategy [5]. Figure 2 illustrates the role of AR in the food industry.

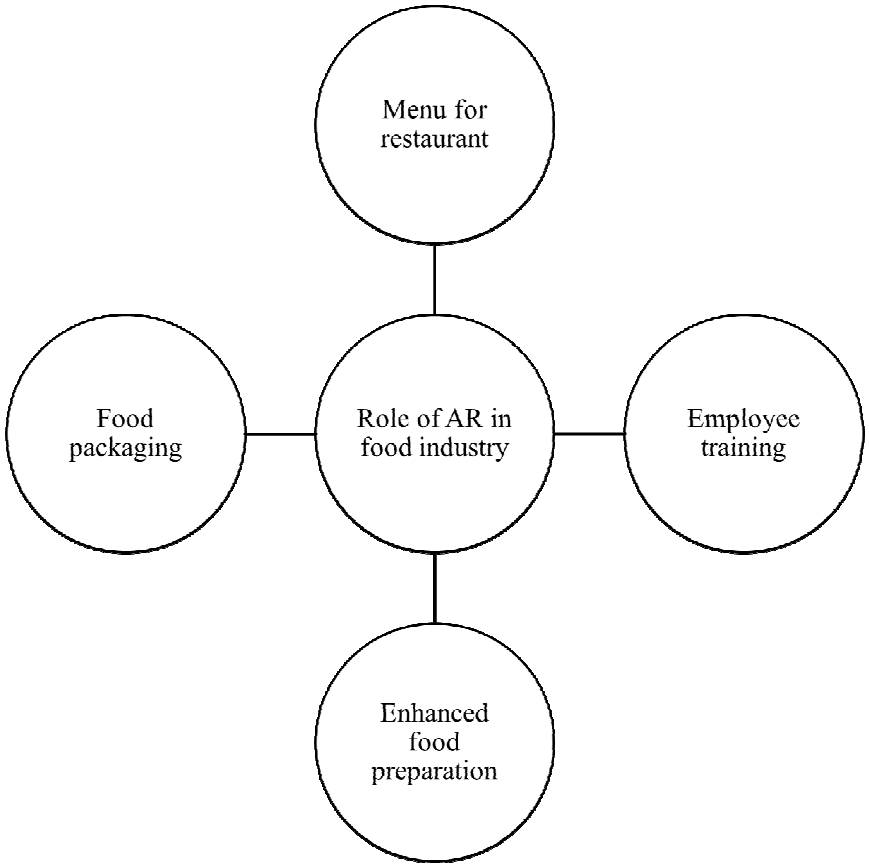

Figure 2: Illustrates the role of AR in the food industry.

The hotel, as well as restaurant-related sectors, have engaged in extensive research as well as discussion on the subject of environmentalism. After a research release in 2018, several businesses from a variety of sectors have undertaken an effort to integrate sustainability practices as well as encourage customers to use company goods as well as offerings in a better ecological way. It has stayed difficult to encourage folks to render more self-sustaining decisions for one ‘s well-being, along with multiple folk's well-being across the planet, even though organizations, as well as individuals, are becoming greater conscious of sustainability concerns as well as the possibly hazardous impacts of numerous of contemporary usage behaviours on the surroundings as well as communities [6]. It has proven especially challenging for the catering services as well as hotel sectors, which are frequently connected to leisure with wealthy spending habits. World Health Organization (WHO) concluded the way people now eat in affluent nations is indeed a major cause of the overweight epidemic as well as the release of greenhouse gases that cause global warming. Notwithstanding this logical grasp of fundamental difficulties, it has been suggested that several adaptive human inclinations pose challenges to making decisions that act responsibly. Among these characteristics is the desire to ignore insignificant matters. Figure 3 illustrates the major challenges of AR in the food industry.

Foodstuff wastage is a major problem, as well as the quantity of foodstuff that is thrown away is influenced by society's behaviour patterns. To decrease waste, it could be helpful to tell customers about excessive wasting tendencies. Customers often struggle to comprehend the quantity of trash created, thus electronic tools like AR might offer a helpful measure to

enhance attention with the ability to favourably motivate customers through offering graphical assistance to comprehend the quantity of garbage generated. Since it's growing progressively widely used and more available primarily owing to the characteristics of cell phones, AR is indeed an ideal technique for such an application. Due to this, practically everybody customer in the modern world owns an AR-enabled gadget, which makes the innovation a perfect option for audio-visual interaction. For example, every cell phone does have a display, scanner, as well as other technology that makes them appropriate for using current augmented reality (AR) apps. Moreover, AR has already been often used in communication and educational settings. For instance, research claims believe AR is indeed an effective way to provide instructional content because it may create training experiences [7], [8].

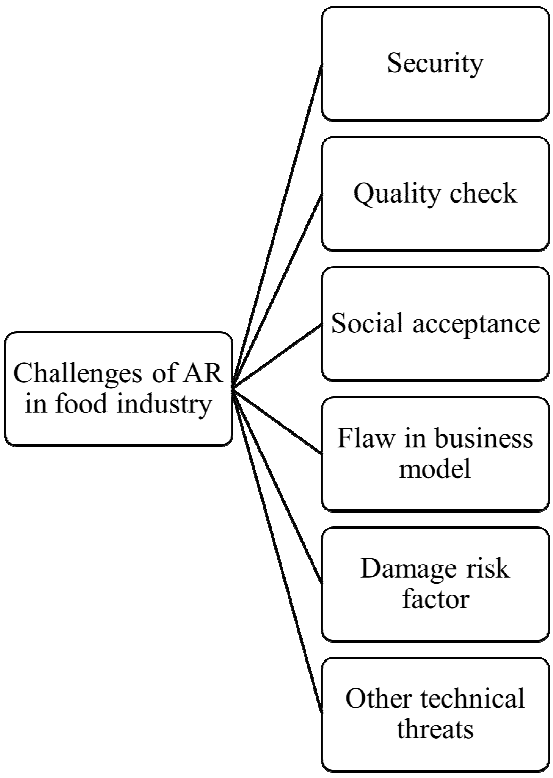

Figure 3: Illustrates the major challenges of AR in the food industry.

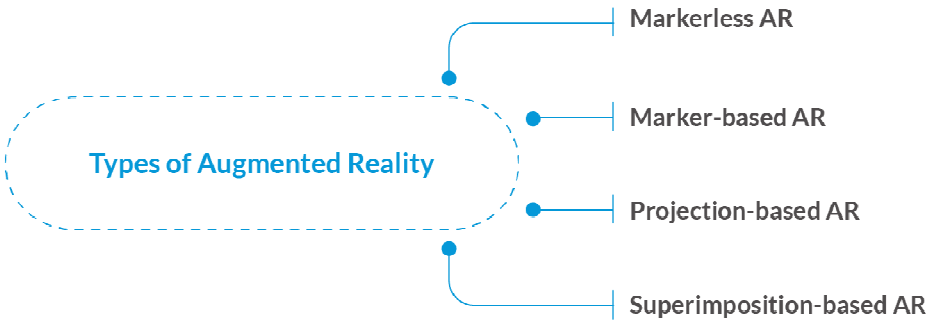

Figure 4: Illustrates the classification of AR.

The restaurant sector is actively debating how AR may help maintain culinary production networks as well as provide businesses a comparative edge as emerging technology opens up fresh prospects. Several industries, including medical, combat activities, entertainment,

business, and servicing but also repairing, have made substantial use of augmented reality. This food-tech sector is predicted to see phenomenal growth, as well as the spread of augmented reality inside the food supply system is contributing to this development. Worldwide business for smartphone AR is anticipated to develop at an amazing compounded yearly expansion pace of 62% to achieve USD 80 billion by 2025. Both real as well as virtual worlds are combined with augmented reality technologies. Instead of trying to replace existing, the merging of actual with imaginary items adds rich yet important data to actuality. Digitized acquiring, gathering, as well as analysing diverse dataset flows, identifying data that is valuable, as well as promptly displaying metadata in a straightforward yet understandable manner are all steps that might emerge in AR [5], [8]. Figure 4 illustrates the classification of AR.

2. DISCUSSION

Targeted pictures (markers) are employed within marker-rooted AR applications to place items in an area. Those markers specify in which the 3D electronic material would be shown inside the participant's range of vision. Markers served as the foundation for earlier AR technology. To transpose the 3-dimensional component on a particular tangible picture sequence marker inside a real-world context, several apps are connected to that though. To generate its architecture, the sensors should continually monitor the data as well as set a marking for picture feature identification. This virtual item won't appear if the webcam is indeed not correctly fixed. As just a result, a device for marking images includes several components, including a webcam, picture acquisition, picture synthesis, as well as marker monitoring, amongst things. Broadly speaking, it's a straightforward yet low-cost method to include in filtering using a unique program to detect certain sequences using a webcam. Instagram, as well as Facebook, employ this kind of AR via its filtration as well as activities as an instance. As ordinary communal events, this kind of AR has thus been included in folks' everyday lives [9], [10].

By comparing the characteristics existing inside the information at all times, markerless AR innovation, in comparison, enables the positioning of simulated 3-dimensional items in the actual picture surroundings. Although the AR application does the rest, such kind of assistance depends on the technology of every cell phone, including the webcam, Navigation system, and barometer, amongst things. This absence of an item monitoring subsystem in just this architecture is a result of current advancements in webcams, detectors, as well as AI programs. As a result, it operates using the electronic information gathered by such instruments, which are enabled to capture a tangible location. Sequential localization as well as projection is indeed the primary tool used with markerless analytics to examine the surroundings and produce suitable layouts for the placement of simulated entities. Even though the simulated items are not inside the person's range of vision, they do not shift whenever the person travels, as well as the client does not need to capture fresh photos, this markerless picture monitoring analyses the surroundings as well as develops mappings for how to position the simulated elements throughout 3D [11].

Location-rooted markerless AR innovation strives to merge 3D digital items into the real-world environment in which the client is situated. It's indeed obvious that this innovation places the simulated item inside the appropriate area or focus of attraction using the area as well as the cameras of a computing phone. This mobile device application Pokémon GO serves as the greatest illustrative instance of such AR. That employs markerless, place-rooted AR to instantly transform the person's surroundings to life regardless of wherever they're looking.

By collecting the information from the webcam, Geolocation, barometer, and altimeter, this augmented reality connects the simulated picture to something like a particular place. Moreover, since it operates on markerless augmented reality, it doesn't need picture tracking because it can anticipate the person's movement and correlate the information as it happens with said person's position. Such technology is employed to transmit digitized information inside a static environment; project-rooted augmented reality, for example, concentrates on presenting simulated 3D items inside the participant's actual environment. Due to the placement of a monitoring camera as well as a stationary reflector inside a particular location, AR enables the consumer to navigate easily inside the surroundings of that space. Through reflecting synthetic lighting onto actual smooth objects, such technique primarily serves to generate delusions regarding the height, location, as well as direction of an item. Since commands may be presented inside a specific region, projection-rooted AR, for instance, is excellent for streamlining complicated activities in commerce or trade and removing machines. Such a system may also offer input to improve electronic authentication procedures for production operations [12].

Academic study routinely reports on the advantages of AR for those who are involved in the foodstuff sector. For example, employing AR technology might offer culinary firms data about the position of supplies, immediate classification of various foodstuffs, improved contextual understanding and vision over production sites, as well as the detection of possible culinary dangers. Agricultural item advertising must be based on the idea of better economically meeting customer demands because of the growing competitiveness as well as customer demands. Advertising is indeed a creative as well as flexible activity that produces significant consumer worth as well as distributes it to them. Advertising is particularly focused on profiting from customers' desire to re-connecting their nutrition as well as its manufacturing origins, maybe as a result of the intricacy as well as the reactivity of agricultural distribution networks. Current technology advancements, particularly in the area of cellular innovations, provide culinary companies with several benefits that may improve their advertising capacities. With the widespread use of cordless cell technology including networking within advertising, augmented reality (AR) solutions may provide dynamic as well as tailored interaction amongst parties involved throughout the foodstuff distribution chain. Contrary to traditional advertisements, the usage of AR within marketing gives foodstuff manufacturers additional chances to effectively educate customers about their products. AR enhances the physical depiction of culinary goods, provides an engaging user encounter, as well as promotes the food sector. The existing "farm to folk" foodstuff production network procedures have developed throughout decades into something like a vast, intricate structure. Agriculture, storing of feed, manufacturing, transportation, commerce, restaurant work, nutrition tracking, as well as consumption are all part of this complex ecosystem. Currently, companies are capable of offering an extensive range of dietary items which are generally safer, tastier, better nutrient-dense, inexpensive, plentiful, as well as easier to get than anything previously. Without contemporary meal innovation, which integrates understanding from several different subfields to resolve complex difficulties, including such surveillance as well as regulating nutritional safeness, reliability, and production procedures in a self-sustaining manner, it wouldn't be feasible [3]. Figure 5 illustrates the basic characteristic of AR.

The foodstuff industry has a huge opportunity for implementing innovative technology owing to its enormous volume as well as intricacy. Both AR, as well as foodstuff industries, are already interacting, as well as the food-technology sector is anticipated to expand rapidly in the coming decades. With augmented reality, digitally created artificial data is layered just in the real environment. While first utilized in the sports as well as leisure sectors, augmented

reality (AR) innovation is currently seeing rapid expansion inside a variety of different sectors, including medical, combat activities, industrial, repair, educational, as well as advertising. The foodstuff business is currently working to leverage just this strategy for economic benefit because AR brings up the option of enhancing the actual environment with rich computerized attributes. In scientific studies, the advantages of that kind of innovation for the agriculture business are often reported. For instance, AR's visualization capabilities go beyond individual limits and may help people keep a closer eye on the nutritional products they buy in terms of health. Throughout this regard, a ground-breaking technique was put out to determine the energy value of meals utilizing AR eyeglasses, allowing the consumer to choose healthier foods as well as develop good dining patterns.

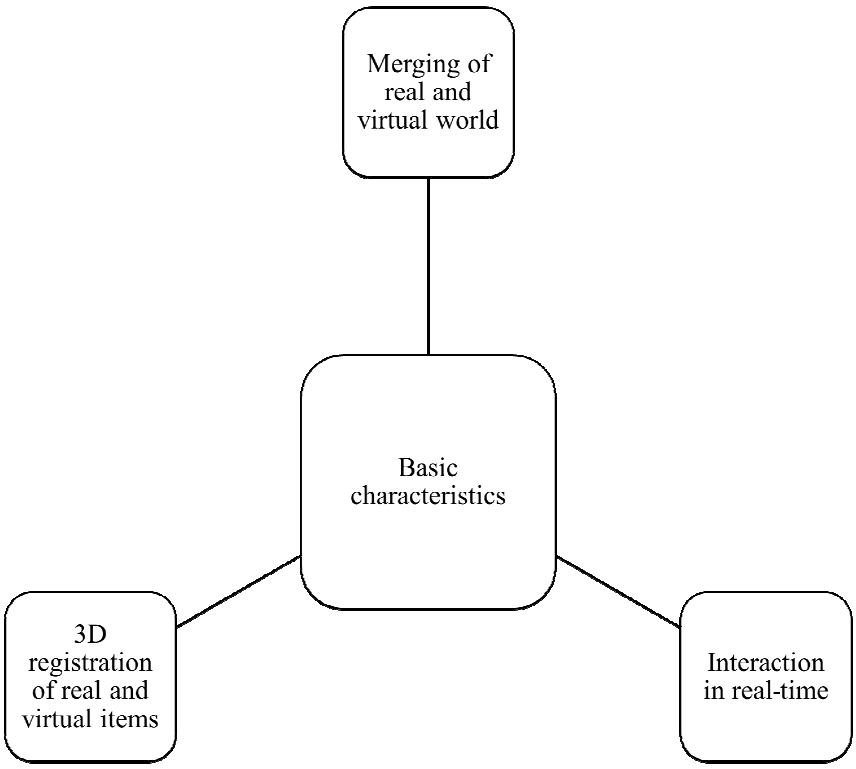

Figure 5: Illustrates the basic characteristic of the AR.

AR technologies may also display healthcare alerts regarding possible food sensitivities, allergies, or even various crucial substances in real-time to help the individual in an immersive yet engaging fashion. Also, it provides the food sector with fresh chances to investigate how people perceive food via their senses, which is crucial for the creation of novel eating items. To accomplish this, another AR approach was used to investigate the connection between the brightness dispersion of foodstuff pictures as well as the perception of texture as well as aroma. Further experiments were subsequently conducted to modify gustation by altering the thickness, brightness, as well as shape of something like the foodstuff utilizing AR innovation. The researcher in previous years observed that adjusting the brightness dispersion impacted the taste/flavor of the meal. Foodstuff may be constantly manipulated to increase realism as well as attractiveness, which is beneficial for aesthetic studies. As just a result, an earlier study has shown how the fields of food technology with AR might work well together.

Throughout this modern age, AR innovation has fundamentally altered the client encounter. As most consumers choose to buy digitally, augmented reality (AR) enables them to examine a specific item as a simulation. The consumer may engage with the item and have a deeper

understanding of it in such a manner. Every buyer is given the option to choose whether it would suit his living. A massive number of consumers reportedly prefer to purchase at websites that make use of AR technologies. AR not just to contributes to an exciting client interaction but also gives customers a wide range of options whenever they decide to buy. Giving clients different colours, layouts, colour, materials, as well as other options as part of the alteration as well as customization may be accomplished with AR. Rather than reading the handbook, users would find it to be much more engaging as well as engaging to explore as well as comprehend the item using AR. Clients would connect as well as become more engaged with the product in this manner. This use of AR has indeed been proven to be a game-changing prospect for numerous industries, such as the culinary industry. AR will be a future big factor for businesses since they adapt to changing patterns extremely quickly. Businesses benefit from AR not only in regards to client interaction but additionally since it's cost-effective. Businesses may utilize augmented reality (AR) on business catalogues to display all the items to the clients, making it simpler to help people start deciding on what to eat. With the aid of augmented reality (AR), food would be presented in an engaging and involving way which would not merely assist the cafe to retain its positive image but also encourage constructive client interaction (Figure 5).

Ultimately, the user's successful interaction might result in extensive business advertising. The user's involvement in future conversations with the business will grow if they enthusiastically engaged in and communicate with the entire experience of browsing an AR buffet. No difference what field a firm operates in, a pleased as well as pleased consumer is its greatest resource. Such patrons remain to patronize the business and aid in word-of-mouth promotion. At the moment, AR could be created using apps on common gadgets like phones, pads, Mixed reality, etc. In light of the impending introduction of 5G, such technologies are gradually seeking for emerging usage areas to enhance their processes. Several industry heavyweights employ AR technologies to maximize efficiency.

5. CONCLUSION

The restaurant, as well as other food-based industries such as the wine business, has embraced AR technologies swiftly in an attempt to improve consumer interaction, and so this innovation has attracted significant industry expenditure as well as attention. Among the latest technological advancements which are increasing steadily daily is recognized as AR in the modern era. Using webcams in real-world operating locations, such innovation enables the visualization of the physical surroundings with a digitally augmented interface. This paper explores the key impact of AR innovation in the food industry along with the different applications of AR. It's an extremely visible as well as participatory approach for integrating electronic material including audio, movies, images, and Global positioning. A variety of present and potential uses for AR include commercial operations for medicine, and the food industry, personalized vehicles to further driverless mobility, use in classrooms for instruction, the ability to translate text instantly, sophisticated face scanning, practical surveillance, and more.

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CHAPTER 16

SURVEY ON SECURITY ISSUES IN ADVERSARIAL MACHINE LEARNING: MAJOR CHALLENGES AND SOLUTIONS

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ABSTRACT: The machine learning (ML) technique called adversarial machine learning (AML) tries to deceive ML models by giving them misleading updates. As a result, it covers alike the creation as well as tracking of hostile instances, or samples made specifically to trick models. Since ML models are complex, individuals frequently don't comprehend how machines generate forecasts. This might create undiscovered flaws that intruders might use. They might leak confidential data or mislead the machine towards producing inaccurate forecasts. Sometimes programs themselves could've been compromised by bogus information outside any knowledge. Such flaws are what the discipline of AML attempts to fix. ML, which enables machines to be trained to recognize trends within data as well as generate forecasts that become better through the period, has experienced a sharp growth in popularity throughout current times. This paper presents a comprehensive review of secrecy issues in the AML as well as major challenges as well as solutions. Artificial intelligence (AI) technology has been attained through ML, which is utilized in increasingly advanced innovations including voice identification, face detection, robots, as well as auto-driving vehicles, as well as useful products including emailing junk filtering as well as virus identification. Cyber security serves to defend against malicious electronic risks including assaults on machines as well as different platforms. The increasing growth of data as well as innovation throughout the digital era makes it increasingly challenging to secure confidential information in a significant manner.

KEYWORDS: AML, Artificial Intelligence, Cybersecurity, Cyber-Physical Systems, Deep Learning.

1. INTRODUCTION

The cognition which runs several apps, as well as data processes in the modern world, is represented by ML techniques. As just a result, adversaries target them to influence individual choices. There are various implications for text produced through ML-based techniques, and several of them may be deemed harmful, particularly when an attempt is made to pass off the writing as having been produced by a person. Safeguarding computer platforms including networking against computerized assaults, which is becoming more problematic in the Electronic Era, is indeed the discipline of cybersecurity. ML is proposed as just a viable remedy since traditional signature-rooted assault identification approaches are frequently insufficient given the increasing rate at that novel assaults have been generated [1], [2].Figure 1 illustrates the AML approaches classification.

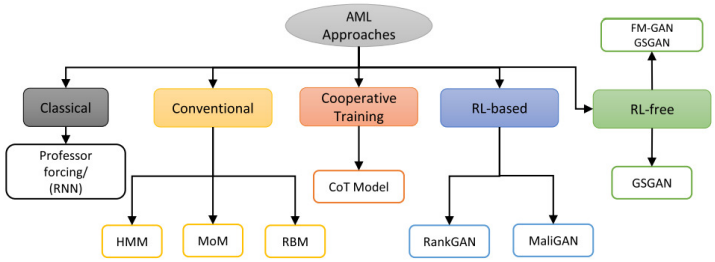

Figure 1: Illustrates the AML approach classification.

This same creation as well as the identification of combative illustrations, or inputs designed particularly to fool classification models, is indeed the subject of the field of study of AML. This field has received a great deal of attention in the study of picture identification, wherein simple adjustments to pictures can lead to inaccurate forecasting from a classification model. Nonetheless, the investigation of similar techniques has still been expanding in various sectors, including such invasion as well as spam filtering [3].

Throughout previous periods, there has been an increase in interest in securing computing platforms as well as devices against cyberattacks. Even though the majority of technologies nowadays are constructed with enhanced protection features, there continue to be a significant number of flaws, mostly brought about by old programs, unsecured interfaces as well as networks, including individual negligence. Cyberattacks may take on many different shapes and aim anywhere at architecture, including cloud computing as well as Internet of Things (IoT) gadgets. To predict assaults, intruder-detecting processes normally utilize indications or trends of computer exploitation. Nevertheless, since the variety of assaults has increased recently, more organizations are turning to ML techniques [4].Figure 2 illustrates the Adversarial attacks classification.

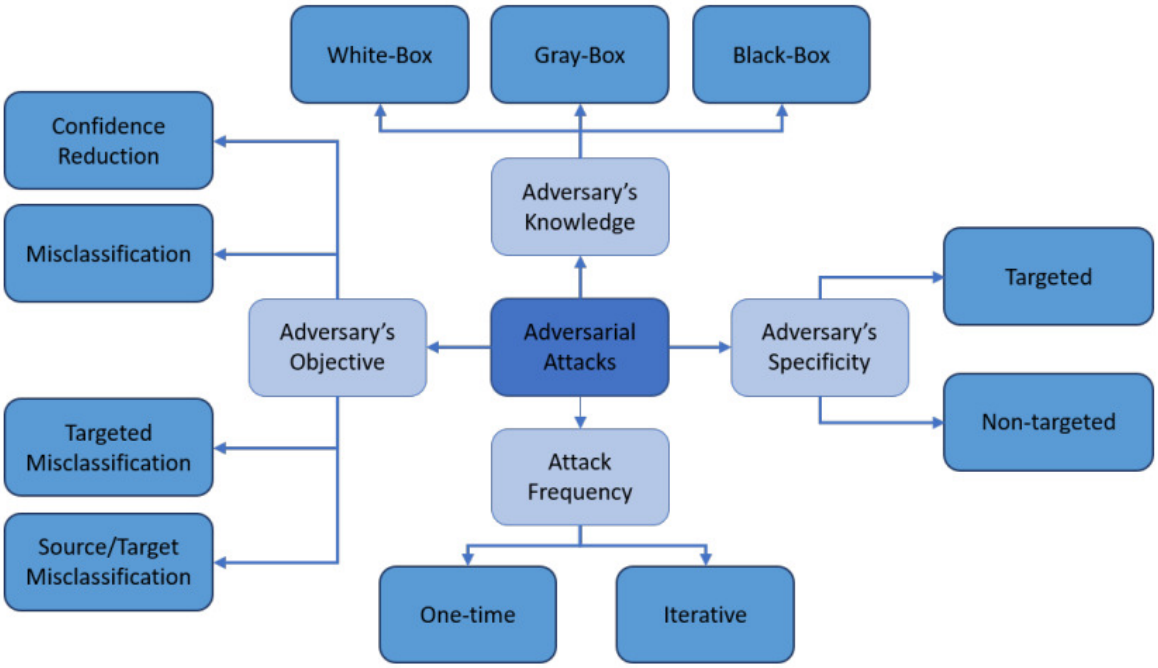

Figure 2: Illustrates the Adversarial attacks classification.

Comparable methods are used for ransomware identification, which traditionally relies on signature-rooted as well as performing various approaches to find dangerous programming inside folders like trojan horses, adware, as well as spyware. This same potential for opponents to attempt to defeat the assessors is indeed a drawback of performing categorization utilizing ML methodologies. The study of such assaults is known as AML which has received modest attention in a few fields like vulnerability scanning but has received substantial study in others like picture categorization as well as phishing filtering. In essence, adversary instances represent instructions to a classifier that have been carefully designed to trick the machine and result in misinterpretation. To facilitate easy computing, assertions like component independence as well as proportional distinctiveness of the information are frequently made while training algorithms. Nevertheless, such sorts of assertions frequently provide room for hostile assaults.

For an extremely lengthy period, ransomware has posed a hazard to both people as well as businesses. It originally appeared in the mid-1980s; about the time some Viruses has been discovered. Since then, multifarious of its versions have continuously as well as unceasingly attacked the globe with viruses. Those programs' only goal would be to wreck as considerable damage as well as interruption as they can. Ransomware assaults continue to pose a danger to the global community despite advances in safeguarding. Scientific investigations indicate that approximately 6% of corporate papers have been typically well safeguarded, whereas greater than 65% of enterprises regularly face cyber risks. The overall typical expense of a ransomware intrusion on something like a firm is USD 2.8 million, as well as the median recovery period following a ransomware strike, is 45 days. Such risks are expensive both financially as well as in terms of period. In light of these significant assaults, ML algorithms for spyware identification have become more crucial [5], [6].Figure 3 illustrates the poisoning assaults, privacy assaults, and evasion assaults.

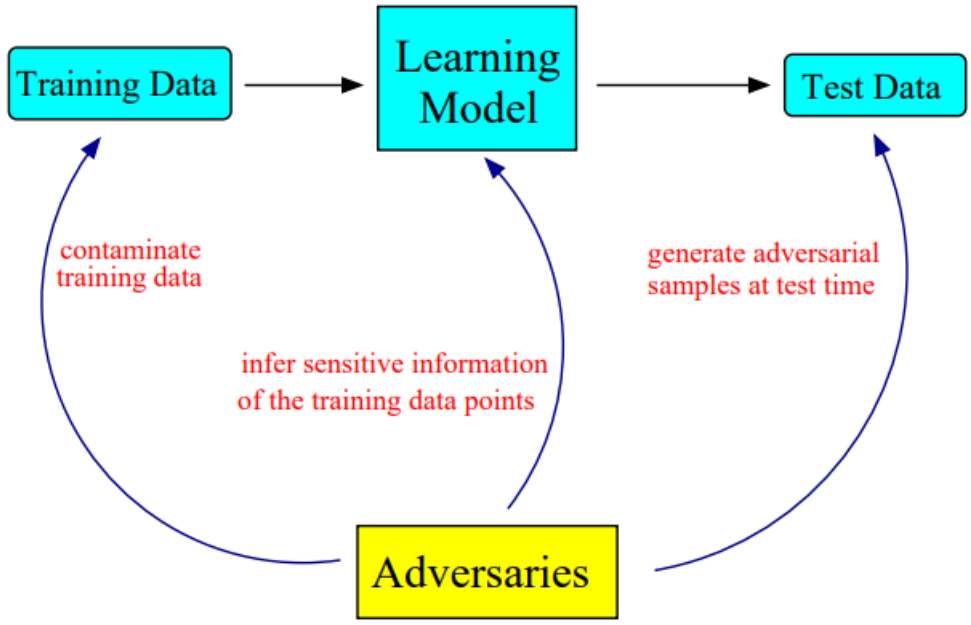

Figure 3: Illustrates the poisoning assaults, privacy assaults, and evasion assaults [6]**.**

Numerous studies have shown how ML-based models that seem to have been learned effectively are quite sensitive to adversary cases. The safety of such technologies is an issue since ML approaches are increasingly utilized as an encryption remedy for cyber-physical systems implementations within various discourses. Yet, the majority of recent work on AML is restricted to virtual worlds alone. Any dangers that adversarial instances may pose to Protective services implementations have not received enough attention. For example, the widely-employed vulnerability scanners as well as the cutting-edge AML technologies in past cyberspace investigations remain impractical because of the global nature of information inputs as well as the intrinsic architectural restrictions enforced via Security mechanisms [7].

In several practical domains, including picture categorization, voice identification, including virus identification, ML-based solutions have shown encouraging results. This same adoption of ML throughout multiple cyber-physical system implementations, including information centre administration, agriculture ecosphere monitoring, and electricity grid assault recognition, has become popular in notable ages, driven by the advancement of cutting-edge correspondence as well as supercomputing innovations. Several studies have shown how ML systems that appear to have been learned effectively are quite sensitive to challenging

cases. AML methods, in especially, provide intruders the ability to trick ML systems with well-constructed hostile instances by introducing slight modifications to valid signals. These flaws may be leveraged with disastrous results since Systems have grown to be associated with secrecy-critical assets including electricity generation, including transit frameworks [8].Figure 4 illustrates the advantages of ML.

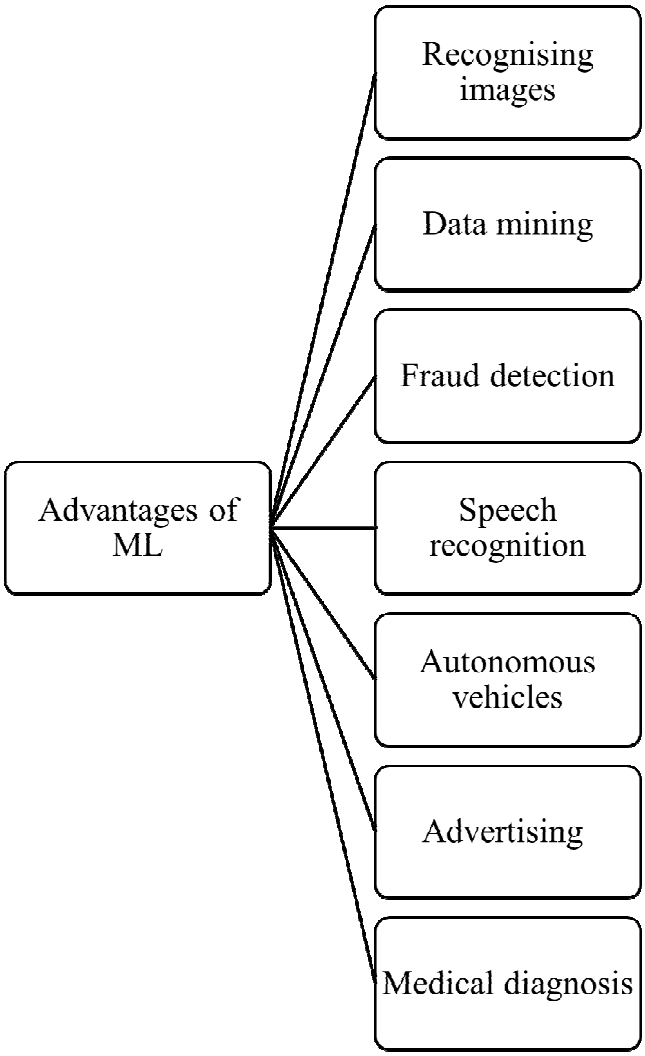

Figure 4: Illustrates the advantages of ML.

The AI groups have given AML study a lot of interest, but it mostly concentrates on computation technologies including object recognition. Nevertheless, it's not relevant to cyber-physical systems because the widely-utilized threat modelling underlying AML techniques from earlier studies cannot be employed with cyber-physical systems due to their unique characteristics. Most current AML study includes widespread assertions about the information of the offender as well as the hostile instances. Much AML work assumes that the adversary is fully aware of the ML-based model parameters as well as that such characteristics are independent of one another. For instance, in machine learning, it is believed that the assailant is aware of every one of the neighbouring pixels in some kind of picture but that there is no strong dependence between the dots. This seems to be unrealistic for assaults against cyber-physical-system, anyway. Applications implementation are often quite big as well as intricate networks with diverse as well as dispersed information sources. Any portion of the detectors might well be compromised, as well as the hacker could change the measuring information. In most cases, the intruder could even understand the parameters

for the undamaged information inputs, much less change those. Moreover, the cyber-physical system often uses numerous information providers including flawed data identification methods for durability as well as resiliency purposes. As just an illustration, multiple phasor measuring units have been employed throughout the electricity network to monitor frequency as well as phase orientation, as well as the residue-rooted bad dataset identification is used to find as well as fix errors within the dataset so that state prediction may be performed [9]–[11].

Nowadays, many cybersecurity duties are automated using ML algorithms. Almost the majority of such methods make use of supervised learning methods, which retrain the computer to categorize entering information utilizing examples from the target area. Such systems have a serious susceptibility to adversarial assaults, in which a malevolent party, known as an opponent, wilfully modifies the experimental dataset to lead the training system to make categorization mistakes. Strikes from the other side might make the training process useless as well as expose crucial infrastructure open to cyberattacks [12].

2. DISCUSSION

ML-based technologies have achieved significant advancements within social media network implementations recently, including sentiment classification, textual creation, including social media network expert algorithms. It's indeed unavoidable, nevertheless, because hostile instances may lead ML techniques to provide incorrect results with such a significant likelihood. To simplify, introducing disturbances to the sample signal which are unnoticed by humans can do this. This limits the broad application of ML techniques in practical settings. Corporations as well as agencies are using ML more frequently as a technology to support choice-making as well as automate procedures. In general, AML refers to a situation whereby an ML system in this case, the classification model tested by such an adversarial adversary. Such adversarial input examples change the genuine data patterns by deceiving the classification into misidentifying given data [13].

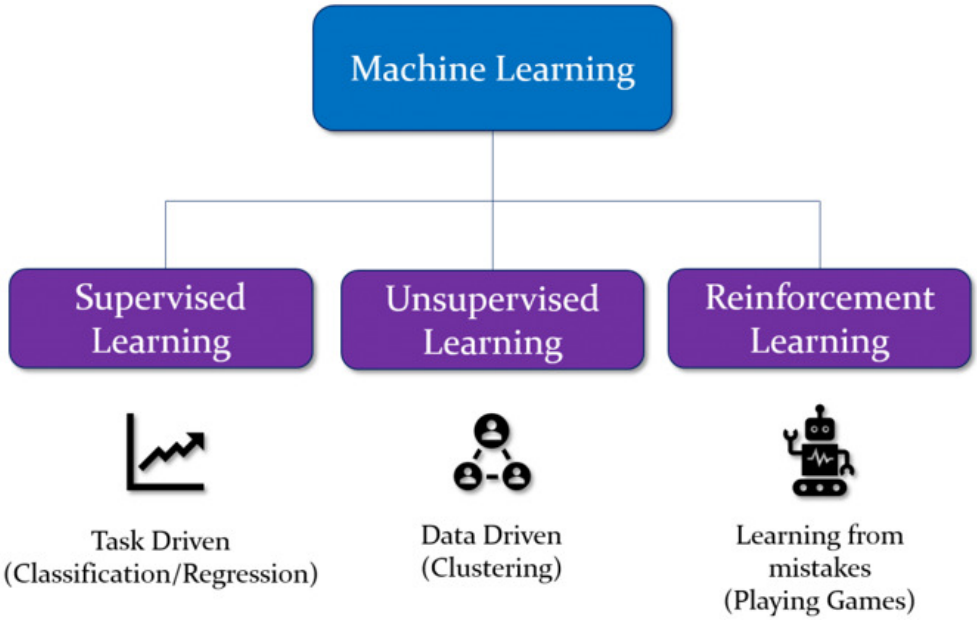

Figure 5: Illustrates the types of ML [New Tech Dojo].

They are intended to interfere with the functioning of something like the ML algorithm. ML systems may be taught to produce hostile instances for use with the classification because this is something that happens frequently. Any ML system could be protected, but the

security is neither complete nor guaranteed to survive. As just a result, this continues to be a concern, as mentioned therein. Several issues, particularly those relating to computer safety, are being solved by ML. It has become clear that it's a highly helpful feature as spyware identification technologies develop. The safety of AI-rooted virus identification methods is, nevertheless, precarious. Assailants have discovered a means to get past such identification technologies by utilizing an aggressive assault approach as a result of advances in ML. These assaults include classification systems, information at the dataset stage, including validation processes. In real-time AI-enabled intrusion identification systems, such assaults often lead to the classification incorrectly classifying the data, and this could be quite detrimental [14].Figure 5 illustrates the types of ML.

Figure 6: Illustrates the diverse types of Malware [Norton].

Considering the fast advancement of deep learning (DL) as well as AI-enabled approaches, it's indeed essential to guarantee the safety as well as the resilience of the implemented procedures. This safety weakness of DL techniques to hostile inputs had lately gained widespread recognition. These fake specimens, however, seem harmless to individuals and might cause numerous errors in DL algorithms. Confrontational assaults are successfully used in real-world situations to better illustrate their applicability. As just a result, antagonistic assault, as well as defensive approaches, have gained popularity as a study area in previous decades within both the ML as well as cybersecurity fields. Adversarial instances represent data to something like an ML algorithm that has been purposefully created by an adversary to cause the network to provide false results. Such instances have had considerable effectiveness in several fields, including spammer identification, picture synthesis, including voice acknowledgment.Figure 6 illustrates the diverse types of malwares.

Each day, it becomes increasingly clear how ML algorithms are producing outstanding outcomes in fields where it is difficult to define a system of parameters for computer operations. Businesses including banking, transport, schooling, including medicine are instances of that kind of phenomenon, as are activities including voice identification, picture identification, and even computational linguistics. The adversarial instance seems to be an

ML-based model data that has been purposefully created by the assailant to throw the network off. The black-box assault is one in which the adversary generally does not have an insight into the computational intelligence system's infrastructure. By employing the concept of "interchangeability," hackers may simulate a white-box assault by getting data intended to mislead one ML model to cause identical behaviour inside a separate network. By comparing these samples to several ML models throughout this study, they construct a white-box assault and demonstrate effectiveness across a broad spectrum of potential devices.

Network Intruder Surveillance Software keeps an eye on network activity to spot suspicious activity, including assaults targeting clients or computers. Such technologies have traditionally used association rules as well as program identities developed by knowledgeable personnel analysers. They take a lot of effort to make but are only usable when the assault technique of choice has been utilized at a minimum once. Hence ultimate categorization of the event must be determined by an authority when these conventional techniques have detected a potential breach. To solve such problems, ML methods are progressively getting implemented within Intrusion detection systems. By learning on both regular as well as assault data, ML systems have the advantage of recognizing unique variations in networking activity, negating the necessity for prior experience to something like an assault. ML systems also suggest minimizing the overall number of false positives, which take a long time to analyse and add to the burden of the said investigator.

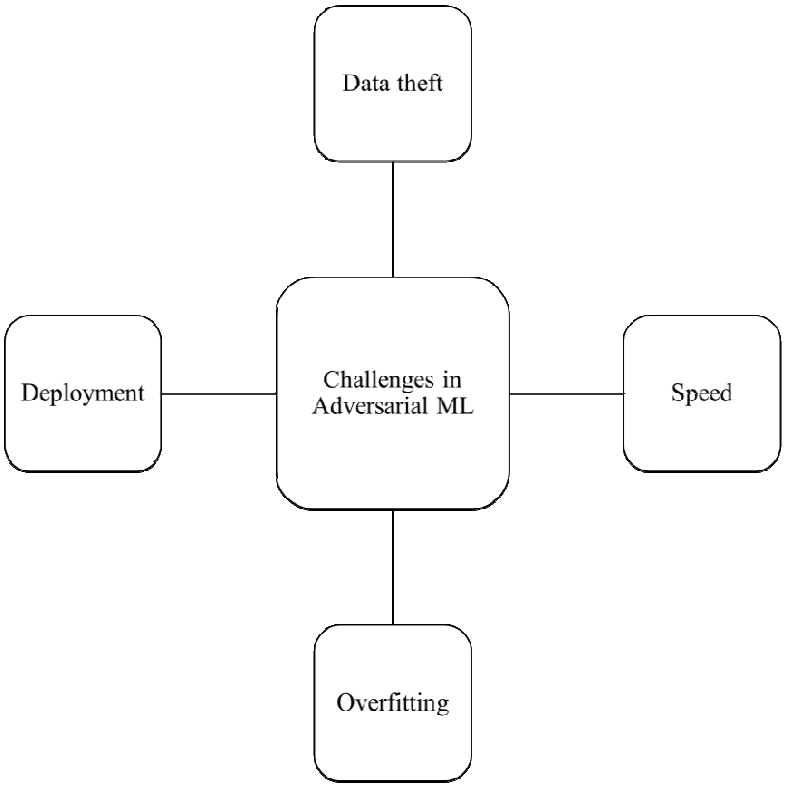

Figure 7: Illustrates the challenges in adversarial ML.

Businesses deal with emerging online threats day after day. Companies require a mechanism to combat the assault of this kind of danger. The solution to that issue, as well as several others, lies in ML. There continue to be a lot of weaknesses within today's techniques, mostly because of personal mistakes, outdated technology, as well as the usage of insecure methods of operating devices, even though they are constructed according to the greatest secured coding sophisticated penetration methods. Assailants utilize ransomware as their contemporary-age weaponry to harm unwary customers as well as take personal information

by breaching customer confidentiality. With recognizing source code, pathogen monitoring systems had advanced to identifying binaries. This monitoring method, meanwhile, may potentially be the victim of this kind of assault.Figure 7 illustrates the challenges in adversarial ML.

The subject of ML is developing more quickly than it has ever been. Several businesses employ ML algorithms to glean insights from vast amounts of information. For example, ML is used in espionage as the world moves closer to mechanization. Yet, there are particular difficulties with ML implementations in defence. Operations by proactive opponents are uncommon in different areas. Adversarial assaults which alter information to make harmful occurrences elude identification by training algorithms present difficulties within fields including vulnerability scanning, financial spam detection, spamming filtration, as well as virus tracking. The adversarial education issue mimics a sport involving the opponent as well as the training machine.

A technique called ML is used to extract useful trends across massive volumes of information. Programs used in ML are created expressly to examine information used to teach the intended notion. During supervised learning, the process starts with a collection of trained information that has been classified from subject expertise. Finding a fundamental principle that sums up the information that produces a prediction modelling that can forecast a labelling for something like a fresh example that does not appear within the trained set is how learning progresses. This notion that now the trained information as well as the prospective information share the same features allows ML techniques to generalize through one collection of train specimens as well as generate precise forecasts for subsequent collections. Hence, the independent as well as the uniformly dispersed condition has to be true for both the information utilized to teach the training mechanism as well as the information from which the learned computer is tested for ML techniques to correctly acquire the intended objective idea. In other term, the collection of trained information is indeed a true approximation of the information across the whole area. Material is delivered independently yet uniformly. One secret to creating a conventionally effective ML program involves presumption.

Admittedly, the specific difficulty of violating the autonomous as well as equally dispersed often has to be faced by protection programs. supposition. For instance, virus developers frequently provide a hurdle to ML-based anti-virus solutions by purposefully obscuring dangerous programs to avoid identification. Both the opponent (the assailants collectively) as well as the training mechanism (the defence) often have opposing tastes and thus compete with one another. Through carefully altering the bad information utilized inside the learned algorithm, the attacker assaults the having-to-learn network by preventing it from being autonomous as well as uniformly dispersed, for example, virus dissemination information found in the running system.

3. CONCLUSION

Because of its remarkable decision-making power as well as precision, AML-based techniques are becoming more and more common in countless practical situations. AML algorithms, meanwhile, fall prey to its inherent excellence when their fame rises. AML seems to be a key object often of hostile assaults. Adversaries are encountered outside of the protective realm. For instance, opponents with a monetary incentive might attack training techniques for intelligent marketing or site rankings. The difficulties of dealing with hostile assaults are especially evident with programs that often function in hostile environments. The imminent need for increasing ML algorithms' resistance to hostile assaults has emerged. The

objective of this paper was to provide an overview of the most current developments in AML techniques employing ML in modern computational systems along with major challenges and solutions.

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CHAPTER 17

EVALUATION OF AUGMENTED REALITY IN THE FARMING SECTOR: KEY CHALLENGES AND APPLICATIONS

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ABSTRACT: Precision agriculture uses cutting-edge tools as well as the accompanying ideas to boost output as well as financial gains while frequently also aiming to have a less environmental effect. The agricultural managerial informational platforms, which allow the automated process of information collecting as well as analysis, tracking, scheduling, choice-making, archiving, and controlling agricultural activities, constitute one of the major components of precision agriculture. Several manufacturing industries are showing a rising amount of attention regarding Augmented Reality (AR) technologies. Still, there is a void inside the research about the use of wearable technology such as wearable glasses for AR in the agricultural as well as cattle industries. With the help of AR, beginning producers may get acquainted with crop machinery before wanting to use it themselves. Producers may educate youngsters about how to prevent similar unanticipated fatalities by using prior mishap-related data including information about how events happened. AR could assist inexperienced producers in learning how to operate sophisticated agricultural instruments aesthetically. Furthermore, this will make it easier for producers who are knowledgeable about utilizing cutting-edge farming techniques to teach people remotely. By providing novice producers with agricultural advice from certain industry veterans, they may choose the best strategy for their particular cropland's circumstances as well as increase productivity. For example, one AR application lets producers use a mobile or iPad to see the internal functioning of agricultural farmland.

KEYWORD: Agribusiness, Augmented Reality, IoT, Machine Learning, Precision Agriculture.

1. INTRODUCTION

Digital visualizing methods are enhancing targeted livestock as well as grain cultivation in agricultural development by improving effectiveness while lowering supervision expenses. Inside an agrarian environment, AR has a critical role to play in this area. The incorporation of 3-dimensional assets or envisioned information insights enhances the physiological realm, which means the person's communication along with corporal surroundings also isn't hindered but instead improved via an extending of actuality. This is why AR is progressing in a distinctive position, in contrast to other connected optical innovations including Virtual Reality (VR), and why this is so different from those innovations. For instance, earlier research show, AR may offer automated way-finding procedure to assist producers with customarily time-consuming ground survey operations. Improvements are also obtained through layering simulations of plant development patterns and therefore by projecting information onto actual artifacts for real-time selection assistance, including the detection of pest or pathogen types. In each instance, the holograms cohabit invisibly with the viewer's impression of the physical environment [1], [2].

It's indeed obvious because AR is showing promise for improving the administration of crops as well as animals together in a smart agriculture environment. The upsides of augmented reality for smart cultivation are dependent on a symbiotic connection with some fundamental intelligent advanced technology, which includes computer vision or Global positioning system (GPS) module incorporation, to deliver a cite-exclusive management provider, it should be highlighted even though several functions outline the upsides AR provides inside of agribusiness. Attention is given to the method by previous research, wherein the

advantages of using AR for topsoil samples are only rendered practical through combining the technologies using Internet of Things (IoT) metadata [3].Figure 1 illustrates the classification of AR.

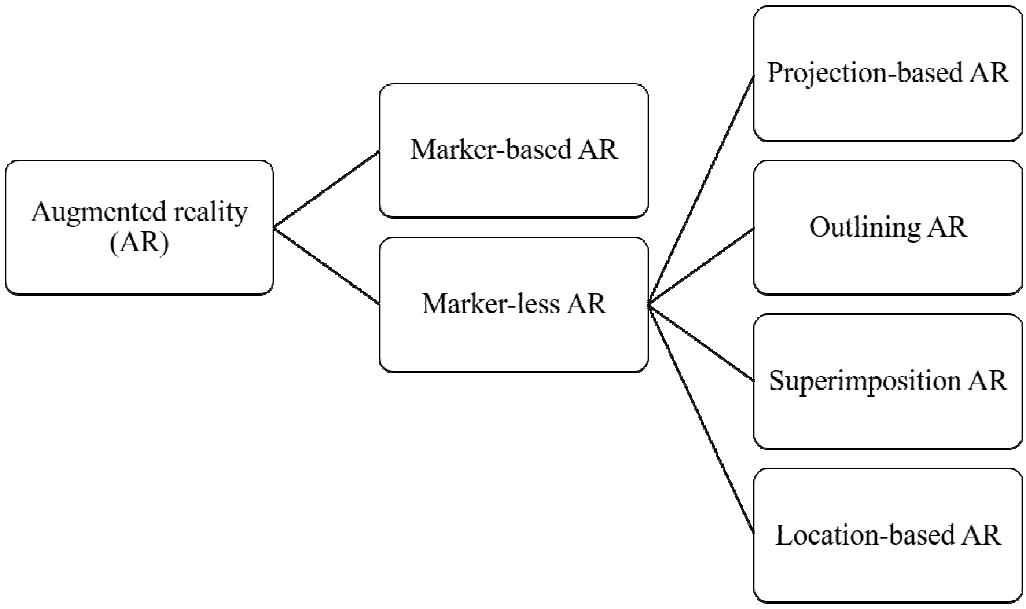

Figure 1: Illustrates the classification of AR.

The creation of imaginary spaces or the enhancement of extant real-world items as well as situations via numerous perceptual modalities is just two examples of the numerous things that have become feasible thanks to substantial technological breakthroughs in recent years. AR has the power to change how pursuits like commerce, amusement, as well as medical services are seen. While it's frequently believed that AR is capable of solving a multitude of existing problems in the agriculture sector which are quite distinct. There are also other names for AR in the modern era, and this innovation helps in mapping digital items onto the physical environment with the addition of additional perceptual information. AR involves total participation in a computer-generated world [3], [4]. The viewer is being shown such a setting and acknowledges it as a true setting. Its distinction serves as the foundation for how digital computing operates. To accomplish certain objectives, AR as well as other innovations are often integrated. This long-established commercialization of AR had greatly altered how people now carry out tasks. Nevertheless, due to several difficulties, the technique initially failed to provide the desired outcomes. Since experts thought that now augmented reality needed further development before it could provide the intended results, businesses were unwilling to make significant investments in this area [5].

This innovation AR has already been utilized in the fields of sports, entertainment, healthcare, mobility, as well as related industries. Farming practices including ranchers might potentially benefit greatly from AR's ability to help them with day-to-day work, and training, including strategic planning. This same rapid expansion in the world's populace has led to a sharp rise in the need for assets like foodstuffs including agrarian goods. Producers are going to have to quadruple even their current levels of output. Producers may benefit from modern technology in attaining business objectives. Producers might utilize AR in addition to Robotics, big data sets as well as IoT to handle the rising agricultural need. Using AR throughout agribusiness may assist producers in reducing agricultural loss, and increasing output, especially in mentoring new producers [6], [7].Figure 2 illustrates the architecture of the AR-rooted mobile application for laboratory instrument training. Farmer-planted

commodities develop in a variable environment that is influenced by a variety of uncontrollable elements, including varying plant variables, insect as well as pathogen threats, and climate, including soil quality. Such elements influence possible results as well as seeding characteristics. Smart agriculture refers to the use of ecological tools using computer technologies to boost productivity, save administrative expenses, as well as offer additional producers the in-depth insights they require to operate their farms.

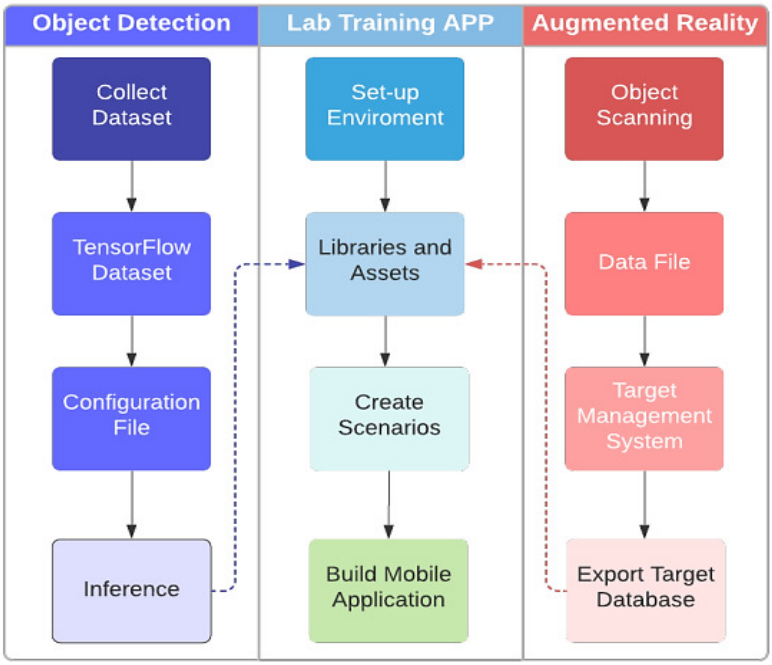

Figure 2: Illustrates the architecture of the AR-rooted mobile application for laboratory instrument training.

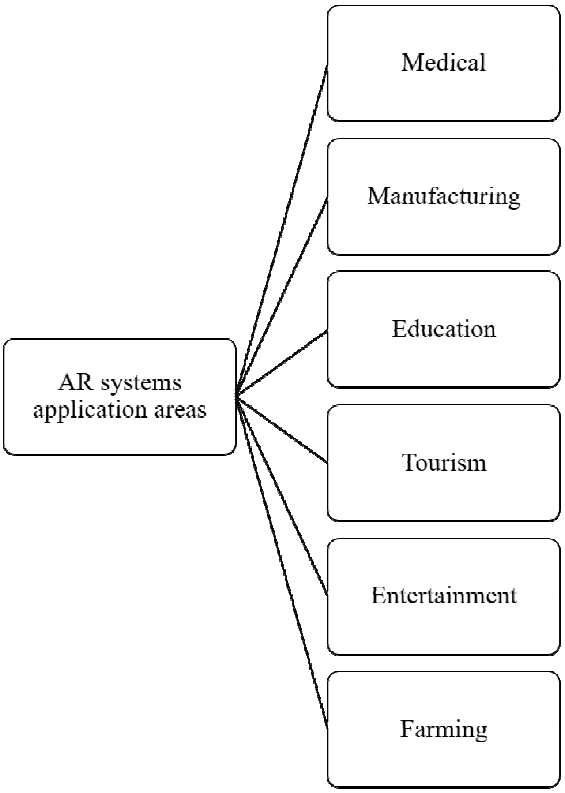

Figure 3: Illustrates the AR systems application areas.

Today's modern smart agriculture uses IoT as well as AR technology because of its scalability and eco-friendly nature. To locate crops as well as solve accessibility issues, utilizing IoT within agricultural placement is essential. Growers can also adapt to potentially possibly profit from such developments thanks to current yet visually appealing IoT data. Conventional approaches to IoT information visualization in agribusiness, meanwhile, have consigned those procedures of information gathering to outcome presentation to an entirely physical yet remote setting. Human perceptions are deprived of tangible features like form, height or colour in this text-based world. Furthermore, the immediate environmental setting is often absent. Without the need for a notion of form as well as the appropriate background, it is neither fast nor natural to analyse or comprehend IoT information. The creation of dynamic IoT information visualization is driven by such requirements. Figure 3 illustrates the AR systems application areas.

The use of AR-rooted advanced technologies is a fantastic way to meet the needs of this sensory awareness as well as engagement. Through overlaying digital (machine-generated) things, including such imagery, and messages, including audio, over a person's actual surroundings, AR complements realism, which can't be fully represented inside an item tag. One might envisage how information visualization, as well as understanding, might help plant location made possible via IoT gadgets with augmented reality information, allowing a producer to engage with the targeted harvest as well as review everyday statistics via digital stuff [8]. Among the potential innovations which could be employed to achieve better productivity inside the agricultural sector includes AR. This may be used in conjunction with additional innovations including robotic equipment, IoT, prescriptive modelling, artificial intelligence (AI), including sophisticated techniques. Some many micro-level reasons, besides the rising grain need, are anticipated to support the expansion of AR inside the agricultural business. Throughout the augmented realism industry right now, augmented reality (AR) seems to be the dominant category. The principles of spatial computation, which also are thought to represent the ultimate development in virtualization, constitute the foundation of such innovations [9], [10].

2. DISCUSSION

Innovations like AR-embedded devices, including machine learning, are being developed as a result of the growing tendency of digitalization. Such innovations together have a significant impact on worldwide digitalization initiatives. The development using AR in many industries is however significantly influenced by the increasing focus on digital interactive capabilities as well as solutions. Basic farming techniques are being combined with mobile technology like augmented reality, which is causing a significant upheaval in the agribusiness sector. Through 2026, the marketplace using AR in agribusiness is anticipated to exceed $4.5 million. According to projections, the marketplace will expand rapidly due to the rising need for agricultural applications as well as innovative agricultural techniques. This, therefore, fuels a rise in the desire for AR as well as other modern devices [11], [12].Figure 4 illustrates the types of vertical farms.

Nowadays, among the largest societal issues facing the whole planet is nutritional stability. It is anticipated that innovations like augmented reality, business intelligence, and automated machines, including artificial intelligence would make farming methods more efficient, which will improve the industry's total production. This could contribute to improved worldwide agricultural stability. The marketplace for augmented reality in agribusiness will continue to expand due to the growing need for geospatial computer technologies. Spatial technology is indeed the connection between a person and a computer in which actual items are superimposed or digitally maintained. Spatial computation techniques are the foundation

of the complete immersed awareness ecosystem, which includes AR, virtual reality, as well as other mixed reality applications. Consumers may interact with computers as if they were in the actual universe including in real-time thanks to spatial technology. Due to the need for a model or a functional object for teaching, such capacity has addressed educational issues encountered across a variety of sectors [13].Figure 5 illustrates the augmented reality technology advantages in smart farming.

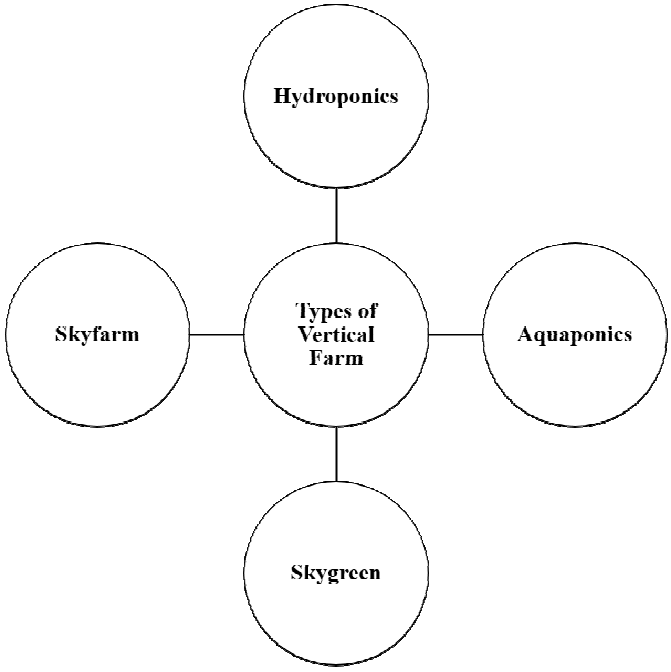

Figure 4: Illustrates the types of vertical farms.

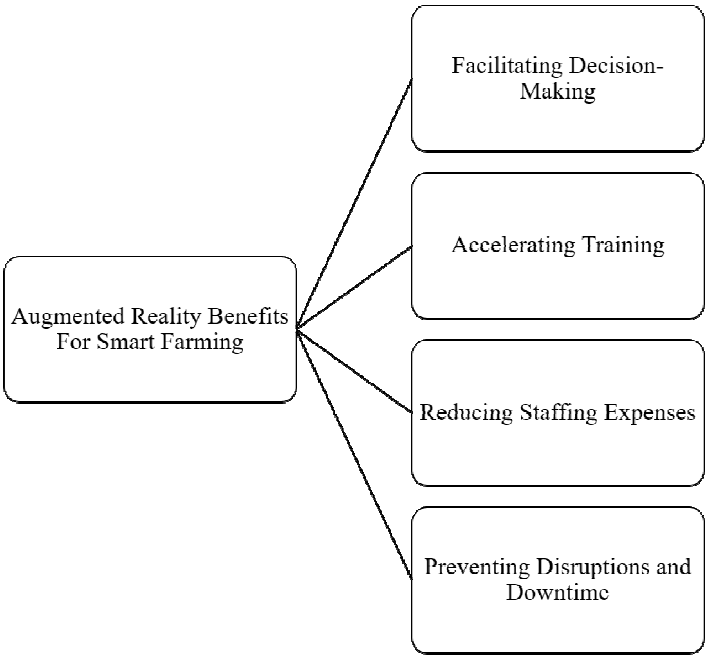

Figure 5: Illustrates the augmented reality technology advantages in smart farming.

Several gadgets, including laptops, face-mounted displays, cell phones, pads, as well as other gadgets, are connected to potentially use AR technologies. In actuality, AR is indeed a

convergence of several equipments as well as application innovations that integrate digitized data into the sensory realm. Smartphone AR has advanced thanks to contemporary advancements in cordless connectivity as well as smartphone technologies. This offers a practical technology that makes enhanced data accessible to consumers anywhere that will indeed normally be without even a fixed place. Currently, cellular augmented reality (AR) relies heavily on handsets (portable gadgets), however smart glasses i.e., wearable technology that has been hands-free solutions, may supplant handsets as the primary foundation for developing AR innovation. The screen given the consumer's eyeballs, which serves as the primary differentiating element, is given through smart glasses, which are head-worn small electronics. There are several distinct lens structures, optically, as well as visually see-through—that may be used to present the enhanced overlaying information onto the screen. This primary merge the actual with simulated views into a single, fully digitized patient's sight; the next overlaying simulated items onto a participant's field of sight inside the reality; as well as the third projected simulated things onto this same eyeball using a lower-power laser beam. Moreover, intelligent eyeglasses are often equipped with a webcam for taking pictures, detectors, as well as input devices. The primary industries where AR technologies are used include schooling, business, healthcare, tourism, as well as amusement.

This hybrid realism boundary involves the coexistence of actual as well as artificial things at various points along the continuity. AR as well as enhanced hybrid realism are both parts of a mixed vision. The earlier is more like the actual reality and the latter is like the imaginary one. As just a result, while enhanced reality expands the view of the online globe with actual items, the enhanced digital world does the opposite. Subsequently, the phrase AR came to refer to all these technological advancements which merge real-world things with digital counterparts, allow for real-time interaction, as well as match physical as well as digital items with one another. To convey data regarding the actual components which human perceptions were unable to supply, AR technology enables the layering of various digital components created by a machine over the actual environment.

Several gadgets, including personal computing, face-mounted displays, cell phones, pads, as well as other gadgets, were connected to and used AR technologies. In actuality, augmented reality (AR) is indeed a convergence of several technologies as well as programming innovations that integrate electronic data into the visible domain. Portable AR has advanced thanks to current advancements in cellular connectivity as well as smartphone technologies. This demonstrates a practical technology that makes enhanced data accessible to consumers anywhere that will indeed not usually be without a fixed place. Currently, portable augmented reality (AR) relies heavily on cell phones (portable gadgets), although intelligent spectacles, which are hands-free solutions, may supplant cell phones as the primary foundation for AR innovation.

This term precision agribusiness refers to the use of contemporary information as well as telecommunication technology throughout farmland to increase output including financial gains while often minimizing environmental effects. Smart farmed, site-specified farming, site-specified plant administration, prescription gardening, as well as remote growing crops are examples of words that are employed for the identical thing. Information-driven agriculture, big dataset insights, cloud technology, distant scanning, as well as IoT are examples of modern innovation that are incorporated into precision agriculture. Research lists several significant advantages of precision agriculture, including maximizing agricultural grade but also producing effectiveness, lowering risks as well as ecological effects, conserving assets, lowering costs, boosting profits, and making smarter managerial choices.

This agricultural administration data technology is among the essential components of precision agriculture. While systems were originally just straightforward file-keeping systems, they have evolved into complex systems with cutting-edge components that serve a wide range of agricultural activities. Modern systems and precision agriculture in particular has gotten a fresh boost with said advent of IoT innovation. This IoT facilitates automatic yet intelligent data fusion. Moreover, it aids in the tracking of sensing information through distinct equipment, creatures, crops, fields, and conservatories, as well as similar devices including unmanned aviation as well as ground devices. By supporting choice-making as well as organization in the agrarian sector further, humans may improve farming's effectiveness as well as efficiency. IoT technology makes it possible to apply agricultural procedures like crop surveillance, seedling choice, insect control, watering, etc. Agricultural output may be tracked, while detailed harvest charts that highlight regions with excessive as well as inadequate productivity are easily accessible [14].

In countryside cultivation, nearly the majority of outdoor labour is now completed by human-powered machinery. Mechanization of agriculture's intense agricultural practices prevents producers from having first-hand expertise in detecting changes within the state of both crops. To collect information for smart agriculture, satellite imagery techniques have been suggested. Only with the right statistics, the development throughout the period may be tracked. This amount of satellite surveillance information increases with the weather. An additional resource enabling remotely sensed data is UAVs, also known as Unmanned Aerial Vehicles. Although satellite-rooted imagery is constrained under foggy circumstances, photography using UAVs is conceivable. In contrast to satellite-rooted photography, using UAVs involves additional work during the pre-flighting stage, during flighting, as well as during picture post-processing. Yet, while UAV photography seems to have a greater resolution regarding the centimetres scale, imaging technology has an optical precision measurement. Like AR may be applied to certain other modalities as well, digital data isn't just confined to visible things. The advantage of AR is its capacity to provide users with knowledge that is inaccessible to their perceptions, therefore, aiding people in carrying out practical activities. Although, AR is probably best known for its use in amusement applications like various games, other fields where it might be used include production, robotic telematics, and travel, including medical. Multifunctional eyeglasses that support AR are already readily accessible. Recent decades have seen an increase in studies into employing AR within agribusiness.

When choosing the product to plant on farmland, producers must assess the richness underlying the soil. AR may improve reproductive testing. Now let us say a producer wanted to physically examine every square foot of the field for just about any infestations. Yet, using AR, growers can see their whole field on a unified screen and observe potential rodent or bug infestations. For example, a newly created AR application may help growers examine their property. For continuous surveillance, it gathers spatial information on the ground. Moreover, it combines AI, machine learning, as well as AR to find potential problem spots.

3. CONCLUSION

By using AR across agribusiness for site inspection, and virtual retraining, including equipment evaluation, producers are moving from conventional to augmented agribusiness. This same populace of the world is expanding quickly and therefore is predicted to do so much more. Around 2030, it's anticipated that there will be a growth rate of approximately 10 billion people around the planet. And thus, the need for commodities, including foodstuffs, would rise even as the populace grows. Producers would be required to generate double as much wheat compared to what they do now due to the rapid expansion in the global

populace. And therefore, only sophisticated technology could help growers accomplish one such task. Producers may utilize AR in conjunction with certain other innovations including AI, machine learning, as well as IoT to handle the rising agricultural need. This paper provides an evaluation of augmented reality in the farming sector along with the key challenges in implementation and applications. Using AR within farming may assist producers in reducing agricultural loss, and increasing output, especially in mentoring new producers. There is a lot further to agribusiness than just planting as well as collecting; it also involves surveying the property including keeping an eye on the commodities. Also, a variety of instruments are accessible in agribusiness to carry out all such various activities. In actuality, several instruments may be used to do a particular job. Depending on the preferences as well as specifications of the grower as well as the work, AR systems may assist in choosing the best instruments for a given operation.

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CHAPTER 18

COMPREHENSIVE EVALUATION OF AIR QUALITY AND DISCUSSIONS ON AMBIENT AIR POLLUTION

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ABSTRACT:The impact on health are expected to endure until, thus three distinct demographic models will be examined to see how they may affect the health effects of Danish air pollution emissions. Methods. In a newly developed health effect evaluation method that replicates four major diseases or mortalities in addition to fatalities from all causes, modelled air quality from several Danish sources is utilized as exposure. For the local level model, Denmark's approximately million citizens were split up into municipalities. A stable population for the year, fixed mortality and morbidity for the year, or a projected development were the three possible sets of demographic presumptions. No simultaneous exposure to two or even more toxic gases compared to multi-exposure may have different relationships with health effects. Methods. Examined were case-crossover records on ischemic heart disease (Disease), erythema, and respiratory infection admissions to the emergency department). Conditional logistic regressions were used to compute the likelihoods and their confidence intervals related to the elevation in the interquartile air pollutant concentrations. Results. The results show a connection between IHD in senior people and hydrogen-supplied exposure.

KEYWORDS: Air Quality, Air Pollution, Disease, Factors, Risk.

1. INTRODUCTION

It is well known that air pollution has negative consequences on health as various researchers have shown. Multiple Health Impact Evaluations (HIA) have been conducted to calculate the consequences of numerous inflight effluence factors in a variety of diverse geographic contexts. Most centered on how particulate matter (PM) affects overall morbidity, but others have also cited the consequences of a spectrum of pollutants, illnesses, and fatalities. The Apheresis study evaluated how PM2.5 affected 26 different using the Air program from the WHO, European cities. Utilizing Environmental Benefits Mapping and US Environmental Protection Agency's Ben MAP Protection Agency to evaluate the effects of PM2.5. Models for both external energy as well as the Assessment of Air Pollution Model (EVA) using task-exact replicas to assess the fitness impacts of European energy production's air pollution and Danish, respectively, released air pollutants. These two HIA tools, whose conceptual structure most closely resembles the HIA model, are based on an impact pathway method, which was applied in this study[1]–[4]. Where several tests are used to assess the impacts of air pollution linked complex calculations based on the volume and distribution sources that release it through scattering and contaminant conversion, to exposure to air health and environmental effects experienced by the citizenry, as well as how safety is valued effect.

The impacts of pollution from emitting sources, atmospheric dispersal, chemical, and deposits, as well as the effect on the subjected human species, all have been covered by a series of interrelated models, according to the Centre for Energy, Environment, and Health. The air pollution scenario that is described here models the effects on Denmark's health from all Danish causes from 2005 to 2030.Because they had well-established links to air pollution and accounted for a sizable portion of total mortality, lung cancer incidence, and mortality,

heart disease, pulmonary embolism, as well as long-lasting disruptive pulmonic disease, as well as mortality from the cardiovascular disease from other factors that cause, were included as health outcomes. Huge birth cohorts occurred in the 1940s during World War II, and as a result, huge baby cohorts occurred in the 1960s a century later [5], [6]. Over the recent periods, the age units have shrunk, hitting a slight opinion. The age distribution of the population has changed and is expected to continue to do so (with 14.8percentage points in 2000 to a projected 24.4% over 64 years in 2050), as well as an improvement in life between those 65 and older combined with aging-related increases in sickness rates.

The fundamental design of illness occurrence, transience, and demographics plays a part in deciding how air quality may impact people's health as a result, as appearance contamination is known to raise the threat of many infections and death have to take into account planned increases in infection occurrence, impermanence, or demography when measuring the fitness impacts of air contamination because the majority of diseases do not immediately manifest but instead develop clinically for decades or even decades following exposure to risk factors. To evaluate how the aging of a Danish community throughout the same period influences such consequences, this study looked at the main health effects of Danish air quality on the Danish community from 2005 to 2030.

The HIA modeling, which came after modeling emissions of air pollution based on several (global) technological and economic improvements as well as rises in fuel and CO2 pricing, completed the CEEH-model chain. For this modeling, the Technical University of Denmark's C T was employed. Aarhus College Department of Environmental Studies and Environmental Environment's Danish Eulerian Spatial model (DEHM model), an atmospheric chemical transfer prototype, was then given the resultant air pollution emissions. The DEHM design computed the atmospheric dispersion, chemical reactions, and deposition of air contaminants. In a 16.6 x 16.6 km grid spanning Denmark, calculations were done hourly. This made it possible to calculate the annual mean.

The baseline 2005 population, birth, and migration flows, as well as all other characteristics, were held constant between the three evaluations. The first instance of static mortality allowed the birth cohort to develop and incorporated potential consequences of the large Wartime births and their progeny, as previously mentioned, whereas the second scenario's stable population kept the population fixed. The projected scenario showed how, based on our projection of deaths and migration, we expected Denmark's population to evolve between 2005 and 2050. The fixed demographic scenario was nonetheless used, even though it had minimal predictive power, to study the consequences of prospective cohort study size disparity, as seen in the Danish residents. [7], [8]. The HIA perfect used was an inter-Markov system, in which each state represented a distinct age and sex group's health condition within one year. Following the first year of illness, a series of pathological conditions followed, along with things causing death in countries with heart disease as an instance, we seemed to have the nations of becoming fit and active, sick in the first year sick in the 2nd year, sick in the 3rd year, sick in the 4th year, sick in the 10th year, sick, and sick in the subsequent years.

Scenarios to relocate to other states have been calculated for every state transmission using Danish registry data. The perfect necessitated a variety of dissimilar information and death, as well as publicity to air pollution levels, to create this same baseline inhabitant, migratory rates all over model components (municipal governments), death and increased mortality, and dimensions for connections between air pollution exposure and morbidity. Statistics about the population of the model using the initial (the year 2005) each age or intimate relations Danish demographic at the municipal level. Statistics Denmark made this information easily accessibly utilized data on intermunicipal migrations from Statistics Denmark to account for

an inter-municipal movement that varied significantly by age group utilized observed information for the net migration during the previous five years, which showed a linear increase in numbers[9]–[12]. Information on the prevalence and causes of specific mortality Devices was gathered using the Danish Registry of Death Causes the Danish Patient Registration and the Civil Registration. By linking the three registries and the whole Danish community (aged Sixteen or over) by year between 1977 and 2006,were able to calculate the annual incidence of a four relevant disease groups. The incidence chances for each year may then be calculated using the yearly occurrence instances, with a wash time of sixteen years, as well as the midyear illness population. Then, the inclusion method was used to include the five years with higher-than-average prevalence. To forecast the drop in deaths under expectations, historical mortality statistics from of the Danish Causes and Death Registry were examined (Figure 1).

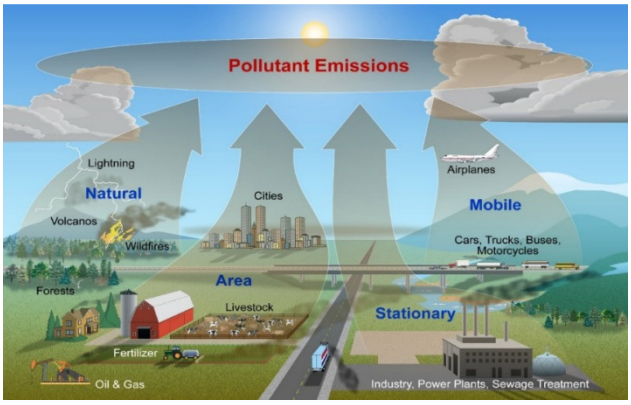

Figure 1:Illustrates the Air Pollution Comes From.

In one-year age categories, the starting level of mortality in 1990 was evaluated, because we anticipate that all age groups will experience a decline in mortality, we projected mortality from 2005 to 2050 with a minimum yearly drop of 2%. This minimum annual drop lifts the life expectancy to 86 and ensures the anticipated decrease in total mortality during the simulated period [13], [14]. It took about a week to replicate an entire year's worth of air pollution exposure due to the limited computational power available. Only the DEHM model's calculations for the specific years 2005, 2020, and 2030 were available. Therefore, using the anticipated average annual mean atmospheric PM2.5 in 2005 and the change from the DEHM grids to the local level as examples of the modeled air pollution, we linear extrapolated the pollution levels that would occur during the subsequent years. As is evident, the change preserved the air pollution distribution. The causes of air quality are depicted in Figure 2.

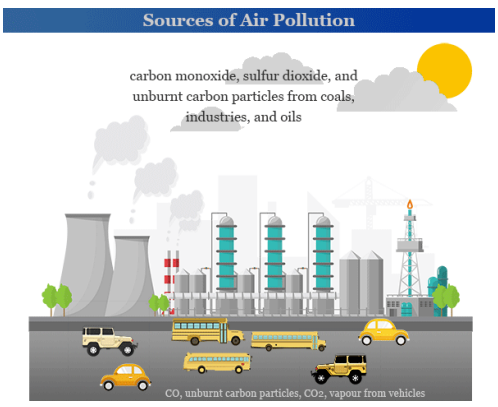

Figure 2:Illustrates the Sources of Air Pollution.

2. LITERATURE REVIEW

In [15], Paula Valencia Moulton et al. A well-known environmental risk is air pollution, and several epidemiological studies have repeatedly shown that it is linked to respiratory and cardiovascular disease studies. Numerous toxicological investigations have recently concentrated on the hypothesis that air pollution may potentially be linked to Hypertension (AD) and other neurodegenerative illnesses. However, there is little epidemiological data to support this relationship. More than 4 million individuals in the USA and close to 30 million people globally have Alzheimer's disease, a neurological ailment that is progressive and irreversible. Age is the most significant risk factor for AD. Other significant risk factors include having an APOE-4 allele and having a positive family background of AD. There is growing evidence that oxidative stress is at least largely responsible for AD and other neurological illnesses. The redox imbalance caused by the formation of reactive oxygen species is known as oxidative stress (ROS) which is more than what ant oxidative defense systems can withstand. Air pollution exposure could very well be a contributor to AD risk by increasing oxidative processes that may lead to physiological abnormalities in the central nervous system. Air pollutants like air pollution can enhance an organism's generation of ROS.

In [16],Junfeng (Jim) Zhang et al. The source, concentration, exposure, dosage, and negative impacts are some of the key components that make up the system that represents the problem of air pollution. Exposure is when an agent (such as an air pollutant) comes into touch with a target (like a person). The connection between the source of pollution and its impact on human health is the human respiratory system). The amount and length of time that humans are exposed to air pollution varies. Exposure concentration, which generally refers to the area where people breathe, is the density of a pollutant at a contact boundary. However, surveillance sites have been used to assess ambient amounts of controlled contaminants to simulate real exposure. If the pollutants are those that are mostly produced outside and the monitoring sites are properly chosen, this might be a viable approach. This is because a huge emission source may only have a relatively tiny exposure effectiveness value, or the percentage of a pollutant produced from a source that causes an exposure reaches the area where people breathe. Decisions about risk management priorities, cost-effective methods for preventing or lowering hazards, and assessments of risk mitigation initiatives all depend on exposure data. Environmental epidemiology studies frequently fail to appropriately address the measurement or estimation of exposure.

In, Joaquim Radua et al. Depending on the objective of the exposure assessment and the accessibility of pertinent data, exposure can be assessed using either direct or indirect measuring methods. The advancement of present techniques and the creation of new techniques for the future is anticipated to be accelerated by the quickly evolving battery and electronic technologies, as well as developments in molecular biology. It is generally known that air pollution and the deterioration of respiratory conditions are related. However, there is little research on its connection to hemoptysis. The connection between severe hemoptysis and air pollution is discussed in this research. Methods. Over 5 years, all consecutive participants who experienced severe hemoptysis were included.

In, Jeffrey S. Gaffney et al.Poisson regressions were used to assess the relationship between levels of pollution and the incidence of embolization. The monthly number of embolization’s served as the dependent variable in these regressions, while the explanatory variables either were the concentration or concentration of an atmospheric pollutants during the prior month, or the difference between the two outcomes. Over the months with higher temperatures, a greater overall number of embolization’s each month was seen. Grasp air pollution and its

effects require an understanding of atmospheric chemistry. In addition to giving a quick explanation of some of the basic photochemical involved in the production of air pollution, this mini-review also gives a brief account of the history and air pollution. Ozone is one of the several peroxides in the environment. This discussion of urban atmospheric quality concerns especially addresses chlorine as well as other oxidants, primary and secondary aerosols, alternative energy sources, as well as the possibility for chlorine leaks to worsen oxidant chemistry in needed for the business. Regional air pollution issues including acid rain, lengthy aerosol transportation and loss of vision, and the relationships between nitrate and ozone are also examined. The potential impacts of atmospheric quality on the worldwide radiative balance of aerosols and gases are then briefly discussed.

In, MieczysBaw Szyszkowicz et al Ambient air pollution is an established risk factor for a number of illnesses. People in a certain age range are particularly aware of how air pollution affects a number of health conditions. Non-simultaneous doses to two or more air pollutants may have different relationships with health effects than simultaneous exposures. Methods. We looked at case information on trips to the disaster room (ED) for epistaxis, upper respiratory infection, and ischemia of the heart. Unconditional logistic regression models were used to compute the odds ratios and their 95% margins of error related to an increment in inter - quartile range of air pollutants. Results. The findings for IHD demonstrate that there is a relationship between hydrogen-supplied (SO2) exposure and IHD in elderly individuals (age 60+ years). Premature mortality rates rise and air pollution is known to worsen disease states and be a risk factor for several health problems. Many epidemiological studies identify age groups in advance, and typically, those who are at least then, let's say, 65+ are taken into account and placed in one category. The effects of air pollution on people this and older are assumed to be uniform. For some disorders, older people in this category may be more influenced by the preexisting disease itself than by the effects of the environment. In this study, ischemic heart disease (IHD)-related ED visits were taken into consideration. ICD-9 codes were used to identify the instances.

In, Esben Meulengracht Flachs et al. A set of advance and lag timings were introduced to the model to postpone the beginning of mortality and occurrence from the period of exposure to air pollution in instruction to depict an accurate growth of sickness incidence and death. Interval period was in fact the amount of times in between point at when there was no longer a risk from exposure to air pollution, and time was the amount of decades between the peak level of risk and that point principal and interval durations was influenced by the conversation surrounding the delay and interval periods for burning. The sum of the two factors was used to calculate the health financial impact associated with changes in disease occurrence and pollution.

3. DISCUSSION

Additionally, we considered the possibility of modelling the long-term health impacts using The HIA model used here illustrates a novel approach for producing health impact assessments of air quality setups in which the affected population was monitored and their existing state of health was modelled, approximating the effects of Danish air pollutants using a bottom-up methodology. The population and variations in sickness prevalence and mortality were therefore immediately integrated into the models. Life-table evaluations also permitted the estimation of multiple exposure years as well as fluctuating exposure levels nevertheless. The four disease categories that were considered were chosen as they are serious illnesses, leading causes of death, have a considerable impact on death rates, and have a known link to air pollution. In Denmark, heart disease, respiratory illness, strokes, and COPD together accounted for about half of all fatalities in 2005. The difference in odds ratios

for men and women used here was calculated using data from studies on mortality and particulates emissions and the supposition that men's hazard ratios are half those of women. Foremost collections of skilled in the arena who model the consequences of inflight contamination concur that the proportional hazards are fairly significant. The principal causes of air quality are depicted in Figure 3.

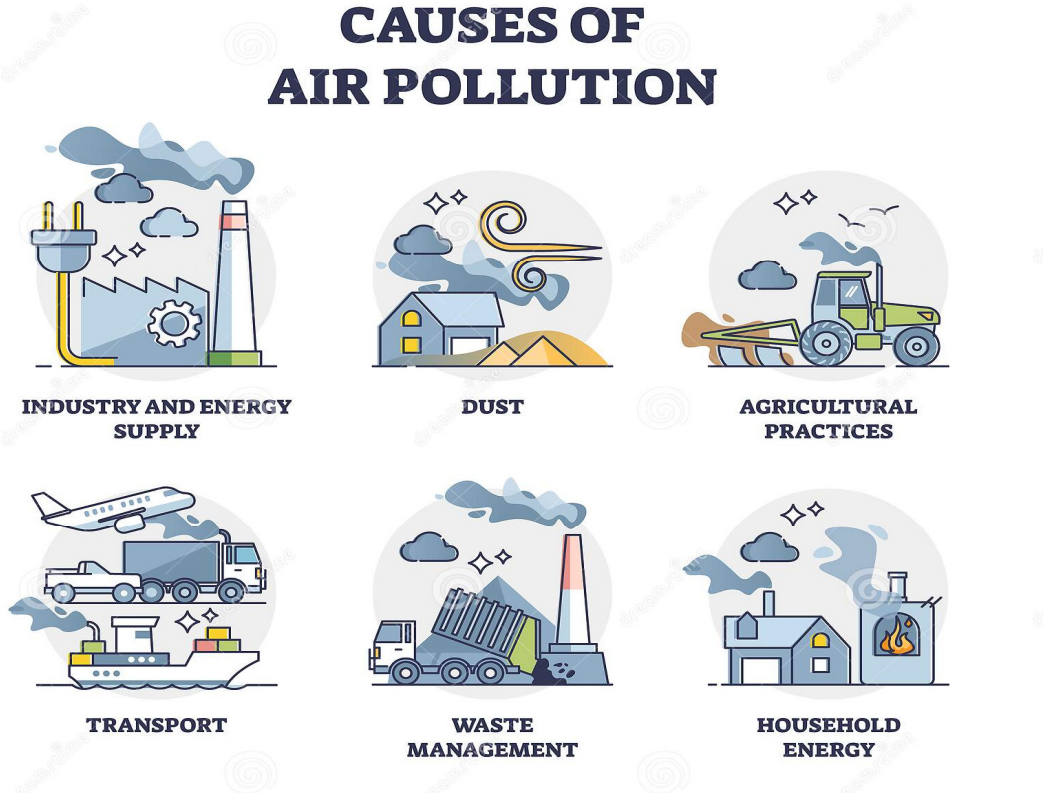

Figure 3:Illustrates the Main Causes of Air Pollution [Google].

Because demonstrating the four main illness classifications and the related humanity would not completely explanation for the due to rise in humanity risk, leaving some residue left excess risk of death, even after accounting for the relative risk of death for PM2.5, NO2, and SO4 as well as the risk of any death rates. To account for this, we offered a rough estimate of the percentage likelihood of dying from all sources equal to 50%. The exact scope of this residual effect is controversial, but if it is fully disregarded, the evidence for the harmful impacts of appearance pollution on human health will be greatly understated. One of the justifications for a bigger influence is the fact they are the primary causes of lung cancer and chronic bronchitis. The analysis relies on exposure statistics that are hazy at the individual level and generic across vast geographic regions. Air pollution had already recently been discovered to have a considerable impact on COPD in Denmark, according to recent research. Data on differences in the overall hazards exposure to environmental have been well approximated to use a road model in Scandinavia using historical air quality data at the identify level with NO2.The lead and lag durations utilized in the simulation came from a thorough investigation of the connection between smoking exposure and illness and death picked since there was no research on lead exposure from air pollution and lag periods and because the exposure was comparable, albeit to a much greater amount in smoking, which causes the same problems. The authors also employed this strategy. Figure 4 shows the ways to stop air pollution.

Figure 4:Illustrates the Ways to Stop the Air Pollution [Google].

4. CONCLUSION

A critical component of evaluating the impacts of population dynamics and air pollution on population health was the assumption that population growth would result in various aging patterns were crucial for establishing estimates of health effects that take place over a long time, on all sizes (urban, regional, and global), air pollution chemistry is now acknowledged to be vitally relevant. Regional and worldwide). Early research has shown that human industrial and power activities have been identified as possible sources of observable phenomena, particularly fossil fuel combustion implications on agriculture and health. While investigating the chemistry of several trace gas species, now understand that the processes that result in high pollution levels in urban and regional several harmful trace gas species can be removed from the atmosphere by changing certain circumstances. Although hydroxyl radical interactions can cause the tropospheric ozone to rise in a damaging way, the Ammonia and other organics that might have negative impacts on the environment are also removed by the same mechanism if they were left to build up, the stratosphere and troposphere.Since the earliest reports of photochemical air pollution in Los Angeles in the 1940s, this field has expanded significantly. For further in-depth information, current works on the subject are recommended to the reader beginning to appreciate the importance of our atmosphere and how our actions affect it. Understanding and protecting the air is important since it is a valuable resource. It is hoped that ongoing research in atmospheric physics and chemistry will increase the body of knowledge necessary for making wise policy decisions that will protect future generations.

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CHAPTER 19

IMPLEMENTATION OF ROBOT APPLICATIONS AND MANAGEMENT OF PLANTS FOR DETECT THE PLANT DISEASES

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ABSTRACT: The robot wanders the field, taking pictures of the leaves while keeping an eye on the field's status, which is managed via an android app. The farmer may increase productivity by using this robot to monitor the field conditions and aid in early disease diagnosis. Illness management procedures may be a waste of time and resources and may result in further plant losses without accurate identification of the disease and the disease-causing agent. Therefore, accurate illness diagnosis is essential. Plant pathologists often have to depend on symptoms to determine the presence of a disease. Common techniques for the diagnosis and detection of plant diseases include visual disease assessment by human raters, microscopic examination of morphology features to identify pathogens, as well as molecular, serological, and microbiological diagnostic techniques with the aid of robot applications, which are explained in this paper. This paper's conclusion justifies supporting the disease detection feature, which includes procedures like picture capture, image preprocessing, image segmentation, feature extraction, and classification. For crops to be successfully grown and for future harvests to be excellent for farmers, effective identification and categorization of plant diseases are crucial.

KEYWORDS: Crop Diseases, Disease Detection, Plant, Plant Management, Robot.

1. INTRODUCTION

Many nations are heavily dependent on agriculture. Due to the increase in population, the demand for food grains is continuously increasing. To meet this urgent need, it is essential to boost agricultural production and protect crops. But since there are so many pathogens in their environment, crops become vulnerable to many diseases. These disease pathogens include bacteria, fungi, and viruses. Crop diseases can reduce productivity by 10% to 95%, which has a negative impact on both the quantity and quality of agricultural production [1]. Thus early disease detection is essential to prevent serious losses and limit the excessive use of pesticides, which can be harmful to both human health and the environment [2]. Farmers often diagnose crop diseases visually based on visual signs, especially in underdeveloped countries and small farms. This laborious process requires extensive treatment time and plant pathology knowledge [1]. Additionally, if a rare disease strikes a farm, farmers seek expert help for an accurate and timely diagnosis, which inevitably results in higher treatment costs [3]. Therefore, this type of visual observation is neither feasible nor practical for large farms, and it may also provide inaccurate forecasts resulting in biased decisions [4].

In order to fulfil growing consumer expectations and lessen the negative environmental effects of chemical inputs on the environment and human health, researchers have been inspired to create technical approaches for the precise, quick, and reliable early diagnosis of crop diseases. In this sense, several techniques have been put forward to automate the illness identification process [5]. There are two categories of these techniques for the automated detection of agricultural diseases: direct and indirect techniques [6]. Direct approaches include molecular and serological techniques, which provide precise and direct identification of the pathogens causing the illness [7]. However, these techniques take a long time to collect,

prepare, and analyze the samples they need. Optical imaging techniques, in contrast, are among the indirect approaches that may spot illnesses and forecast the health of the crop based on several factors including morphological change and transpiration rate [8]. Some of the most popular indirect techniques for detecting early illness include fluorescence and hyperspectral imaging [9]. Even though hyperspectral pictures are a significant data source and include more information than regular photographs, hyperspectral equipment is quite expensive, cumbersome, and challenging to get for low-income farmers.

1.1.Robotic Seeding and Plant Management:

For routine tasks like tilling, sowing, harvesting grains, planting, watering, and harvesting fruit, robotic farming has important plant management characteristics that may also be controlled by farm management information systems [10]. Sowing seeds is a crucial aspect of plant care, so autonomous agricultural robot prototypes were developed with this task in mind. A farming device that only requires human input for the distances between crop rows and certain crops. Utilizing IR sensors, plant row identification was made possible [11]. Because of the high plant density and short lifespan of many farmed plants, automation of this process is essential in greenhouses where frequent and extensive planting processes are required. Using the basic guiding framework provided by the iRobot Create platform, automatic cars may move inside a greenhouse and recognize specific plants [12].

The iPlant robot has two arms: one for watering and the other for planting seeds. The second arm has three primary parts: a ploughing tool, a seed container, and an excavation tool [13]. Solutions like the Ladybird robot, which has an electric motor backed by solar panels and can record elements of the environment using a Light Detection and Ranging (LIDAR) laser system, may be used for robotic fertilization [14]. While IR and UV data are gathered using a hyperspectral imaging camera, RGB (Red, Green, and Blue) pictures of the crops are created using a stereo camera (400–900 nm). This robot uses machine learning techniques to assess the condition of the plant. It has a spraying system for fertilizing plants that are connected to a six-axis Universal Robots UR5 robot arm [15]. RIPPA (Robot for Intelligent Perception and Precision Application), a scaled-down version of Ladybird, is now in the construction stage. More study has been done on robotic fertilization, and a robotic manipulator using laser sensors has been developed. It can determine the amount of water and nutrients in the soil and/or plant, as well as the best fertilizer dosage for the plant. This site-specific strategy may increase the effectiveness of nutrient and water use [16].

Technologies have been created and developed for automated and semi-automatic selective plant thinning. Used machine vision to design and test an autonomous multi-purpose device for lettuce thinning, weeding, and variable fertilization. Developed a selective thinning algorithm and contrasted two approaches to sugar beet plant identification [17]. According to their findings, the average width algorithm (AW) detected plants with 88% more accuracy than the mass centre algorithm (MC), however, it took more time to analyse the data. Pome and stone fruit thinning is also an extremely difficult, labour-intensive, and time-consuming process. A peach thinning device that is automated and selective [18].

Additionally, a clamp-like end effector and a prototype robotic manipulator were created and studied for brushing off peach blooms. This program's goal is to provide customers with a core service that includes issue identification, information delivery to help manage the situation, if at all feasible, and recurrence prevention. All sample findings are followed by a written disease diagnosis report, a disease info sheet, and, if necessary, a visit by a crop specialist. In this section, the author has carried out a critical study of the literature-based work used for the diagnosis and categorization of plant diseases [19]. Even though they were

initially designed for agronomic activities like monitoring or harvesting, platforms (UAVs, UGVs, or sensors attached to vehicles or buildings) and manipulators' hardware and software are rapidly evolving [20]. Robotic autonomous navigation inside or above crops and orchards has advanced to very complicated levels, enabling the effective manipulation of whole plants for planting, thinning, or harvesting. Undoubtedly, there is still potential for development, notably in the administration of robot fleets and the coordination of robots with varied task-specific specialities. The development of diagnostic systems should be closely tied to the development of robots since many of the most cutting-edge image-processing methods for identifying plant pathogens are often created and tested apart from robotic application or integration.

2. LITERATURE REVIEW

Jun Liu et al. explained the challenge of detecting plant diseases and pests is described, along with contrast to conventional techniques for doing so. This article describes the research on deep learning-based plant disease and pest detection in recent years from three perspectives: classification network, detection network, and segmentation network. The benefits and drawbacks of each approach are briefly discussed. The performance of previous research is compared after the introduction of common datasets. Based on this, this article explores potential difficulties in real-world applications of deep learning for plant disease and pest identification. The issues are also discussed, and several recommendations are made as well as potential remedies and research directions. Finally, this paper provides an analysis and outlook for the deep learning-based future trend of plant disease and pest detection [21].

Vignesh M et al. explained the availability of skilled plant disease specialists, as well as extra processing time. Maintaining the health of the plants would be the most beneficial thing for farmers. Consequently, plant disease detection uses image processing. Image capture, picture preprocessing, image segmentation, feature extraction, and classification are all processes in the disease detection process. Our robot is solar-connected for power supply, so it will always have a source of electricity. We get an SMS through mobile phones when the taken picture has been processed. The SMS includes comprehensive information on the illness as well as a treatment plan. It will be easier to manage and safeguard huge plant areas and their output [22].

Vijai Singh et al. explored the use of an automatic technique for plant disease detection is advantageous because it lessens the amount of work required to monitor large crop farms and can identify disease symptoms at their earliest stage when they first appear on plant leaves. The automated identification and categorization of plant leaf diseases using an image segmentation system are presented in this work. It also includes an overview of several disease categorization methods that may be used for the identification of plant leaf diseases. Utilizing a genetic algorithm, image segmentation, is a crucial component of disease detection in plant leaf illness [23].Vijay Kumar et al. explored a robot that uses machine learning and image processing to identify leaf illness is in use. This robot also keeps an eye on crop quality, soil moisture, and the quantity of water and pesticides that are needed to achieve a good yield in agriculture. The robot's design makes use of the cutting-edge Latte Panda CPU, which also incorporates a machine-learning model. The feature extraction, segmentation using the Mean Shift Algorithm, and disease classification using the SVM classifier are used to train the machine learning model for image processing. Control of the robot is provided using an Android application. The robot's whole functioning is under the direction of this application. The farmer gets notified by SMS of the current field conditions and disease [24].

3. METHODOLOGY

3.1.Design:

Visual identification of plant diseases is more time-consuming, less accurate, and only practicable in a few locations. However, using an automated detection method will require less work, and less time, and result in a higher degree of accuracy.

Brown and yellow spots, early and late scorch, and other common bacterial, viral, and fungal diseases are all present in plants. Image processing is performed to quantify the size of the diseased region and identify any colour differences. This study is separated into various distinct sub-methods based on the processing characteristics of each kind of method, as shown in Figure 1.

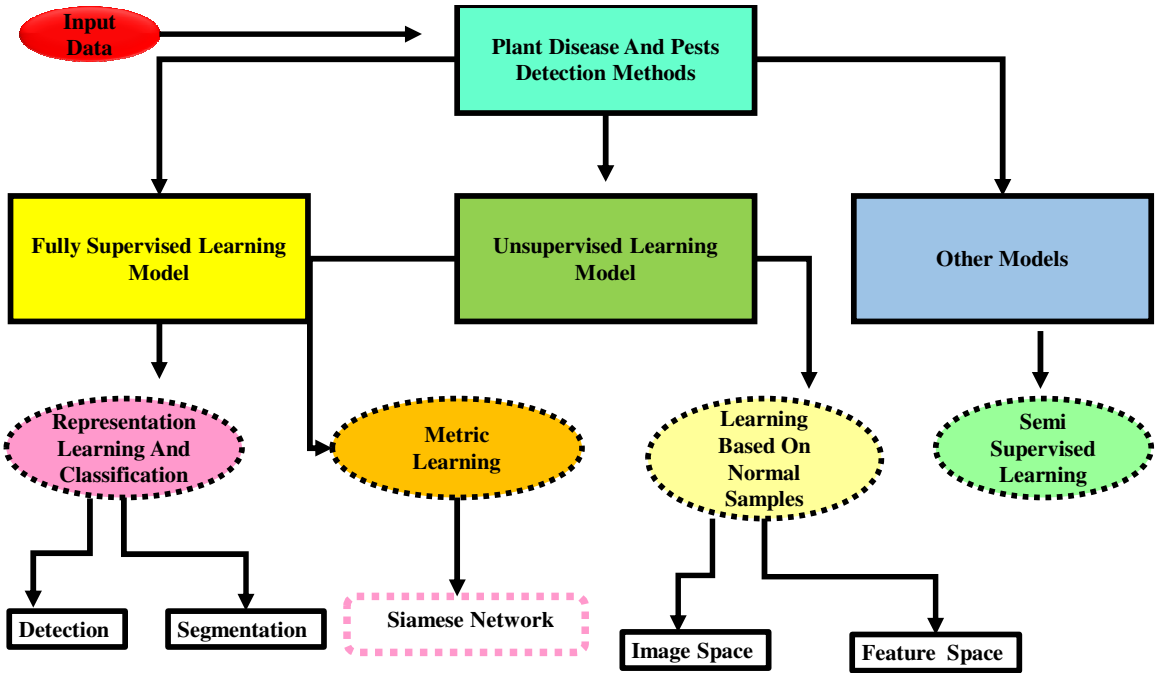

Figure 1: Illustrate the process of the plant disease and pests detection methods.

Experts can identify and detect plant problems with nothing more than their own naked eyes nowadays, according to the current approach for disease detection in plants. This requires a sizable team of specialists and ongoing plant monitoring, both of which are quite expensive when dealing with huge farms. Meanwhile, in other nations, farmers lack access to sufficient resources and even know they may consult specialists. Because of this, consulting specialists is expensive and time-consuming.

The recommended method works well in these circumstances for keeping an eye on vast fields of crops.

It is simpler and less expensive to automatically identify diseases based just on their symptoms on plant leaves. To enable image-based automated process control, inspection, and robot guiding, this also supports machine vision. The main actions involved in picture processing are: Figure 2 illustrates image acquisition, image preprocessing, image segmentation, and feature extraction.

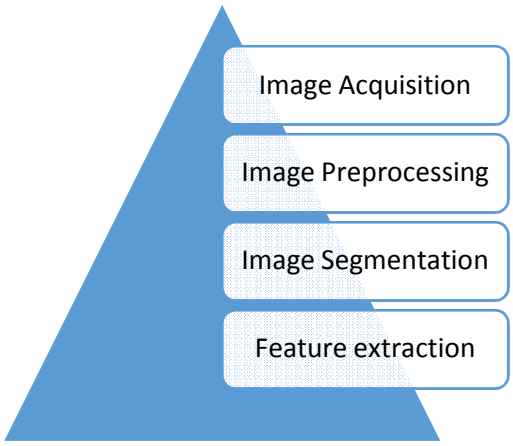

Figure 2: Illustrate the Image Processing Steps in four stages.

3.2.Sample:

Deep learning techniques are now extensively employed in many computer vision applications, and the identification of plant diseases and pests is often considered to be a specialized application in the area of agriculture. There are not enough samples of agricultural plant diseases and pests. Self-collected data sets are laboriously labeled and smaller in size than open standard libraries. The issue of tiny samples is the most pressing issue confronting the identification of plant diseases and pests, as opposed to the more than 15 million sample data in ImageNet datasets. Only a few or a dozen training data are often obtained due to the low incidence and expensive cost of various plant diseases, which restricts the use of deep learning techniques in the detection of plant diseases and pests. In reality, there are now three alternative solutions addressing the issue of tiny samples.

3.3.Instruments:

3.3.1. Support Vector Machine(SVM) Classifier:

Support vector machines are supervised machine algorithms mostly used for regression and classification. When compared to other algorithms, the SVM classifier is one of the most effective algorithms for classification and regression. An algorithm called SVM classifier uses labeled data as input and outputs the best result. Here, the diseases Bacterial Blight, Fusarium Wilt, Grey Mildew, and Leaf Curl are identified using labeled data. The SVM classifier identifies the illness using the extracted characteristics of the specific disease, which are stored in the form of an array, based on this labeled data.

3.3.2. Robot:

The robot has two motor drivers: one drives the machine, and the other controls the shaft that is attached to the soil moisture sensor, which measures the soil's humidity. This link is then connected to the Arduino Microcontroller, which is linked via Bluetooth and allows the farmer to input data using an Android app. The robot consists of a GSM model with a 2G architecture that sends the farmer an SMS with information about the state of the field and any diseases. UART is used for both Bluetooth and GSM communication between Arduino devices, and it is also used for GSM communication. The water and pesticide pumps in Figure 3 are operated by relay switches.

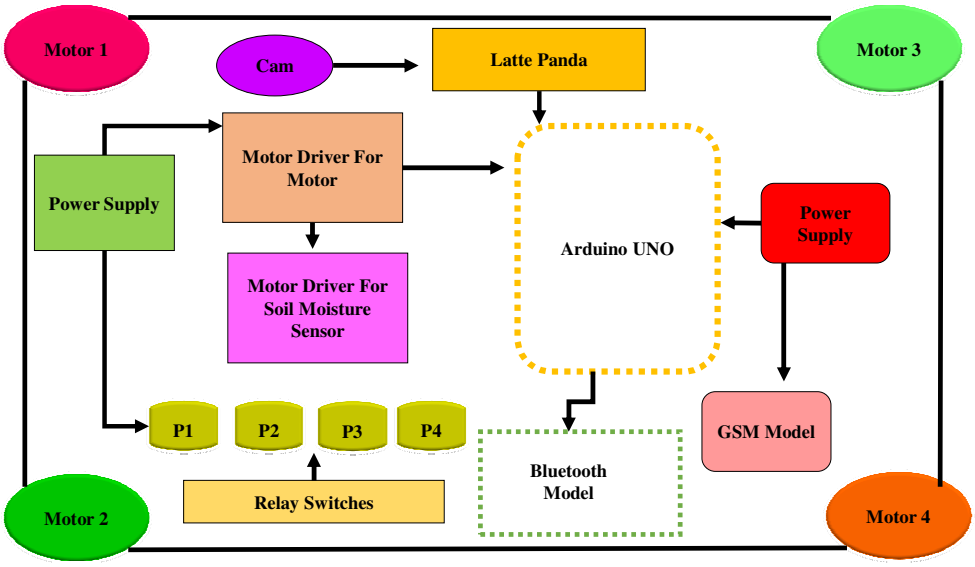

Figure 3:Illustrate the process of the robot with the different stages.

3.3.3. Android Application:

For microcontrollers, Arduino boards, and other devices having serial or UART interfaces linked to an Android smartphone using a Bluetooth to serial converter, there is a terminal or console application called Serial Bluetooth. Different Bluetooth versions, including Bluetooth Classic, Bluetooth LE, Bluetooth Low Energy, BLE, and Bluetooth Smart, are supported by this application. In this instance, the HC-O5 robot is operated using Bluetooth Classic. The table below displays the commands that are passed using this Android application.

3.3.4. Software and Hardware Specifications:

Python was used to develop the DL architectures since it has a wealth of relevant libraries and DL frameworks. MATLAB was utilized to extract the results linked to the diseases. The architectures were constructed using Keras with a backend based on TensorFlow. Installation of the CuDNN library was made since it speeds up training and integrates with TensorFlow. On a graphics processing unit (NVIDIA Quadro K2200) with the following characteristics, all tests were conducted: 80 GB/sec memory bandwidth, 1045 MHz core frequency, and 640 CUDA cores.

3.4.Data collection:

Plant Health Reporting System is used in the data gathering and logging process (PHRS). This computer application may be used to look up information on particular illnesses and to keep track of both emerging and persistent diseases. All pest levels are tracked for the Crop Specialists, Pest Hotlines, and farmers using the data collecting system (PHRS). Farmers may use timely information on pest levels to make wise judgments about the use of suitable control techniques and management strategies.

1. Collect a fresh sample that includes a variety of specimens, from healthy to diseased tissue.
2. Include the root system and as much of the plant as is practicable. To prevent the root system from drying out and dirt from infecting the leaves, place it in a separate plastic bag.

3. Put the samples in the proper bags: paper bags for the tubers and plastic bags with a moist paper towel and air for the leaf tissue.
4. Protect samples from crashing, freezing, and heat while keeping them cool and moist.

Using deep learning technology, it has been possible to identify certain plant diseases and pests. There is now a theoretical foundation for the identification of certain illnesses and pests thanks to the continued development and extension of several image recognition algorithms. The collection of picture samples, however, came mostly from the identification of disease spots, insect appearance traits, or the classification of insect pests and leaves in earlier research. The majority of study findings are restricted to lab settings and only apply to the pictures of plant diseases and pests available at the moment. The primary cause of this is that plant development is cyclical, ongoing, seasonal, and local. Similar to this, a disease or pest may exhibit various traits depending on the stage of growth of a crop. Distinct regions have different representations of various plant species. As a consequence, the majority of current study findings are not conclusive.

The veracity of the information gained at subsequent times cannot be guaranteed, even with a high recognition rate in a single experiment. The majority of current research is based on images produced in the visible spectrum, but electromagnetic waves outside of the visible spectrum also contain a wealth of information. As a result, it is important to combine diverse information, including visible light, near-infrared, and multi-spectral data, to acquire a dataset on plant diseases and pests. Future studies should concentrate on the multi-information fusion approach to gather and identify information on plant diseases and pests. Additionally, picture databases of many plant diseases and pests in authentic natural settings are currently in the unpopulated stage. The data information acquisition platform, which performs large area and coverage identification of farmland and makes up for the lack of randomness of image samples in prior studies, should be fully utilized in future research. Examples include the agricultural internet of things monitoring equipment, portable field spore auto-capture instrument, and unmanned aerial vehicle aerial photography system. Additionally, it can guarantee the correctness and completeness of the dataset and increase the algorithm's generality.

3.5.Data Analysis:

Since this area of study is very new, significant advancements are always being made. For certain disorders, but not all or at all phases of disease progression, diagnostic specificity may be comparable to traditional diagnostic techniques. Based on the application and needs for plant protection, we need to further examine the inherent limits of image processing methods and technologies for plant disease identification. Robots may do the role of highly skilled pathologists who can remember hundreds of photos and provide a diagnosis. We must take into account the likelihood that data mining and image processing may not be sufficient for all pathogen/host/environment combinations. The further development of manipulators and sample equipment may be a parallel area of study for improving robotic pathologists, moving the research emphasis from experienced robotic observer to robotic observer and analyst. Several stages must be taken to create DL models, from gathering information to creating graphical mappings, as shown in Figure 4.

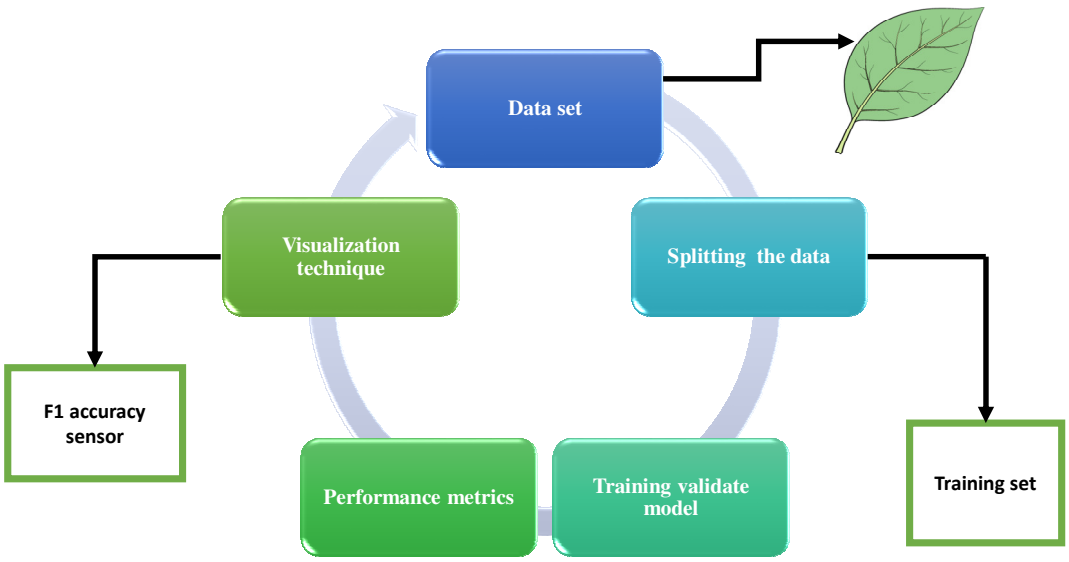

Figure 4: Illustrate collection of datasets to visualize mappings of plant diseases.

3.5.1. Feature Extraction:

An image has many characteristics, primarily colour, texture, and shape. The colour histogram, Hu moments, and Harlick features are the three that are being considered here. The similarity in texture to color, shape, and texture can be used to identify plant diseases. Finally, different measures, which were unique to the model employed in each research, including sensitivity, precision (P), recall (R), quality measure (QM), and F1-score, were used to assess the models for diagnosing and categorizing crop diseases. The following may be computed as the statistical assessment metrics used to examine the quantitative performance of crop disease detection models with deep and transfer learning:

$$\text{Precision} = TP / (TP+FP)$$

Where,

i. *Precision (P)* is the ratio of true positives (TP) to all relevant findings, which includes both TP and false positives (FP). P is averaged across the classes for situations involving multi-class categorization.

$$Sensitivity = TP / (TP+FN)$$

Sensitivity/Recall (R) is the ratio of true positives to all true negatives and false positives (FN). R gets the average of all classes for situations involving multi-class categorization.

$$Specificity = TN/ (TN+FP)$$

ii. *Specificity* is the ratio of samples that are negative (TN) to all healthy samples (true negatives and false positives). This metric is used to assess how well a given model performs in predicting genuine negatives.

$$Accuracy = TP+TN/ (TP+TN+FP+FN)$$

iii. *Accuracy* is defined as the ratio of properly identified samples to all samples that were classified. This metric is used to evaluate a proposed model's overall performance.

$$F1\_score = 2 \times (Sensitivity \times Precision) / (Sensitivity + Precision)$$

The harmonic average of recall and accuracy is known as the F1 score. F1 is averaged over all classes for issues involving multi-class classification, where:

a. *TP:* reflects the amount of absolutely accurate true positive picture samples that are infected.

b. *FP:* is the quantity of improperly categorized false-positive image samples.

c. *TN:* is the number of true-negative image samples that are correctly classified as healthy.

d. *FN*: is the number of false-negative image samples that are incorrectly identified as uninfected.

4. RESULT AND DISCUSSION

The Plant dataset, which includes 54,306 pictures of 38 distinct healthy and sick leaves connected to its 12 plant species and comprises the training data for all the DL models, contains some of the plant illnesses seen in Figure 5. The photos were resized to 224 x 224 x 3, and normalization was taken into account by dividing the pixel values by 255 to make them appropriate for the starting values of the models. To prevent overfitting, the dataset was partitioned into training, validation, and testing datasets, each with a 60%, 25%, and 15% weighting. The trials are all carried out in MATLAB.Data collection is the first phase in our system's processing, followed by several pre-processing and feature extraction procedures that enable us to eventually diagnose illnesses from images. The overview of our suggested system is shown in Figure 6. Images from the dataset depict several plant diseases in a variety of different plants. In this system, crops including sugarcane, cotton, potato, carrot, chile, brinjal, rice, wheat, banana, and guava are taken into account along with cereal crops, vegetable crops, and fruit plants. For the aforementioned crops, leaves in both good and bad condition were gathered from a variety of sources, including photographs downloaded from the internet or just by shooting pictures with any camera equipment.

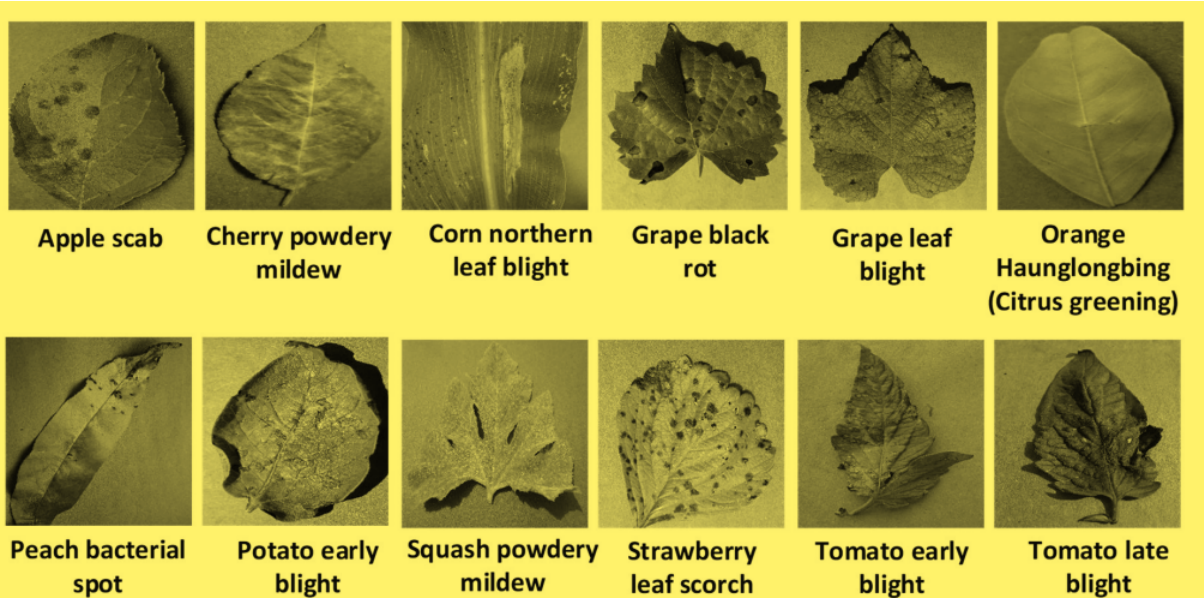

Figure 5: Illustrate the plant species and some of the plant diseases.

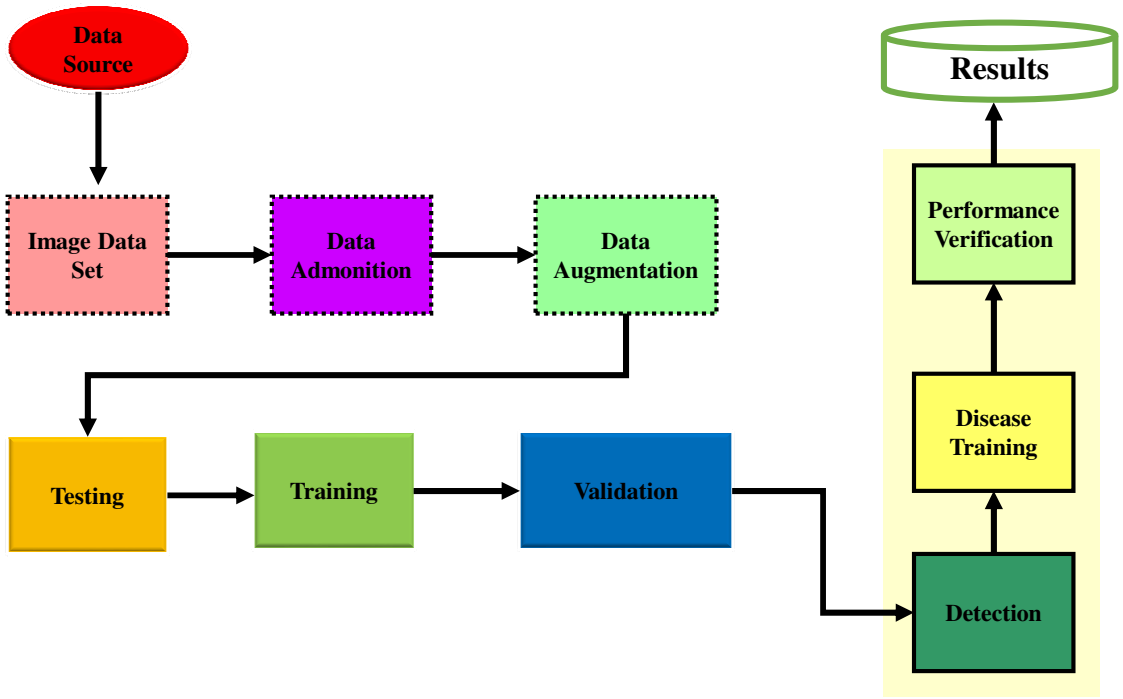

Figure 6: Illustrate the proposed system for detecting plant diseases.

4.1.Challenges for Robotic Plant Management:

The concept of a PEIS-Ecology, or Ecology of Physically Embedded Intelligent Systems, may be used to guide automated plant management systems. According to this perspective, having a network of cooperative robot devices integrated into the environment is preferable to having a highly capable robot in a static setting. This is an example of an ecological viewpoint on the relationship between robots and their surroundings, wherein the robot and its surroundings are seen as components of the same system that are working toward a common objective; this viewpoint is especially appropriate for greenhouses or clearly defined environments like gardens. In this context, a robot (or PEIS) is meant to be any device having certain processing and communication capabilities that can communicate with other devices and interact with the environment using sensors and/or actuators. Each component of PEIS may utilize the functions of other PEIS thanks to their connection through a standardized communication mechanism for transferring information.

A similar concept might be used in the agriculture industry as well, especially in highly regulated environments like greenhouse horticulture. Using a conventional method, the robot would self-localize, identify and recognize plants, measure soil moisture, and irrigate the plants using its sensors to get information from the surroundings. In contrast to the PEIS method, the robot will gather data from the environment, such as calculating its relative position in the garden or greenhouse (using cameras, for example), identifying plants by RFID (Radio Frequency Identification Device) tags attached to or inserted in the plants, monitoring soil moisture, and wirelessly transmitting data to an automated irrigation system. Because agricultural "things" are pressured by several physical factors (heat and light, soil and sand, water, etc.), the less sophisticated robotic devices utilized in this concept seem to work well in the setting. This enables an expansion of maintenance services.

Open-field robotic management is a challenging undertaking, primarily because there is little control over the environment, a high maintenance effort for high-tech equipment, and

incomplete awareness of items inside the robots' operating range. Therefore, agronomic duties like weed control are the primary roles of robots used in open-field applications. The use of Unmanned Aerial Vehicles (UAVs), whose applications are many and extremely promising for plant health monitoring, presents a new difficulty in precision agriculture, however. UAVs may be used to diagnose agricultural nutrients via spectrum analysis or to identify plant diseases and abiotic crop disorders like rice lodging. The ability of UAV systems to identify pathogens in crops has also been investigated. By examining the crop canopy or looking for drops in chlorophyll levels, pathogens may be found (commonly expressed as a reflectance decrease in the near-infrared band). When viruses cause a broad assault on crops, this strategy seems to be successful for monitoring applications for abiotic stress. This strategy should be taken into account for remote sensing applications rather than robotic illness management, where the robots identify and treat the ailment, at this point of development. Using aerial (UAV) and ground robots, disease diagnosis and control in wide areas (rather than only in well-defined locations) might be accomplished (Unmanned Ground Vehicles, UGVs). In this research, spectral pictures were gathered by UAVs, which were then analyzed to find "critical" locations. Wirelessly receiving this data, the UGV moved to the "essential" locations to collect and analyze leaf samples. The UGV initially used a spectral camera to analyze the strawberry plant. If it was determined that the plant was "diseased," it next used a manipulator and web cameras to locate the leaves to gather leaf samples.

5. CONCLUSION

Developing automated and robotic systems for urban farming, agriculture, and forestry is now possible because of the quick development of new technologies and the evolving online environment (such as the Internet of Things (IoT), Internet of All, and cloud-based solutions). Robotic systems and intelligent technologies for precision agriculture have been developed and put into use thanks to advancements in machine vision, GPS, laser technology, actuators, and mechatronics. Here, we discuss developing agricultural technology for intra-urban agriculture as well as robotic applications for plant pathology and management. The past several years have seen significant advancements in greenhouse advanced management systems and technologies, incorporating IoT and WSN (Wireless Sensor Network). For automated and robotic farming, machine learning, machine vision, and AI (Artificial Intelligence) has been used and deployed. Machine vision/learning-based intelligence systems have been created for plant disease detection and identification in addition to planting, watering, weeding (to some degree), pruning, and harvesting. The automatic detection and classification of plant leaf diseases using image segmentation are presented in this paper. It also includes an overview of several disease categorization methods that may be used for the identification of plant leaf diseases. Despite this, detecting plant diseases continues to be a fascinating problem under biotic and abiotic stress. Plant disease symptoms have been successfully identified using numerous recognition techniques and technologies, but the majority of them still need a controlled environment for data collection to prevent false positives. Machine learning techniques, such as deep learning and transfer learning, show promise for enhancing picture processing and identifying plant symptoms. However, the development of mechatronics and robotic disease management solutions should be driven by the challenge of diagnostic specificity in microorganism control.

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CHAPTER 20

AN ANALYSIS OF THE CHALLENGES FACED BY THE INDUSTRIES 4.0 AND ITS DEPLOYMENT IN THE MANAGEMENT

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ABSTRACT: A new industrial revolution focusing on cyber-physical systems is denoted by the term "industry 4.0." It asserts that new enabling technologies and the real-time integration of hardware and software systems will alter how work is carried out and, therefore, how work should be managed. The typical operational trade-offs between the competitive goals of cost, flexibility, quickness, and quality may be broken, or at the very least altered. The technologies that underpin Industry 4.0 are discussed in this paper, along with the potential and difficulties that exist for related research. The emphasis is on sectors that produce things, which include both the industrial and agriculture industries. Production process, the internet of things, block chain, sophisticated robotics, and artificial intelligence are some of the specific technologies covered.

KEYWORDS:Industries 4.0, Management, Software Systems, Technology.

1. INTRODUCTION

The phrase "Industry 4.0" is now popular organizations are attempting to include sustainability components into their daily operations in recent years. As opposed to that, In addition to assuring a sustainable evolution in company, companies struggle to satisfy consumers' constantly changing demands . Industrial managers are using cutting-edge technology like 3D printing, the Internet of Things, data analytics, and Industry 4.0 in order to foster a creative company environment. Supply chain management (SCM) behavior is being drastically changed by these technologies, such as Industry 4.0. Industry 4.0 is a sustainability-focused concept that aids economic managers in integrating sustainability safeguarding and control initiatives as well as process safety measures in their supply chains, such as waste prevention, workplace and community welfare, and smarter and more flexible processes [1]–[4].

Production of commodities and services advanced dramatically and disruptively thanks to mechanization, electrification, and computers, respectively. The German economic development organization GTAI is credited with coining the term "Industry 4.0," which promotes the notion that a new industrial revolution is just getting started thanks to the emergence, development, and interconnectivity of a handful of technologies that permit for a nearly solid relationship between the physical and digital realities. The Internet of Things (IoT), block chain, advanced artificial intelligence, Artificial Intelligence (AI), and other related technologies are driving this digital-physical marriage, which "is gathering force and will be far reaching, affecting every corner of the factory and the supply chain". The technologies that underlie the idea of "Industry 4.0" have the potential to lower costs, increase flexibility, speed up production, and eliminate defects, but even more than that, they also hold the promise of lessening the inherent conflicts between these important operational goals.

Industry 4.0 requires participation from the academic Operations Management (OM) community. From an educational standpoint, we must provide our students with the information and abilities necessary to handle the new supply chain and operational realities that will arise. From a research standpoint, we must investigate whether and how the technologies underlying Industry 4.0 challenge our understanding of operations. In addition, we must recognize the novel and significant operations questions that will arise as a result of the adoption and advancement of these technologies [5]–[8].

With the combined aims of increasing knowledge of Industry 4.0 in the OM community and (ii) stimulating OM research in this area by outlining potential and difficulties, we address many of Industry 4.0's core technologies in this. In order to achieve these objectives, we will concentrate on the operational consequences of these underlying technologies and purposefully exclude other potentially significant sectors, such as applications in the medical and financial fields. Furthermore, we will focus on producing actual goods rather than providing services, in line with the spirit of the phrase "Industry 4.0." The line between products and services is, of course, sometimes muddled by the increase of product servitization, a tendency that may be amplified by Industry 4.0. Figure 1 discloses the industry 4.0 and its uses with application.

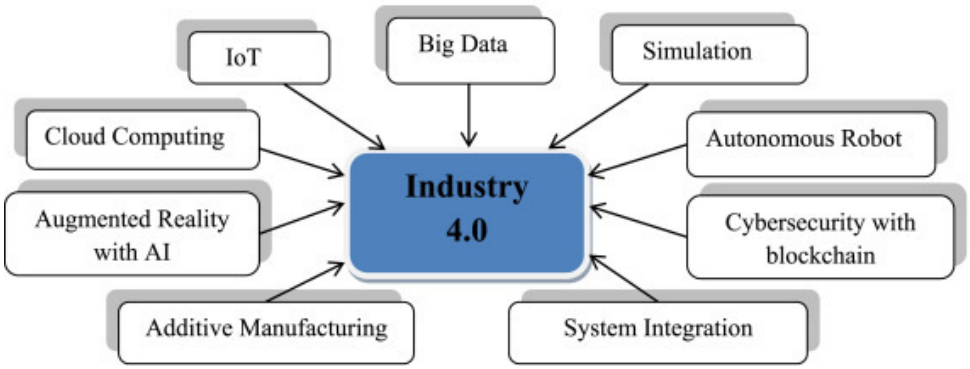

Figure 1: Discloses the industry 4.0 and its uses with application [9]**.**

2. LITERATURE REVIEW

Xu et al. in their study embellish that in the last ten years, the German effort known as "Industry 4.0" has gained international recognition. Similar strategic efforts have been established by other nations, and a significant amount of research has gone into establishing and implementing some of the industry 4.0 technologies. The European Commission unveiled Industry 5.0 10 years after the launch of Industry 4.0. While Industry 5.0 is seen to be value-driven, Industry 4.0 is thought to be technology-driven. The coexistence of two Industrial Revolutions raises issues, which calls for debates and explanations. We decided to utilize five of these questions to organize our arguments, and we made an effort to be objective when choosing the informational sources and while having debates about the important problems [10].

Ling et al. in their study illustrates that Malaysian manufacturers are amateurs who lack a good knowledge of the principles and practises of Industry 4.0, despite the country having one of the strongest industrial economies in ASEAN. By performing literature research, the goal of this article is to identify the problems and difficulties of Industry 4.0 from the perspective of industry-based businesses. The contrast between the issues outlined in the Malaysian National Policy on Industry 4.0 and those suggested by earlier research of other nations was also addressed in this paper. This paper is a survey of the literature on earlier research about difficulties or problems with the adoption of Industry 4.0 from 2019 to 2020.

The adoption of Industry 4.0 into industrial organisations is facing a total of 11 difficulties [11].

Felsberger et al. in their study embellish that Sustainability, an increasing issue for international manufacturing companies, has enormous potential with Industry 4.0. This study looks at how Industry 4.0 deployment has affected the sustainability aspects of European manufacturing sectors, with a focus on digital transformation. In order to gain a lasting competitive advantage, we then provide a methodology to assess the consequences of Industry 4.0 on the firm's current and emerging dynamic capabilities, skills, and market needs. We examine six European manufacturing firms using a multiple case research approach, including aerospace manufacturing (AM) and electronic component and systems (ECS) manufacture.

3. DISCUSSION

Consumer electrical devices depend on ferromagnetic semiconductors and process and communicate information via a regulated flow of electric charges. On the other hand, spintronic devices use the spin of electrons to produce and regulate charge currents as well as to interconvert electromagnetic signals. Spintronics might complement and, in some situations, exceed semiconductor-based electronics by integrating handling, storage, detecting, and logic on a tightly integrated platform, delivering benefits in terms of scale, power consumption, and online analytical speed.

The field of spintronics was introduced by the 1988 discovery of gigantic magneto resistance (GMR), for which “Albert Fert and Pet” later receive the Nobel Prize in Physics. Since then, a wide variety of phenomena have been investigated, such as the performance of nanowires magnetic systems over electric currents, the interaction of charge and spin transport, and spin dynamic behavior in magnetic and nonmagnetic systems. Large-scale commercial applications have already been produced by the field; GMR-based spin injectors and gravitational tunnel junctions (MTJs) were used as magnetic field sensors in tape and hard disc drive read heads, as proximity or position sensors in automobiles, automated industrial tools, and biomedical devices.

The progression of scalable compounds magnetic permutation memories has also been facilitated by the discovery of spin-transfer torque (STT) and spin-orbit torque (SOT) in MgO-based MTJs, as well as giant tunneling magneto resistance (TMR) in MgO-based MTJs and large interfacial magnetic surface characteristics at magnetic metal/oxide interfaces (MRAMs). Due to benefits like simple integration with complementary metal oxide semiconductor (CMOS) technology, low energy consumption, quick switching, and superior endurance, commercial STT-MRAMs are now used as a replacement for embedded flash (eFlash) memory or static RAM (SRAM) in embedded cache memories [12]–[14].

Industry 4.0 is one example of the cutting-edge technological change taking place in the globe. Many technologies, including big data analytics, are available to help industrial businesses adopt Industry 4.0. (BDA), industrial robots, simulation, agricultural internet of things, cybersecurity, cloud technologies, additive manufacturing, augmented reality, machine learning, etc. In order to embrace Industry 4.0, several businesses are incorporating such technology into their manufacturing systems. As an instance –, Google, Amazon, and Netflix employed BDA to track the decision-making process of their customers. BDA tools aid in the analysis of actual data to increase productivity and lessen the degree of ambiguity in the decision-making process. This tool assists several businesses, including those in pharmaceutical, healthcare, chemical, and automotive, in improving the sustainability and efficiency of their supply chains.

A major technology for the Industry 4.0 journey is the autonomous robot.In regions where employees are incapable or constrained, an autonomous robot enables businesses to function more precisely. Many businesses use autonomous robots in their industrial facilities. For instance, Rethink Robotics utilised a "Baxter" robot for packing operations, Gomtec used a "Roberta" robot for effective automation in manufacturing, and Kuka used a "Kuka LBR iiwa" robot for delicate industrial duties simulation is the imitation of the manufacturing processes of a real-world system in machinery, people, and products. It is extensively employed in many different domains, including scientific modelling for operational system visualization and environmental engineering for system security. Examples of these fields include technology simulation for optimizing the design process. To simulate process cycle time, theory construction, energy consumption, and efficiency, both two- and three-dimensional simulations are increasingly often utilized in industrial tasks. It is clear that using simulation in the transition to Industry 4.0 might minimize waste output, production downtime, and production failure rates/quantities. Figure 2 discloses the onsite and on demand model of the industry 4.0

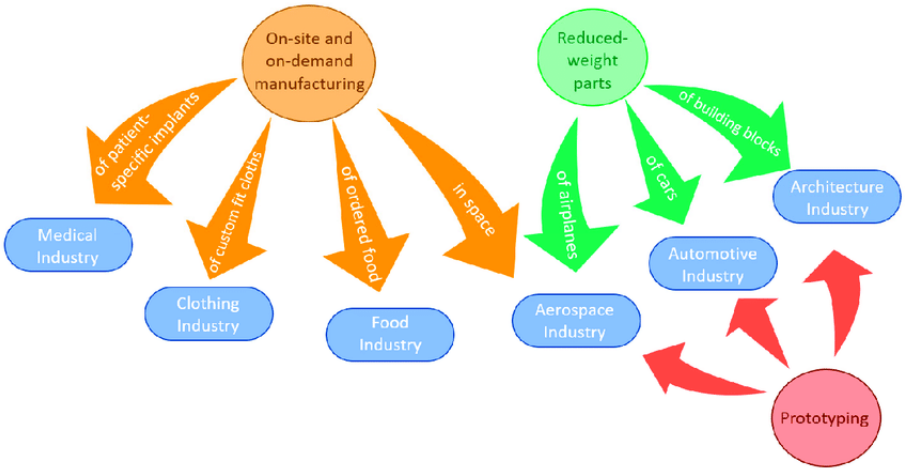

Figure 2: Discloses the onsite and on demand model of the industry 4.0 [15]**.**

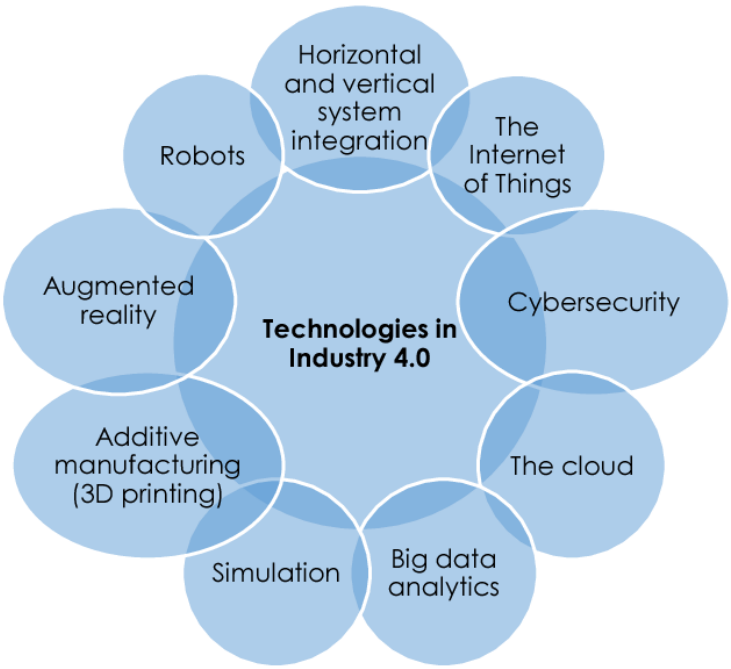

Figure 3: Illustrates the application of the technologies and the industries [16]**.**

Internet of things (IoT) has made a substantial contribution to the industrial sector's march toward Industry 4.0. IoT is often described as an industrial internet, in which communication technologies, the Internet of People (IoP), the Internet of Services (IoS), and the Internet of Manufacturing Services (IoMs) are all connected to support the production system IoT facilitates the integration of data for operational purposes from the virtual world, which may support industrial processes for continuous improvement. IoT-based software is utilized for machine planning and control that is intelligent. Figure 3 illustrates the application of the technologies and the industries.

Implementing Industry 4.0 has significant challenges in terms of cyber security. Industry 4.0 requires connectivity and the usage of standard communication protocols for operational purposes. More secure, complex, and dependable frameworks for machines and operators are required in order to defend the industrial production system from cyber security risks. Connecting physical systems to digital data is crucial in the industry 4.0 journey for system optimization, planning, and quality inspection in the construction sector. The cyber-physical system aids in integrating the physical and digital worlds. Data mining aids in route prediction while smart vehicles based on cyber-physical systems are utilized in the industrial sector to manage warehouses.

Businesses of today rely heavily on real-time data processing and data storage. Cloud computing aids in Industry 4.0 by storing such real-time, huge data that is gathered from multiple sources for the purposes of industrial manufacture. To make the manufacturing facility run more smoothly, it may be helpful to connect and exchange communication equipment amongst companies. By connecting businesses from other nations through cloud computing, the idea of digital manufacturing may be realized.

Technologies based on additive manufacturing, such as selective laser sintering (SLS), fused deposition method (FDM), and selective laser melting (SLM), are used to speed up and reduce the cost of the manufacturing operation. With design optimization, it enables manufacturing organizations to make a limited number of bespoke items. Manufacturing additives may also benefit in reducing stock levels and travel lengths. The needs of consumers are evolving daily, and additive manufacturing assists in meeting those needs by routinely modifying the design of items. To swiftly meet client demand, many manufacturing organizations now employ additive manufacturing systems [17]. As an example, several automobile sectors, such as Local Motors in the United States, adopted design and manufacturing systems to allow them to become more responsive. Figure 4 discloses effect of the tracking and the real time monitoring.

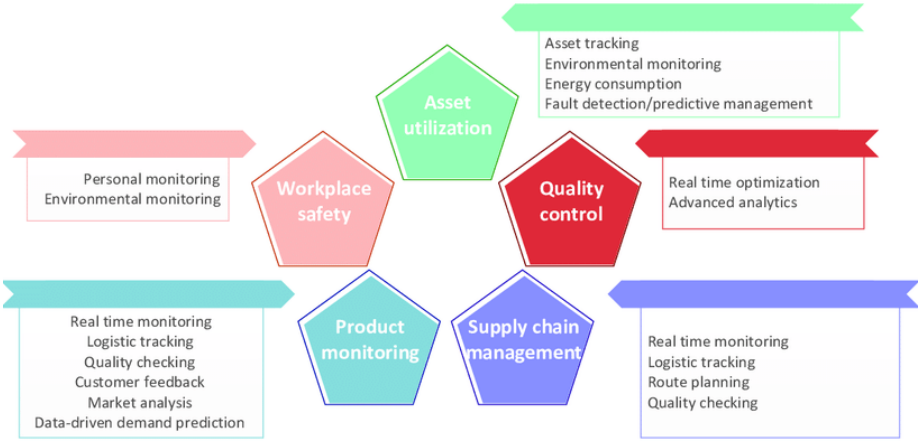

Figure 4: Discloses effect of the tracking and the real time monitoring [18].

However, further advancements in the development of materials, techniques, and circuits are needed if spintronic devices are to fulfil the rising requirements for high, slightly elevated, and low power electronic components. Recent advances include the creation and release of energy of charge, spin, heat, and optical signals based on non-equilibrium spin-orbit interaction phenomena, including the spin Hall and Rashba-Edelstein effects, or their thermal, and equivalents. Any magnetic substance, whether ferromagnetic, ferromagnetic, or antiferromagnetic, including metals, semiconductors, and insulators, may be excited by SOT in particular.

4. CONCLUSION

This is the initial acknowledged research to examine how Industry 4.0 may affect current people management techniques, and it adds to our understanding of the subject in various ways. It primarily emphasises the need of adopting a more dynamic and systemic approach, acknowledging the interrelatedness and interdependence of various personnel management approaches. The effect of tailored employee engagement interventions may be lessened by dynamics in the larger talent system, despite the fact that distinctive and customized talent management is required to maximise organisational resources noted that the presence of supporting internal networks is likely to limit the capacity of "star" external recruits to have an influence on organisational performance. Equally as important, a strong emphasis on hiring and attracting talent as a way to satisfy resource demands may be balanced by higher employee turnover if this translates to a de-emphasis on the growth of current personnel.

Additionally, middle management has been generally disregarded as a talent pool despite having great strategic value and the capacity to differentiate performance in this environment given the crucial role they play in successful change management and the development of others. This highlights the need of challenging biases and heuristics that may be used to identify talent. In fact, this is in line with other writers' claims that, in practise, "Key stakeholders' informed preferences and prejudices sometimes overly impact talent judgments". Technology is now surpassing people's and organisations' capacity to adapt, and it is projected that this scenario will only worsen as a result of the present rate of change brought about by Industry 4.0. In order to significantly boost talent pipelines, talent management processes may need to undergo more of a revolution than an evolution.

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CHAPTER 21

A COMPREHENSIVE STUDY ON THE IMPACT OF TECHNOLOGY ON THE BANKING SECTOR AND ITS EVOLUTION

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ABSTRACT: This study would examine how e-banking affected customer attitudes on the value of online services. In order to significantly alter the operational environment of banks, information technology and communications networking systems were implemented. Some banks have already introduced novel systems thanks to technology. Products including ATMs, Telebanking, Home Banking, "Anytime" and "Anywhere" Banking, etc. are provided to their consumers. The structure of the banking business has changed as a result of changes brought about by IT Information technology, new products, and more sophisticated consumers, shifting cost structures, and increased competitive pressures. Customers of banks have seen the benefits of the technology solutions that institutions have employed. The advantages of technology are that consumers of banks now have a virtual menu of possibilities when it comes to distribution methods. A variety of cards, automated teller machines, electronic-based funds transfers, internet banking, and mobile banking are just a few of the most recent technology-based payment solutions that have gained widespread acceptance among the Indian banking public, with the most obvious benefits occurring in the areas of payments for retail transactions.

KEYWORDS:Banking, Banking Sector, Customer, e-banking, Technology.

1. INTRODUCTION

Due to its interesting properties, graphene has become a popular substance in contemporary chemistry and physics. Since its initial isolation, scientific research into its production processes and associated uses has advanced in an encouraging way, indicating that graphene will transform the industry with its exceptional qualities. The industrial manufacture of graphene for commercial uses, including as electronics, defense, healthcare, and energy, has been pursued by a number of start-up businesses. By 2022, the graphene market is expected to be worth more than £150 million worldwide [1]–[3]. Graphene hasn't exactly become a commercial hit overnight, though the target market will only be attracted by materials that meet application-specific criteria and provide compelling advantages over competing products. The dearth of advanced composite products with compelling qualities and performance to fulfil application-dependent criteria during the incubation phase, for instance, significantly hampered the industrialization of the material.

At the time, the only industries in which carbon fibres could be used were those of fishing poles and brassy golf clubs. The development in the synthesis of high-grade carbon fibres during the ensuing years, particularly in recent decades, has secured extensive commercial uses, including the civil engineering, military, automotive, and aerospace industries. In light of the road taken by carbon fibres to widespread commercialization, persistent attempts to enhance material production and realize genuinely competitive applications may help graphene.

1.1.Graphene Production Methods:

For industrial-scale applications, the method for mass-producing graphene must be capable of providing the required numbers while guaranteeing consistent quality. But current graphene

production methods are still inefficient and pricey. Figure 1 discloses the open banking movement and the closed ecosystem.

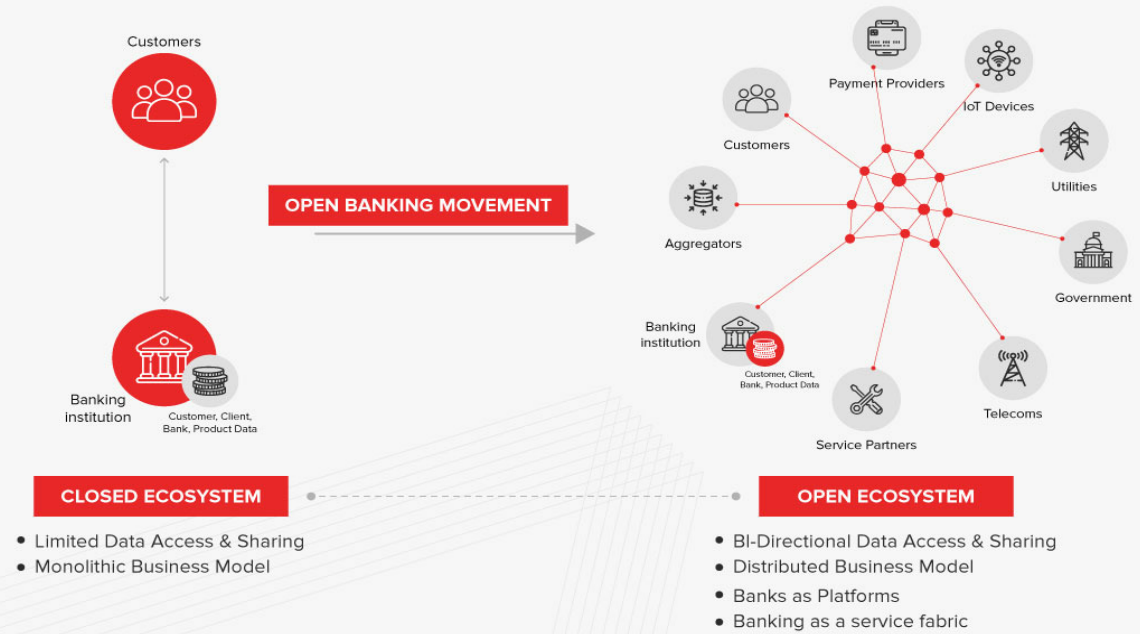

Figure 1: Discloses the open banking movement and the closed ecosystem [4]**.**

According to the production techniques, the worldwide market for graphene and its derivatives may be classified into three main product categories graphene nanoflakes (non-oxidized), graphene oxide (GO) or reduced GO (rGO), and graphene films. Raw graphite may be exfoliated to create Nano flakes of graphene. Sonication and shearing are often used to generate the energy needed to overcome interactions between the graphite layers. The accepted of the graphite none this method invariably results in a broad thickness dispersion and poor exfoliation effectiveness.

For a higher-yield exfoliation, graphite may be expanded with increasing interlayer distance using a non-oxidation intercalation process. For a variety of end-user applications that call for high thermal and electrical conductivity such as conductivity compounds and fillers in batteries and composites, graphene Nano flakes produced by liquid-phase exfoliation have shown tremendous potential. Graphite oxide is initially created by treating it with oxidizing chemicals like sulfuric and nitric acid to generate hydroxyl or carboxyl groups covalently bound to a planar carbon network of graphite. Following exfoliation, it becomes a few-layer or even monolayer GO with a high density of defects. GO is a significant product category in the graphene industry since it is a water-soluble substance [5]–[8]. By further reducing GO, which removes the majority of its oxygen-containing functional groups and partly recovers its sp2 -bonded carbon network, small-size graphene sheets may be produced. However, rGO is much more disordered and of worse quality than non-oxidized graphene Nano flakes because it has many vacancy defects and Stone-Wales defects. Commercial applications for the rGO product include thermal dissipation coatings, conductive additives, and mechanical reinforcement for composite materials.

On a metal surface at a high temperature, Chemical Vapour Deposition (CVD) may create high-quality, large-area continuous graphene films. This growing approach allows for precise control of graphene thickness, although it still has a significant energy and financial cost. A significant percentage of the cost is made up of the metal substrate and the power needed for heating. Two industrially applicable techniques, namely batch-to-batch (B2B) and roll-to-roll

(R2R) processes, have been proposed for the CVD manufacturing of graphene films: large-scale batch growth and continuous growth. Figure 2 embellish the different participant and the accounts.

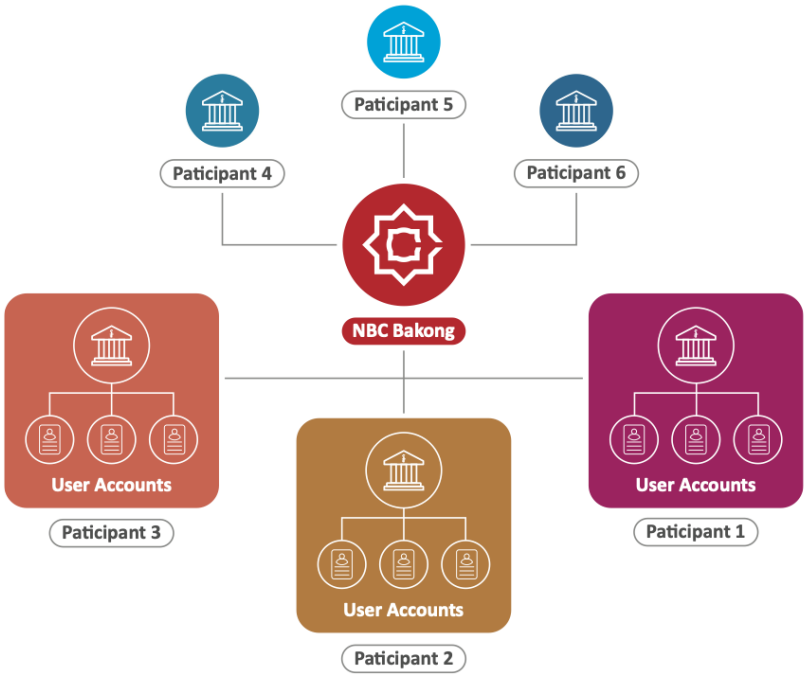

Figure 2: Embellish the different participant and the accounts [9]**.**

Inch-sized graphene wafers and continuous graphene films are the two commercial categories of graphene products that these two industrially viable growth techniques define. While inch-scale graphene wafers demonstrate superior quality and homogeneity, continuous graphene offers benefits in terms of scalability and affordability. As a result, continuous graphene films may be used to create transparent conductive films (TCFs), and graphene wafers might be used to make electrical devices.

Additionally, high-quality films with homogeneous crystallographic orientation, precise monolayer controllability, and suppression of wrinkle formation on a wafer scale are provided by the epitaxial development of graphene on the Si face of SiC. SiC wafer reuse and graphene transfer are required due to the high cost of SiC wafers and subsequent device integration. While waiting for the manufacturing cost to drop, the primary uses of SiC-derived graphene remain focus on electronics and radiofrequency transistors.

2. LITERATURE REVIEW

Abdelraheem et al. in their study embellish that the goal of this work is to examine how digitalization gathering, organizing, storing, and transferring data and information affects the quality of financial information via a field study of the Nile Bank in Sudan. To perform the field study, the researchers used a descriptive analytical technique questionnaires were given away by the researchers, and of them were collected. The research came to the conclusion that factors related to information technology (such as gathering, processing, storing, and transferring data and information) had an influence on factors related to the quality of financial data(relevance, reliability, understandability, consistency, comparability [10].

D. F. Sittig et al. in their study embellish that to guide healthcare organizations, health information technologies developers, analysts, politicians, and funders in concentrating their efforts on patient safety-related health information technology, we identify and characterize

nine critical, short-term concerns. These challenges are divided into categories based on the stage of the health information technology lifecycle they occur in. They include creating models, methods, and tools to enable risk assessment; creating conventional user interface design attributes and functions; ensuring the safety of software in a communicated, system clinical environment; implementing a strategy for unquestionable remote diagnosis Design and Development stage; and evolving a methodology to develop a method for unambiguous health records monitoring, Evaluation, and Optimization stage [11].

Abbas et al. in their study embellish that in relation with IT-based firms, this article attempts to highlight the significance of knowledge business units and young engagement in entrepreneurial endeavours. In order to get a thorough understanding of the purpose, motivation, and capacity to engage in IT-related entrepreneurial endeavours, the data was gathered utilising a questionnaire from final year Bachelors students studying entrepreneurship and computer sciences. The study's results, which were analysed using descriptive statistics, show that final-year graduates have a strong desire to start their own businesses. It has been shown that they are driven to launch their own businesses, even modest ones. In order to support and encourage entrepreneurship, SMEs should pay particular attention to information technology enterprises [12].

In this paper, the author elaborates the researchers distributed questionnaires on analytical procedure, and a collection of them was made. The study led to the conclusion that aspects of the quality of financial data such as relevance, dependability, understandability, consistency, and comparability were influenced by facets technology such as collecting, processing, collecting, and transmitting data.

3. DISCUSSION

Positive effects of technology on the banking industry, digitization is the largest change that has occurred in banking. The banking procedure is now more dependable and quicker than before. Document and record upkeep and retrieval have been quicker and simpler. The basic financial system is enhanced by computerized banking. With the help of the CBS core banking system, all branches are linked together and have access to the same centralized data. The MICR cheque compression algorithm innovation has made processing checks quicker and more effective than before.

The government introduced Unstructured Supplementary Service Data (USSD) so those without internet connection could still access their bank accounts online without going to a branch. With the spread of the internet, online banking was created and is now provided by practically all banks. Through this, it is possible to complete all transaction information and queries online without going to the bank. It provided more transactional transparency. The usage of passwords and double authorization in online banking helps to reduce the scope of bank frauds. Technology encourages competition among banks, which ultimately results in improved services for customers. One may now access their bank from anywhere at any time thanks to the advent of mobile banking. All of it is only a single touch away. Banks have created Automated Banking Services Solutions like Cash Deposit Machines, Cheque Deposit Machines, and Passbook Printing Machines in order to provide improved services. Through these services, services have gotten simpler [13]–[15].

Modern computers are becoming increasingly advanced. Customers of banks now have high expectations because they have given institutions possibilities that they could only imagine. The officers, staff, and clients of banks have all been significantly impacted by the advances that modern technology have brought to banking. Technology advancements are making banking goods and services more accessible and efficient than ever before, opening up new

markets for competition. Future successful banks will be distinguished by rapid access to crucial information and the capacity for quick, effective action. A direct marketing environment, responsible customer service environment, and modern, simplified business procedures provide the bank a crucial competitive edge. The bank's consistent decision and management support systems provide it the competitive advantage it needs to advance in the banking industry.

Principal applications the benefits of computerization are triangular: they benefit the consumer, the bank, and the staff. For the consumer banks want to make new services accessible in response to customer demand. The use of IT has heightened competition and compelled businesses to adopt new technology in order to please consumers. They have previously created and put into practice a specific number of solutions, including:

- Self-inquiry facility the ability to use certain self-inquiry terminals at the branch to look up information about an account and see its transactions.
- Remote terminals at the client's location that are linked to the relevant branch by a modem allow the customer to conduct online account enquiries without leaving his desk.
- Banking at anytime, anywhere installation of automated teller machines (ATMs) with continuous cash withdrawal, remittance, and enquiry services Customers of these branches will be able to do business from any of them when these computerized inter- and intra-city branches are integrated. Telebanking is a round-the-clock service that allows customers to call in and ask questions about account balances and transactions.

Electronic banking allows the bank to provide corporate or high value clients a Graphical User Interface (GUI) software on a PC, allowing them to query about their financial activities and accounts, cash transfers, check book issuance, and rate inquiries without physically visiting the bank. Additionally, the consumer may provide LC text and bill data, and the bank can download these. Electronic data exchange is the name of the technology that is used to deliver this service (EDI). It is used to send commercial transactions in a format that can be read by computers between entities and people.

With time, practically all Indian banks began providing their clients with technology-based self-service banking options. The most well-liked variation of technology based self-service banking (TBSSB) comprises. Banking options include telebanking, mobile banking, online banking, and ATMs. TBSSB benefits both banks' clients and themselves. Banks benefit from cheaper transaction costs and a decrease in client traffic at branches. By enabling 24 x 7 banking from any location, TBSSB adds value for its clients.

Even for their current clients, banks have not completely embraced mobile banking despite the surge in transactions in India. In comparison to the number of online banking and the sizable mobile subscription model of more than 879 million, the present penetration is low. Consumers are not embracing mobile banking for a variety of reasons, such as the lack of mobile banking adoption, the services that are available, the restrictions of mobile banking, the absence of mobile banking services in many Indian languages, etc. With the launch of USSD-based apps, this may alter in the next years. The majority of mobile banking programs are intended for smart phones, which further restricts the consumer base [16]–[18].

You may categories mobile banking as follows a one-size-fits-all approach is ineffective in a setting with a dearth of modern technology and mobile cell capabilities. In order to provide mobile banking services to different mobile / tablet platforms like iOS, Android, etc., which are available on high-end phones / tablet platforms with good processing capabilities, it is

necessary for banks to invest in mobile banking applications like custom applications, mobile browsers, etc. While doing so, they should also offer services like USSD to the low-end segment having java based phones with limited data processing capabilities. Over the past year, there have been a number of developments in the field of mobile banking, including new models for strategic alliances (between banks and telcos, for example) and new goods and services (such as the Inter Bank Mobile Payment System (IMPS), National Unified USSD Platform (NUUP), etc.) entering the Indian markets. By lowering start-up costs and service rates, M-Banking has helped to lessen some of India's main obstacles to financial inclusion. Nearly 80% of Eko India Financial Services' clients are migrants or members of the unbanked population, and the company serves them as a business correspondent by offering bank accounts, deposit, withdrawal, and remittance services, micro-insurance, and micro-finance facilities [19].

Since fundamental financial services provided by banks are essentially the same, banks are attempting to set themselves apart from competing banks on other criteria to increase client loyalty. Since it affects the performance and viability of the organization, measuring service quality and researching its effects on customer loyalty has been a major focus for managers and researchers. Studies to determine the influence of service quality on client loyalty have been carried out in the banking industry in both conventional and automated banking contexts. Impact of technology on the banking industry negatively the main drawback of technology is job loss, since automation has eliminated many positions in the banking industry. With technology comes the risk of a cyber-attack, a system flaw where millions of data might be destroyed in a split second.

4. CONCLUSION

Today's banking industry relies so heavily on IT that it is impossible to imagine one without the other. However, technology comes at a price, just like other resources, therefore company executives will need to know if they are getting the most out of their significant expenditures in IT infrastructure. It will be more crucial than ever to take in to account and marginal value that IT provides in regard to business effect, whether it is growth, profitability, or any other metric. Banks will need to equally concentrate on client retention and growing profitability rather than just acquisition in order to get the most advantages from technology. Going back to their financial institution for some other new relationships is a significant problem for the majority of banking consumers. This is as a result of CRM and BI solutions being insufficient. Front end branch staff still lack access to data integration of client engagement across several channels. The danger of security breaches increases when technology is used more often. In order to handle the dangers for early identification and damage mitigation, banks will need to be on their toes with real-time warning systems and governance regulations. In order to boost the return from technology, banks will also need to concentrate on operational performance improvement, including training, workflow automations, and business process re-engineering. The value supplied to the company will need to be balanced in banks' future IT vision and strategy. It must be responsible for producing the required value and be in line with the company's strategic goals.

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CHAPTER 22

SURVEY ON SENTIMENT ANALYSIS TECHNIQUES AND THEIR MAJOR APPLICATIONS

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ABSTRACT: Because of the very tremendous rise of digitized data these days, sentiment analysis has become a very rising research area all across the world and quickly expanding. Sentiment analysis is a very pragmatic and key innovation used within the current artificial intelligence (AI) field to glean emotional information via a vast number of datasets. Academic literature sentiment assessment remains a highly popular yet fascinating subject presently. Various machine learning-rooted methods utilized with sentiment analysis have been covered within the present study. This paper presents a survey on sentiment analysis techniques and major applications. Typically, machine learning classifiers which include support vector machine (SVM), as well as naïve Bayes including the Random Forest (RF) approach are used in the field of sentiment evaluation. As, sentiment analysis has indeed been extensively used within numerous application areas, including commerce, administration, academia, athletics, entertainment, biomedical, as well as communications activities, this has attracted considerable interest among scholars in recent years. Sentiment analysis is indeed a computationally programmed technique for examining or assessing opinions, and thoughts, including reactions that are conveyed in remarks, suggestions, or criticisms. Machine learning-based algorithms are used for automating the sentiment assessment procedure and evaluating textual trends more quickly.

KEYWORDS: Artificial Intelligence, Deep Learning, Machine Learning, NLP, Sentiment Analysis, SVM.

1. INTRODUCTION

Sentiment analysis involves relevant document extraction that recognizes as well as recovers qualitative data from input content. It assists businesses in understanding the public perception of various brands, products, including services whilst keeping an eye on web discussions. Nevertheless, simple sentiment assessment as well as count-rooted indicators are often the only ones used in social networking streaming analytics. Current developments throughout deep learning have greatly increased programs' capacity for textual analysis. The inventive utilization of cutting-edge artificial intelligence methods could be a useful instrument for conducting more detailed studies [1], [2].Figure 1 illustrates the classification of approaches used in sentiment analysis.

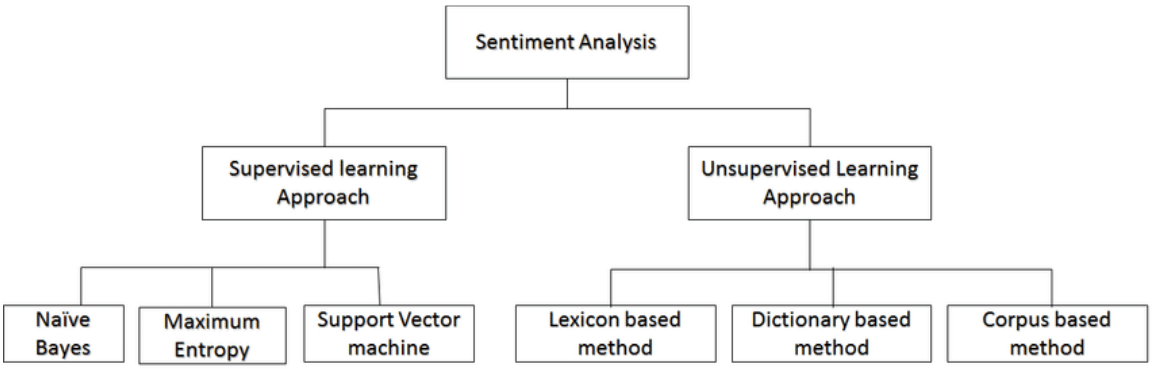

Figure 1: Illustrates the classification of approaches used in sentiment analysis [3]**.**

Sentiment assessment seems to be a procedure that concentrates on examining folks' perceptions, viewpoints, as well as emotions forward into a particular good or facility. Individuals often take into account the opinions of others while formulating decisions. Before the Web, a lot of individuals depended on colleagues as well as family for advice on what products or services to purchase or even for knowledge. Such attempts to gather feedback from the broader public are made easier by this same Web. It's indeed nearly difficult for such a job holder to gather precisely the information as well as identify the thoughts represented in such statistics inside a universe wherein enormous volumes of consumer-generated material are created nearly every day. Consequently, this becomes necessary to create software programs to automatically categorize comments as either good, unfavourable, or unbiased based on underlying polarity [4], [5].Figure 2 illustrates the procedure of sentiment analysis.

Figure 2: Illustrates the procedure of sentiment analysis [Devopedia].

- **Dataset acquisition:**

Because suitable information or data must be established for evaluating as well as categorizing information inside the database, gathering information is indeed a crucial process.

- **Text pre-processing**:

Pre-processing enables the dataset noise reduction following the dataset collection procedure. This is accomplished by eliminating superfluous stopping terms, repetitive phrases, stems, characters, Hyperlinks, and so on.

- **Features choice and extraction:**

The overall effectiveness of the algorithm is largely dependent on the correct choice as well as the retrieval of characteristics. Therefore, the best features recovery method has to be selected to recover the characteristics [6].

- **Sentiment categorization:**

Different emotion categorization algorithms have been used at this stage to categorize given content. Nave Bayes (NB) as well as another powerful approach i.e., SVM are two common sentiment categorization methods used presently.

- **Polarity discovery:**

The overall polarity of something like a feeling gets established once the emotions have been classified. Identifying whether writing communicates favourable, unfavourable, or neutral emotion that's the key aim of this polarity identification [7].

- **Validation as well as assessment**:

To establish the total reliability of sentiment assessment methodologies, verification, as well as assessment of said findings, are then carried out.

Daily activity-related remarks as well as evaluations have been produced as just a consequence of a fast expansion of Internet-rooted apps like social media networks including blogging. The technique of emotion analytics consists of collecting as well as examining actual views, ideas, as well as perceptions of individuals concerning a variety of issues, goods, including activities. Folk's views could be helpful to businesses, communities, and even inhabitants for data gathering as well as decision-making. This sentiment assessment but also the assessment process, meanwhile, faces several difficulties. Such difficulties make it difficult to correctly evaluate feelings as well as choose the right emotion polarities. Sentiment assessment uses textual extraction and spoken linguistic synthesis to identify as well as retrieve emotional characteristics underlying given content [8].Figure 3 illustrates the sentimental analysis at various levels.

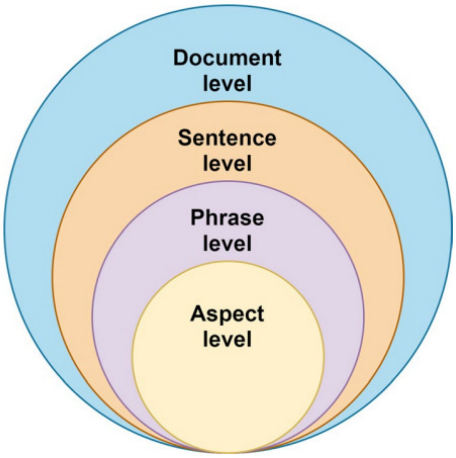

Figure 3: Illustrates the sentimental analysis of various levels [9]**.**

Throughout previous decades, expression assessment has become more popular among corporations, governments, as well as organizations in addition to scholars. This same World wide web has become a primary provider of global knowledge thanks to its rising ubiquity. Many individuals communicate personal ideas as well as thoughts through numerous internet sites. One should utilize a consumer-generated dataset to assess community sentiment autonomously to continuously evaluate community sentiment as well as assist choice-making. As just a consequence, emotion assessment has been more well-liked in the latest days among academic groups. Comment analytics and viewpoint extraction are other names for sentiment classification [10].Figure 4 illustrates the major job role of sentimental analysis.

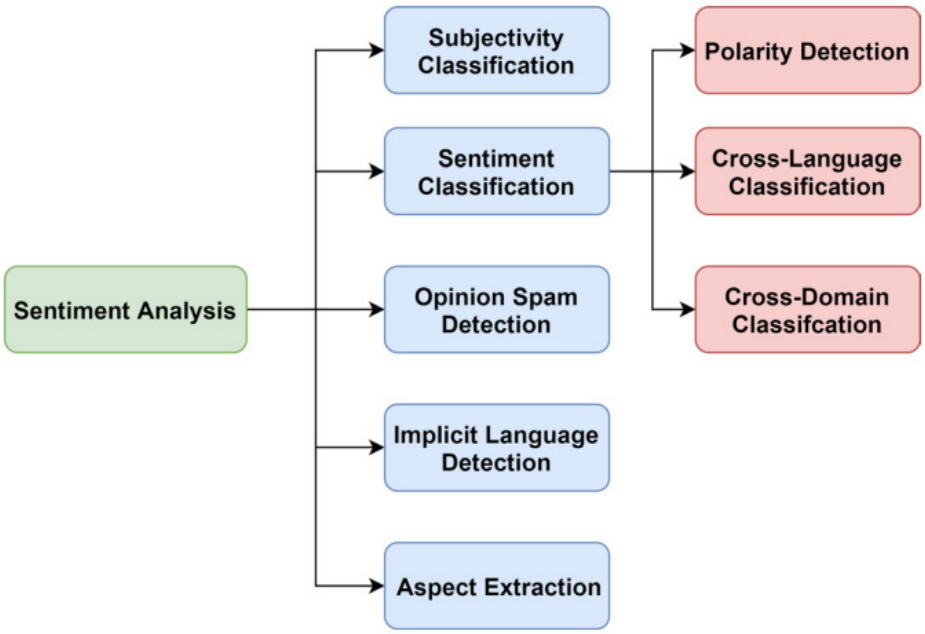

Figure 4: Illustrates the major job role of sentimental analysis [9]**.**

Any sentiment seems to be an emotion, belief, or conclusion brought through a sensation. Sentiment analytics, commonly referred to as thought processing, examines how individuals feel about particular things. The world wide web provides a great tool for sentimental knowledge. Using different digital platforms, including newsgroups, blogging, and virtual communities, individuals may publish their creative material. Numerous digital networking platforms disclose various computer software functionalities, which motivates academics as well as programmers to gather as well as analyse information. For example, using REST API (Application Programming Interface), Searching API is various API variants that are now offered by Facebook [11].

Due to the popularity of online networking websites, a plethora of fields has emerged that study virtual media including associated materials to gather pertinent data. One goal of sentiment assessment would be to infer from the material of a document the emotions it conveys. Given the long and distinguished history of using popular perception throughout choice-making, there have to be several previous publications tackling sentiment assessment, another subfield of NLP (Natural Language Processing). Nevertheless, it continues to function as sentiment assessment develops into the next century.

Sentiment assessment is necessary for a thorough examination of several practical scenarios. Find out, for instance, through brand assessment whether features or characteristics of an item attract consumers in respect of item value.Facetiousness, cynicism, casual style of literature, as well as language-specific difficulties, are just a few of the problems concerning

sentiment assessment including NLP. Numerous phrases in various tongues have different meanings and orientations depending on the situation as well as the field within which they have been used [12].Figure 5 illustrates the major applications of sentimental analysis.

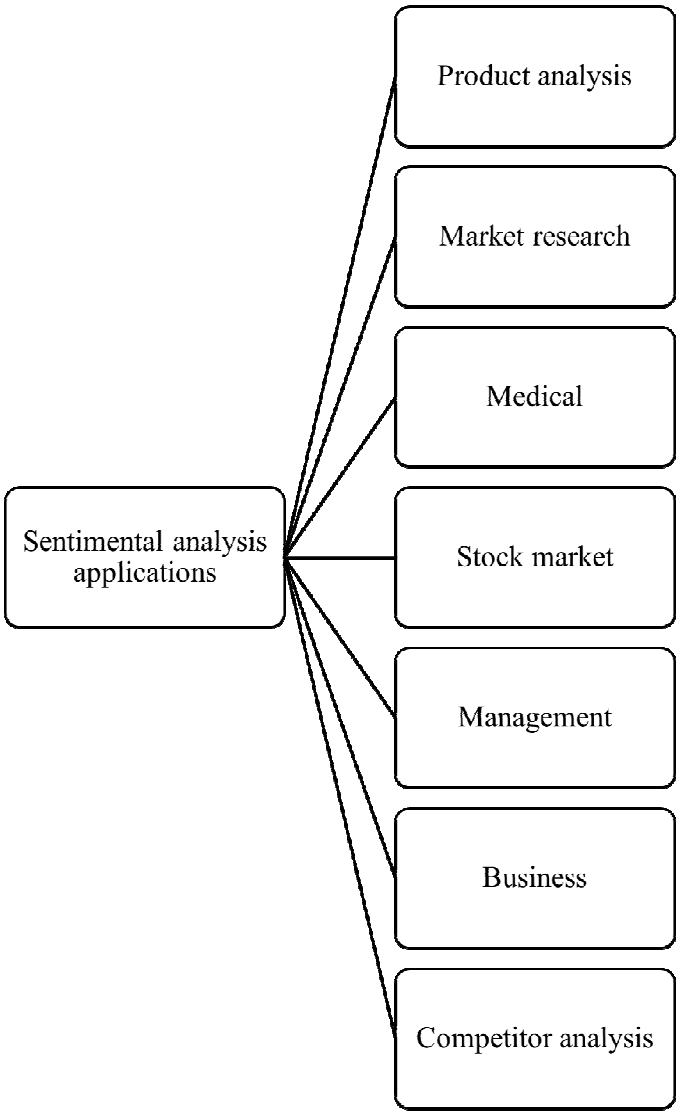

Figure 5: Illustrates the major applications of sentimental analysis [Google].

2. DISCUSSION

One may see a dramatic rise in consumer-generated material, or material created by users and published online and providing their thoughts on many topics, as just a result of enhanced digitalization. This computer research of assessing folk's emotions as well as thoughts for just an object is often called sentiment evaluation. Over the previous years, a lot of studies have indeed been conducted on the subject of expression assessment. This quantitative examination of folk's thoughts, and feelings, including sentiments regarding things like goods, organizations, problems, occurrences and themes, including associated qualities is often known as viewpoint research or thought extraction [13], [14]. As just a result, viewpoint assessment enables analyzing the global public's attitude toward a certain object to produce meaningful data.Additionally, such kind of information may be utilized to comprehend, clarify, as well as forecast economic problems. Sentiment analytics seems to be essential for the corporate world because it helps companies refine existing strategies as well as learn more about what potential consumers are saying concerning brand items.

Recognizing the client is becoming more and more crucial within today's customer-focused company environment.Figure 6 illustrates the sentiment polarity classification procedure.

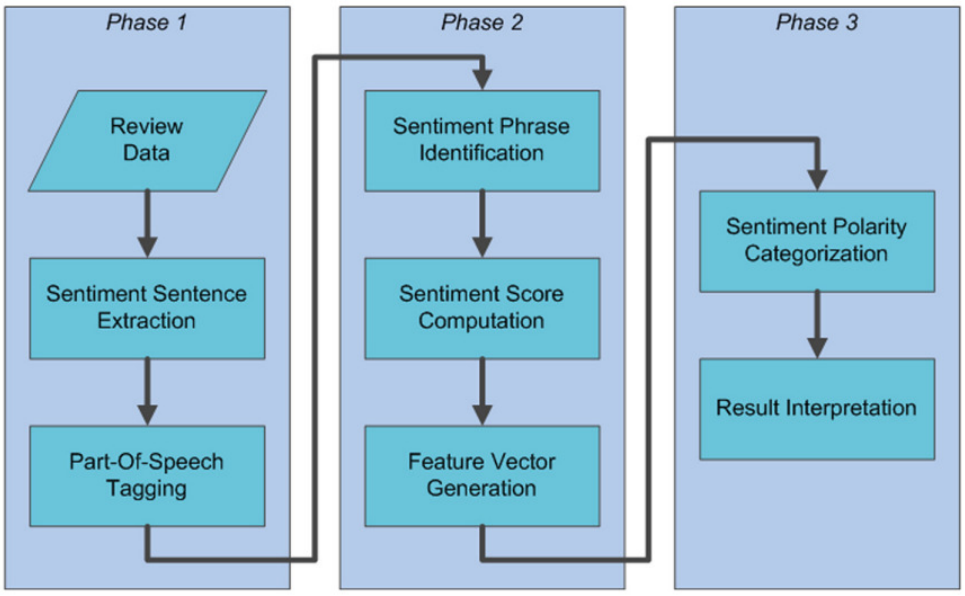

Figure 6: Illustrates the sentiment polarity classification procedure [15]**.**

The rapid expansion of conversation forums, item evaluation blogs, and e-commerce, including digital connectivity has enabled a never-ending flow of ideas as well as viewpoints. Due to such an expansion, it has become more difficult for businesses that comprehend the general views as well as beliefs of their client base. The increasing proliferation of user-generated information over the web combined using methods including mood assessment offer advertisers a chance to learn more about how customers feel about brand goods. To better serve consumers as well as increase revenue, advertisers can reach directly to those that require special attention by identifying thoughts using item evaluations [16]. Figure 7 illustrates the sentiment analysis emotions detection process.

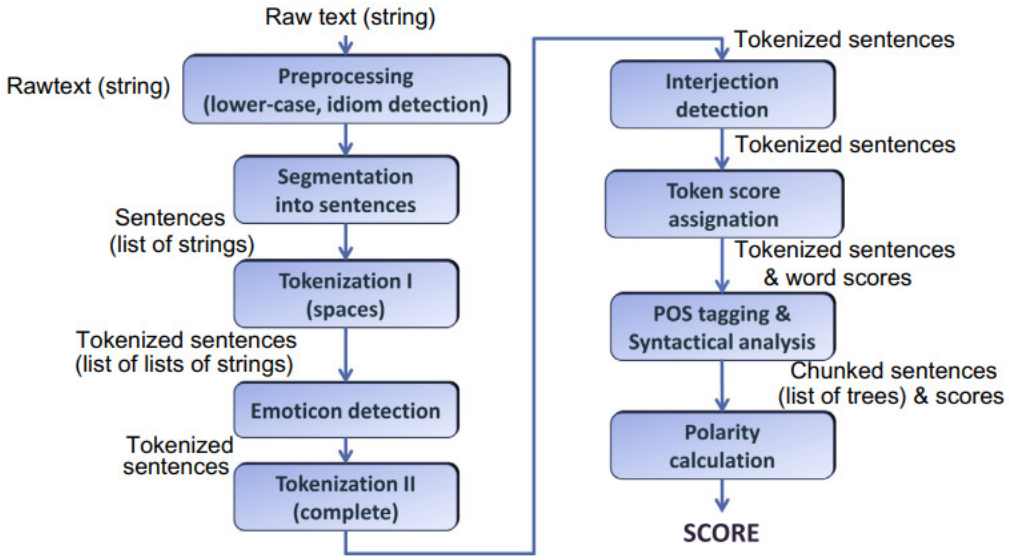

Figure 7: Illustrates the sentiment analysis emotions detection process [17]**.**

Interdisciplinary fields comprising economics, anthropology, NLP, as well as machine learning are equally involved in attitude assessment. Previous years have seen the

development of increasingly sophisticated statistics thanks to the rapid growth of information as well as processing capacity. As a result, machine learning emerged as the key technique for attitude assessment. There has been a ton of scholarly publications about sentiment assessment, as well as some supplementary research has been done just on the subject.Figure 8 shows major challenges in sentimental analysis.

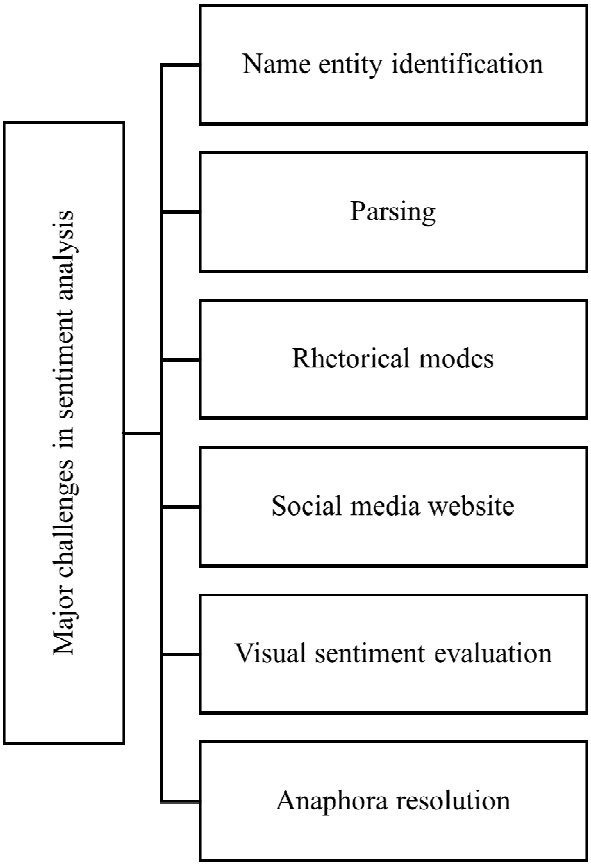

Figure 8: Shows major challenges in the sentimental analysis [Google].

Sentiment primarily describes thoughts, opinions, attitudes, or perspectives. Individuals frequently communicate personal feelings on the web using online platforms, blogging, and ratings, as well as ratings as just a result of Global Online Network's tremendous expansion. This growth in textual data necessitates an analysis of the idea of conveying thoughts as well as the calculation of discoveries for commercial exploration. Sentiment assessment has been frequently used by corporate managers including marketing agencies to develop innovative corporate strategies including promotional campaigns. To categorize as well as forecast when a text exhibits a favourable or unfavourable vibe, machine learning methods have frequently been useful.

Both categories i.e., unsupervised machine learning approach as well as supervised machine learning protocols are distinct subcategories of machine learning techniques. Every article inside the learning sample gets tagged with the relevant attitude by the trained approach using a labelled sample. Unsupervised training, on the other hand, uses datasets that have not yet been tagged with the proper emotions for the content. Social networking is indeed a potent tool enabling individuals to communicate with one another as well as express their feelings through a manner of thoughts as well as viewpoints through whatever subject or piece of content, that generates a tonne of unorganized data. To research information as well as generate commercial information, corporate organizations must analyse as well as examine such feelings.

Therefore, several machine learning, as well as NLP-based algorithms, were employed throughout before assessing such attitudes. Furthermore, deep learning-rooted approaches were also gaining a lot of traction because of their excellent results throughout previous years. The increasing expansion of digital networking is functioning as just a supplement to the Web as the greatest accessible yet economical provider of content. Through digital networking, websites, comments, emails, comments, and debates are analysed to glean user opinions. When studying a patient's conduct, or emotions, this is crucial to include their mindset, perspectives, emotions, and ideas. This study of subjective feelings about whatever object is called sentiment analytics, or thought extraction.

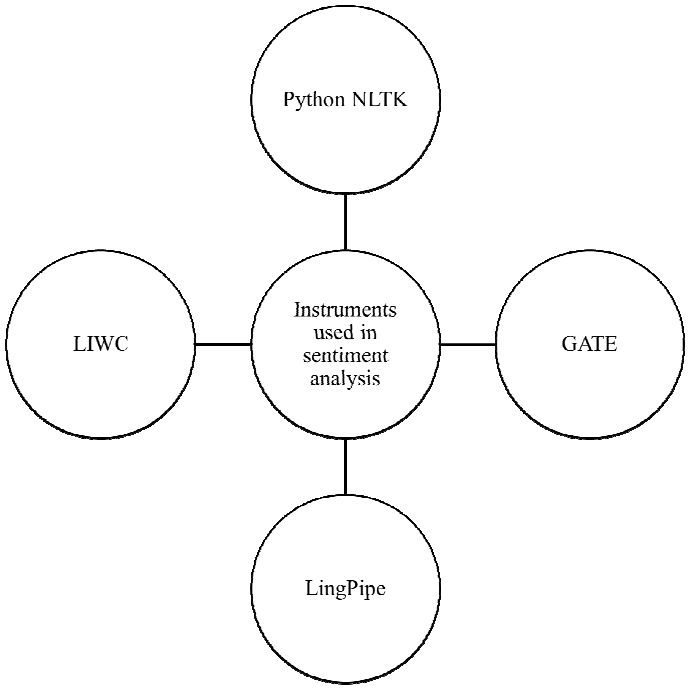

Figure 9: Shows major instruments utilized in the sentimental analysis [Devopedia].

Lately, this has indeed been discovered that the number of individuals using digital networking regularly is rising quickly. On just a variety of subjects, individuals have shared their ideas through evaluations, remarks, postings, and updates. As just a consequence, using the Web generates a vast quantity of information that may be examined for more investigation. As a result, attitude assessment is a well-known discipline with a wide range of applicability.Figure 9 shows the major instruments utilized in the sentimental analysis.

3. CONCLUSION

Businesses currently receive a massive amount of client comments via various blogs, online networking pages, and others, owing to the potential of the modern world wide web. However, most companies aren't always aware of ways to utilize such knowledge to better themselves. On such channels, a sizable percentage of users openly discuss actual goods as well as services expertise. The unorganized nature of such a response is indeed the issue, though. That's where artificial intelligence enters into the scenario. This study presents an examination of sentiment analysis approaches challenges as well as major applications. One among several methods, deep learning as well as machine learning, could be used to analyse current text information.There have been initially discussed thoughts including the many forms of them, then discussed potential use or significance within sentiment assessment. Upcoming applications of sentiment analytics would include intuitive attitude identification,

malware identification, contextual labelling, including posture identification, among numerous more.

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CHAPTER 23

METHODS OF SUPPLY CHAIN PLANNING AND DEVICE PRODUCTION MODELING

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ABSTRACT: To help managers make decisions by identifying contemporary supply chain management strategies and exploring supply chain modeling. The study's ultimate objective is to assist supply chain members, particularly producers, in bettering their existing management techniques by pointing them toward research that may be appropriate. For immediate use in their value and supply chains to increase productivity and profitability. We discovered that there is material accessible on modeling methods in general as well as supply chain management. However, there aren't many published studies from Canada that use a demand-driven modeling approach to valuation chain planning for the manufacture of wood pellets. Only three studies focusing on addressing the value chain analysis of wood pellets could be located suggest conducting more research on the wood pellet value chain. Construction companies that use prefabricated buildings and merge beneficial resources to integrate initial project technical feasibility, investment and financing assistance, layout, etc., as well as post-construction decoration, maintenance and operation, and waste disposal are said to be serving their relationship to work on value chain integration. This article examines how the appliances industry can recognize the logic of industry value thru service reintegration and data simulation using the equipment-manufacturing market as the research object. It does this by trying to analyze the service-based supply chain integration process, putting forward research hypotheses, building research models, and conducting data simulation research. During this process, optimization reveals the essential governing principles and value-added capabilities of the equipment manufacturing business. The outcomes demonstrate that the industry connection density, strategies for integrating services, and expertise.

KEYWORDS: Device, Supply Chain, Modeling, production, Optimization.

1. INTRODUCTION

Many businesses have found it imperative to move away from producing conventional wood products at a time of significant uncertainty and radical change in the global forestry sector. Forest goods and concentration on added-value forest products in addition to better managing waste (wood). Particularly, the development of renewable fuel sources, such as wood pellets, for the generation of energy has gained a lot of popularity recently. Among their numerous benefits are their high density, high heat value, low moisture content, and relative ease of storage and transportation. Pine shavings are used to generate heat and/or power for both domestic and commercial buildings[1]–[4]. Canada has seen an upsurge in the market for wood pellets on a worldwide scale.Globally, a lot of wood pellet manufacturing plants are opening up, increasing competitiveness.

Currently, Canada is one of the leading exporters and producers of wood pellets, but because of this heightened rivalry, Canadian producers must develop strategies to maintain their position as market leaders. The value chain's manufacturing and logistics may be improved as a means of gaining this competitive advantage.This essay reviews the literature on the manufacture of wood pellets, the value chain, the supply chain, and market research on wood pellets. more specifically, the four goals objectives of this paper are too I review the properties and production of wood pellets, (ii) identify and explain the value chain, as well as supply chain for (wood pellets), (iii), provides a summary of the wide range of various types

of mathematical modeling approaches for value chains and supply chains, and (iv) provide our viewpoint on the gaps in the scientific literature within certain three objectives as potential future research areas.The utility of demand forecasting for supply chain and value chain leanness and agility enhancement to reduce unpredictability will be assessed, and this aim will also contain a summary of the wood-burning industry. The amount of unique value chain studies that may be discovered throughout the various mathematical modeling techniques will be highlighted by Objective.The value chain keeps track of the processes necessary to bring a good (or service) from conception to completion in terms of the worth that is contributed to the good (or service) as it goes through a series of procedures necessary for its production and distribution, known as the supply chain. The value chain helps to clarify how, where, and how much of the product's value is generated at various phases of product refinement along the supply chain[5], [6]. The idea is that every step along the value chain will generate value that is greater than the cost of producing the good (or service), resulting in a net profit for the business.

Value chain optimization aims to optimize value realized at each level of the supply chain while reducing expenses. the value stream, despite being built on internal operations, also has ties to suppliers and merchants, and any conflict between them will hurt the entire chain porter has underlined the significance of value chain reconfiguration and/or cost reduction to get a competitive edge in the market. No one value chain can be employed to meet the needs of a particular industry since value chains drastically vary depending on the type of product being manufactured.A supply chain is a collection of businesses or a network of independent agents, each with its value chains that move materials forward and sell goods or services chain. It was discovered throughout this study that there is significant confusion about the distinction between the supply chain and the value chain. Numerous publications and studies that we read did not differentiate between the two chains and frequently used both words interchangeably. To give a more comprehensive understanding of the supply chain, combed through the myriad of conflicting definitions.

They defined the supply chain as "a group of three or more entities (groups or persons) directly participating in the upstream and downstream."If businesses pay greater attention to entire supply chain expenses rather than just certain areas of the supply chain, the value network and, consequently, the supply chain may become both more efficient and lucrative to optimize sales and performance. Value chain optimization entails coordination between a manufacturing company's numerous supply chain nodes through effective value chain management at the top management, enabling the supply chain as a whole to become more efficient also more effective.

To finally enhance their value chain, wood pellet makers and other industry participants require a clear grasp of distribution routes, sustainability, long-term forecasts, and strategies to improve their operations within the wood pellet supply chain and various supply chain operational management techniques.This identification and investigation are provided in this study through an analysis of the participant literature that has been made public to date review of the existence and benefits of contemporary supply chain management strategies, as well as information collected on modeling methodologies to assist managerial decision-making[7], [8]. This overview serves as a great beginning point for an in-depth review of certain management techniques and enables supply chain member companies, mostly producers, to identify weaknesses in their existing management approaches. The long-term objective of this review article is to implement strategies that will increase the effectiveness and competitiveness of the activities of certain businesses and their supply networks.The quantity of publications we read is grouped and described in the methodology

section concerning each target. The findings and discussion section breaks out the number of articles we discovered for objectives I through, concerning the number of papers we evaluated, in subsections for each objective. In the subcategories of the findings and discussion section, we explore the key ideas of the examined articles and how they connect to each goal and sub-objective. We emphasize the literature gaps we found when looking for peer-reviewed research about objective I in the sub-section for goal, and we make suggestions for future studies to address these gaps.How they were grouped into goals and require to obtain looked at 153 sources in total and categorized them including the first three goals of this research report. To accomplish this goal, we looked at a total of 23 published journals and reports about the manufacture, quality, and certification of wood pellets. To achieve the goal (ii), we examined 68 peer-reviewed papers for information on value chain or supply chain management views. To achieve this goal, we looked at 62 peer-reviewed articles where models were created to increase the effectiveness of the supply chain or the value chain. Through the accomplishment of the goal reached the target[9].Figure 1 shows the types of Supply Chain Management.

Figure 1:Illustrates the types of Supply Chain Management.

The compaction of wood pellets results in densification, which improves product homogeneity, combustion efficiency, and transport and storage effectiveness. According to research, burning wood pellets uses less primary energy than burning wood waste that has not been densified, and pellets also produce fewer hazardous pollutants (such as carbon monoxide, nitrous oxide, and particulates) than wood waste. Preference Ranking Organization Technique for Enrichment and Evaluation, or PROMTHEE, was used by Sultana and Kumar to establish that wood pellets outperformed pellets produced from various feedstocks, such as straw, switchgrass, alfalfa, and chicken litter.For application in large-scale heat events, this technique was applied while taking into account 11 quantitative and qualitative characteristics under three alternative weighting scenarios as well as electricity plants. The findings show that in all cases, wood pellets were the "best source of energy." In

comparison to other biomass samples, Canadian pinewood exhibited the best physicochemical features and the fewest harmful emission levels.Wood pellet producers and other industry participants require a thorough comprehension of distribution routes, sustainability, long-term planning, and techniques to enhance their operations within these fields to finally enhance their value chain, the wood-burning supply chain. The examination of various modeling techniques will assist in establishing the optimum fit for wood-burning supply chain modeling under altering conditions. Various operating management methods of the distribution network need to be discovered for improvement.This summary provides a great framework for supply chain member companies, particularly producers, to identify weaknesses in their present management techniques beginning place from which one may conduct a thorough review of particular management techniques. This review paper's long-term objective is to implement the methods most likely to increase the profitability of the activities of certain businesses and their supply networks.Agility must be accomplished while modeling the value chain inside the manufacturing business to account for variations in specifications and kinds of woody biomass, as well as variations in the techniques used for acquisition, processing, and delivery. Value chain models have to be designed to quickly alter these components in response to market demand and ought to shorten operational planning periods[10], [11]. All actions that must be scheduled to guarantee a business's effective operation in a relatively short amount of time are included in operational planning cycles. Figure 2 shows the Process of Supply Chain Management.

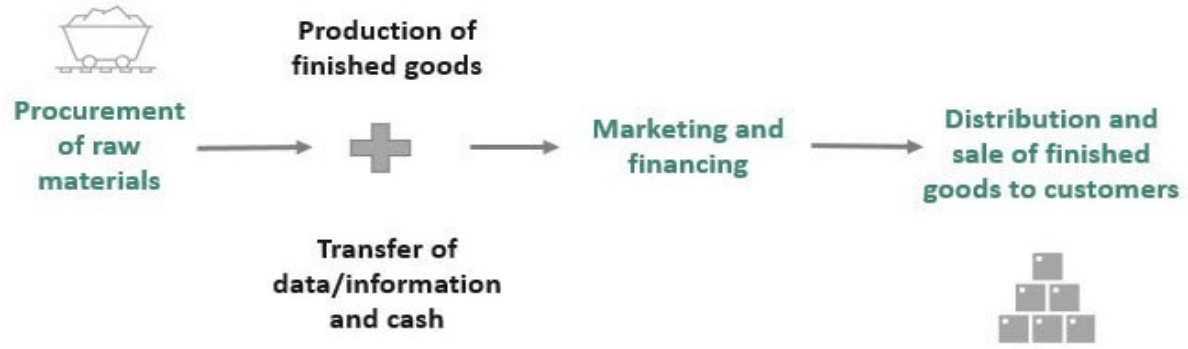

Figure 2:Illustrates the Process of Supply Chain Management.

2. LITERATURE REVIEW

In [12], Natalie M. Hughes et al. The capacity to reduce (or eliminate) inefficiency in operations through cost leadership or cost performance is referred to as leanness in a firm's value chain methods. In a company's value chain, agility includes operational flexibility, performance, and response to information changes, such as changes in product volume and/or logistical scheduling to establish agile supply networks, agility must be implemented not only inside each firm's value chain but also throughout the whole supply chain throughout the partner selection procedure. Leanness and agility are both effective tactics for gaining or preserving a competitive edge in an ambiguous market. Managing the value chain of a business should be viewed as a continuing interaction between vendors, the manufacturing firm, and demand and supply, which are dynamic and ongoing activities for final consumers, too. Management is more likely to follow with the effective implementation of the supply chain at the official level the more involved they are with the production chain, the greater their ability to see connections between the value chain and the broader marketing strategy and goals of the company. Gooch discovered that despite value chain optimization measures being applied within a company, human resistance is unavoidable and can significantly reduce the managerial plan's efficacy.

In [13], Sisi Dong and Liangqun Qi Demand-driven management can be applied to the supply chain from the downstream to upwards value chain perspective. Due to this application, the product is "pulled" through the distribution chain and/or value regarding the amount requested, rather than being "pushed" out into the market, and production becomes a reactive method based just on signals supplied by the market demands to the upstream (acquisition) end of the supply chain. Demand-driven management techniques, which are supported by demand-driven models, have several benefits. These have demonstrated considerable gains in efficiency procedures, enhanced inventory management and attain optimal production capacity, and are better at responding to market changes. They lower, or eliminate, inefficiencies across the supply chain and enable "smooth product flow." Demand projections are essential for feeding information into systems of demand-driven planning. There are several methods for predicting demand. The Interbank Some of these methods, such as exponential smoothing, the naïve bays method, moving average, autoregressive (AR), autoregressive integrated moving average, autoregressive extra, vector autoregressive, neural network, and the quantile regression technique are discussed in, and Hosed, and Disney.

In [14], Michael Erickson and Robert Stern These techniques are not very efficient, and they still permit unpredictability, which is an amplified variation in demand as one moves upstream through a supply chain or supply chain, is caused by erroneous demand prediction at every stage across the supply chain. Acetyl glucosamine and glucuronic acid are joined by 1-4 and 1-3 glycoside bonds, respectively, to form the strictly alternating disaccharide known as HA. This is the only GAG that has neither a covalent connection to a substance nor its sulfated core proteoglycan protein. Cell motility, tissue multiplication, embryonic development, the spread and metastasis of cancer, wound repair, and angiogenesis is just a few of the diverse processes in which it takes part. As HA is generated, it is extruded past the plasma membrane and into the extracellular area.

In [15], RODERICK V. et al. It may be tightly intercalated inside a proteinaceous complex, such as cartilage, where surface charge between link proteins with an avidity holds it in place. This is comparable to the specific antibodies combination. In loose tendons and ligaments and tissues undergoing fast proliferation, growth, repair, and regeneration, HA can be supposed linked with a variety of mucin. The primary issues are brought on by a large number of dynamical systems for which arbitrary near-beginning circumstances might result in sorts of trajectories that are fundamentally different (including exponentially diverging). Such severe trajectory instability necessitates other methods for describing the evolution of dynamic systems. A probabilistic method substitutes the normalization of the density along trajectories for the deterministic parallelism of phase points along trajectories such that a "conservation of extension in phase" physically necessitates the ultimate creation of Gibbs distribution using a stochastic characterization of states.

In [16], Issah Sugri et al. However, there are still significant production and use problems, including low yields, the use of regional cultivars, restricted access to vines, field pests and diseases, and problems with postharvest storage, preservation, and consumption. In West Africa, the lack of seeds when it's time to sow is still a persistent problem. A variety of biotic limitations, including worms, viral infections, soil arachnids, weevils, or insects that feed on leaves, have been observed to occur throughout field production. Overall, the butternut squash butterfly, clearwing moth, and African potato weevils represent the greatest threats. Farmers, dealers, and users in sub-Saharan Africa continue to face significant difficulties in maintaining fresh product shelf-life. Due to the farmers' and dealers' inability to employ cold chain facilities to minimize physiological and microbiological losses, significant quantity and quality losses have been observed to break down. This results in a seasonal oversupply and

low pricing, which have an impact on the financial rewards for performers. Due to the lack of finished preferred genotypes that allow for daily eating as a staple, root crops have lower patronage than other crops.All major players and activity initiatives within an industry that possess the potential to foster sustained competitiveness are included in the value chain approach benefit.

In, Junxiang Li et al. Smart contracts, which serve as the foundation of the blockchain, inherit the traits of the blockchain, including interference, reliability, and distribution. Information disclosure is a feature of smart contracts that can guarantee the dependability and transparency of the contract's terms. Agreements are used by users to facilitate safe and secure payments amongst users. Agreements, which are built into blockchains, allow for the automatic enforcement of an agreement's obligations without the involvement of a reliable third party. Smart contracts are built from the joint daily operations of parties who do not trust one another and may be used on the chain. Smart contracts provide new opportunities for establishing trust in situations where there is no existing trust by enabling verifiable actions to be carried out in blockchains. Past research has demonstrated the viability of smart contracts in several supply chain applications, including e-governance and Logistics Services.

3. DISCUSSION

Managing the value stream of a business should be viewed as a continuous interaction among vendors, the industrial firm, and demand and supply, which are dynamic and ongoing activities and final customers. Management is more likely to follow along with the effective implementation of the supply chain at the official level the more involved they are with the production chain, the better they can see connections between the value chain and the broader marketing strategy and goals of the company. Gooch discovered that human resistance is unavoidable and can significantly reduce the efficacy of the management plan, also when value chain optimization measures are used inside a corporation. The ideas can occasionally even confound managers, and they may even discover. Identification of the essential value network sites is a helpful managerial strategy when working with complicated value chains. It was stressed that managing instead of only controlling the flow of items via the distribution chain, the employee's working capital (short-term financing flow) as well as its supply chain is a primary priority. A more abstract approach to judgment may provide overall better results instead of a more concrete one, according to Cantor and Macdonald's analysis of management problem-solving techniques inside the supply chain. Cantor and Macdonald highlighted how having comprehensive, complex knowledge might be overwhelming.Demand-driven supply networks seek to directly correlate the rate of production and supply for a certain frame so that allows the producer quickly adapt in real-time to changes in the amount of need and obtain knowledge about broader trends in consumer demand for their final products.

The origin of raw materials needed to make a product and their transportation to the processing facility make up the "upstream" component of the production value chain, while the "downstream" component runs from processing through the distribution of the finished product to the ultimate customers.By default, most businesses look at their value and supply chains from an "upstream to downstream" viewpoint they create the specific products on capacity, with an idea of anticipated market demand, and "push" it into the market while also looking at related value generation in this way. When conducting surveys of various businesses, discovered that even when using lean manufacturing techniques, relatively few businesses adopted a demand-pull approach.Customer management can be applied to the supply chain upstream through an upstream value-chain perspective (as a directed flow). Due to this application, the item is "pulled" through the distribution chain and/or value regarding

the amount requested, rather than being "pushed" into the market, and production becomes a reactive process that is based mostly on signals supplied by the real market to the river (acquisition) portion of the supply chain.

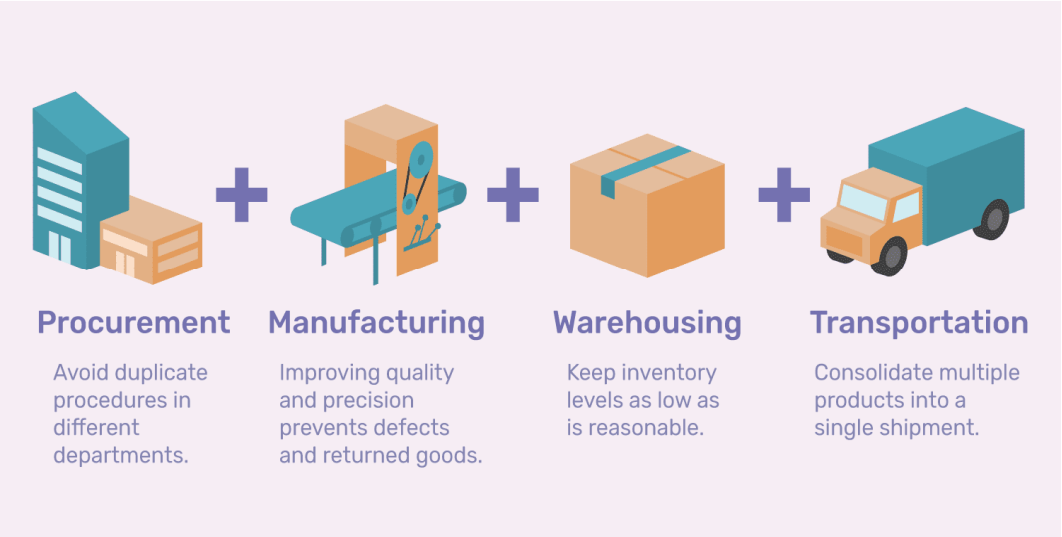

Figure 3:Illustrates the Process of Creating a Learner Supply Management.

Demand-driven models are extremely beneficial for many reasons and are employed to support demand-driven management strategies.Canada's provincial governments have successfully carried out several measures to encourage the production and use of renewable energy. For instance, the Green Power Act in Ontario implemented the programmer, which provides financial incentives for new electricity-producing facilities that use renewable resources. Ontario's indigenous or first nation communities have also started the process of implementing renewables schemes. The Pine Rivers First Nation is actively involved in information and expertise exchange with other indigenous nation peoples across Ontario and Canada and has several ongoing and upcoming renewable energy initiatives.The mechanization of heating systems, logistical infrastructure, and other variables all play a role in the wood pellet industry's global development.

In addition to public awareness initiatives, marketing activities, and governmental funding mechanisms, the oil and gas industry has seen price rises. If the need for pellets exceeds the present capacity of manufacturing facilities, demand for pellets will have to be satisfied through capacity expansion to meet demand and maintain competitiveness as the market grows and the need for wood pellets rises.Figure 4:Illustrates the Shows process of Logistic vs Supply Chain Management

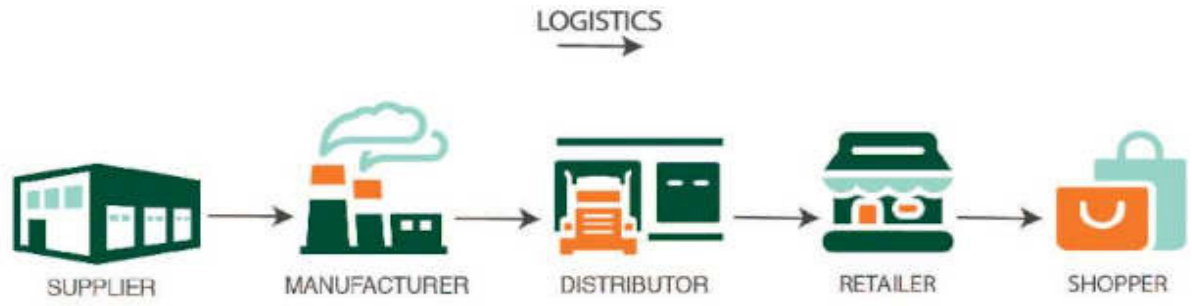

Figure 4:Illustrates the Shows process of Logistic vs Supply Chain Management.

4. CONCLUSION

This review article examined the existing literature on wood pellet production, features, value/supply chain resource management, and value/supply chain modeling methods. The findings indicate that generally, only a few studies that have been published give a thorough analysis of wood pellet manufacturing, pellets plant viability, and value/supply chain management. Furthermore, there aren't many articles that describe the value chain as a whole. During our study, we also only came across a tiny number of Canadian-based papers. Future research should be done to close these gaps, especially in the area of the production chain for Canadian pellet producers.

The Canadian bio-economy is now being expanded, thus new research revealing workable initiatives in the bio-economy with better value and supply networks are crucial for fostering this development. The operation of existing facilities will be enhanced, and the operation of new facilities will be managed most efficiently, via the use of contemporary demand forecasting and customer supply chain management methodologies.The equipment economy is the researcher, and based on an examination of the process of integrating the service-based value chain, it advances research hypotheses, builds research models, and gathers data. The shifting laws and major influencing variables of the vehicle production industry's value-added capacities throughout that process are revealed by simulation study to investigate how the industry might fulfill the logic of industrial value via service reintegration and optimization. , The findings demonstrate the concentration of commercial interconnections, and how service elements are embedded.

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CHAPTER 24

AN ANALYSIS OF THE EMERGING USE OF AI CHATBOTS IN INDUSTRIES

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ABSTRACT: An Artificial intelligence (AI) chatbot is a computer program designed to simulate conversation with human users, especially over the Internet. These chatbots can be integrated into messaging applications, websites, or mobile apps, and can interact with customers or users through text or voice input and output. AI chatbots are designed to improve customer service and convenience by providing quick and accurate responses to user inquiries, as well as handling tasks such as making reservations or recommendations. Some AI chatbots are also designed for entertainment purposes, such as by telling jokes or engaging in playful banter with users. The effectiveness and utility of AI chatbots depend on the quality of their natural language processing abilities, as well as the depth and breadth of their knowledge and capabilities. AI chatbots are becoming increasingly popular and widespread, as they offer several benefits for businesses and organizations. For example, chatbots can handle a large volume of customer inquiries and interactions, freeing up human customer service representatives to handle more complex tasks. AI chatbots can also operate around the clock, providing immediate assistance to users at any time of day. In addition, chatbots can be customized to fit the needs and preferences of different businesses, industries, or users.

KEYWORDS: Artificial Intelligence, business, chatbot, e-commerce, Machine Learning.

1. INTRODUCTION

Artificial intelligence chatbots, or simply AI chatbots, are computer programs designed to simulate conversation with human users, especially over the Internet. These chatbots can be integrated into messaging applications, websites, or mobile apps and can interact with customers or users through text or voice input and output. AI chatbots are becoming increasingly popular and widespread, as they offer several benefits for businesses and organizations. For example, chatbots can handle a large volume of customer inquiries and interactions, freeing up human customer service representatives to handle more complex tasks. AI chatbots can also operate around the clock, providing immediate assistance to users at any time of day [1]–[3]. In addition, chatbots can be customized to fit the needs and preferences of different businesses, industries, or users.

There are various approaches to building AI chatbots, including rule-based systems, which follow a set of predetermined rules to generate responses, and more advanced machine learning-based systems, which can learn and adapt based on their interactions with users. Some AI chatbots also utilize a combination of these approaches, leveraging both pre-programmed rules and machine learning algorithms to deliver more personalized and accurate responses.Figure 1 shows the Different Types of chatbots**.** One of the main advantages of AI chatbots is their ability to handle a high volume of interactions with users, making them particularly useful for customer service and support [4]–[6]. AI chatbots can provide quick and accurate responses to user inquiries, as well as handle tasks such as making reservations or recommendations. This can help improve the overall customer experience and satisfaction with a business or organization (Figure 1).

In addition to their practical applications, AI chatbots can also be designed for entertainment purposes, such as by telling jokes or engaging in playful banter with users. This can help make the interaction with a chatbot more enjoyable and engaging for users. Overall, AI chatbots represent a promising technology that has the potential to revolutionize the waye-commerce businesses and organizations interact with their customers and users [7].

To be effective, AI chatbots must have strong natural language processing capabilities, allowing them to understand and respond to user inquiries and requests in a way that is both accurate and appropriate. This requires the chatbot to be able to interpret and understand the meaning and intent behind a user's words, as well as generate appropriate responses. The effectiveness of an AI chatbot also depends on the depth and breadth of its knowledge and capabilities. A chatbot with a limited set of pre-programmed responses and tasks will not be as useful or effective as one with a more comprehensive understanding of a wide range of topics and the ability to perform a variety of tasks [8].

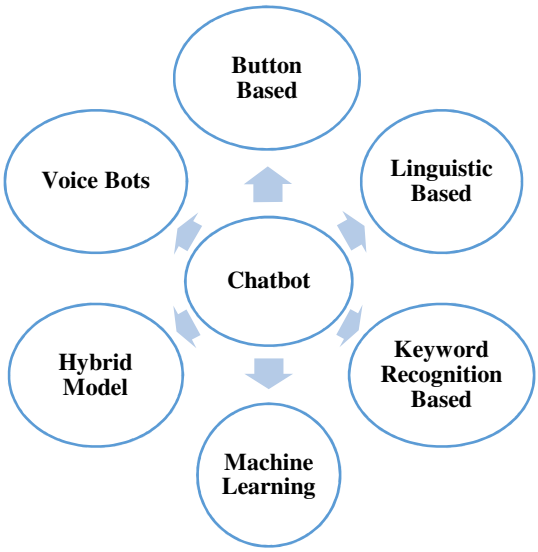

Figure 1: Illustrates the Types of Chatbot [Google].

Another important factor in the effectiveness of AI chatbots is their ability to adapt and learn from their interactions with users. Machine learning-based chatbots can analyze user data and adjust their responses and behaviors accordingly, improving their performance over time. Overall, the success of an AI chatbot depends on a combination of its natural language processing abilities, knowledge base, and adaptability. With these factors in place, AI chatbots have the potential to provide a valuable service to businesses and organizations and improve the customer experience for users [9].It's worth noting that AI chatbots are not a replacement for human customer service representatives, but rather a complementary tool that can help improve efficiency and effectiveness. In some cases, a chatbot may be able to handle a customer inquiry or request on its own, while in other cases it may need to escalate the issue to a human representative for further assistance. One potential limitation of AI chatbots is that they may not always be able to understand or respond to complex or nuanced inquiries or requests. In these cases, it may be necessary for a human representative to step in to assist [10]. This highlights the importance of having a human backup in place to handle more complex or sensitive issues. Despite these limitations, AI chatbots offer several benefits and have the potential to greatly improve the customer experience and convenience for users. As technology continues to evolve and improve, AI chatbots will likely play an increasingly important role in customer service and support.

2. ITERATURE REVIEW

Su-Mae Tan and Tze Wei Liew discussed chatbots are software programs that mimic human communication by using text-based chat systems. Because of advancements in artificial intelligence, chatbots are now widely employed on mobile platforms. (AI) and technology for natural language processing, as well as the important shift in business toward conversational commerce. In m-commerce domains like food (Pizza Hut), apparel (Zalora), travel (Malaysia Airlines), banking services (Bank of America), and multi-categorical products, chatbots have been implemented to carry out a variety of tasks, such as taking customer product orders, responding to frequently asked questions, and recommending products (eBay). Companies may provide automated personalities that are constantly prepared to take inquiries by incorporating chatbots into easily accessible chat interfaces known to consumers.

Sage Kelly et al. discussed over the next ten years, artificial intelligence (AI) will be incorporated into routine technologies to improve services. An intelligent technological learning system of AI that is capable of doing activities for humans on their own. At the moment, chatbots depend on the intellect of a human engineer to continually update the system. Since AI chatbots will autonomously identify arrangements, trends, and significance from data that is too complex to be processed by human programmers or machines to mimic human-like conversation, they will differ from conversational and messenger chatbots currently in use (such as Google Home and Siri). It has been predicted that AI chatbots would boost customer value by having intelligent discussions that save expenses for businesses by reducing human input.

Giovanni Pilato et al. discussed the development of the Artificial General Intelligence (AGI) paradigm in recent years has been a defining feature of research on intelligent systems. This paradigm places more emphasis on the codification of the learning process than it does on the actual domain. Following this idea, an intelligent system ought to be built as a hybrid architecture that combines many strategies to mimic characteristics of human intelligence, such as adaptability and generalized capacity, in addition to solving a particular problem. To achieve an acceptable man-machine interaction, special attention has been paid to the creation of useful and approachable interfaces between intelligent systems and their users. The development of intelligent computers with conversational capabilities is an ambitious objective in this situation [11].

Lorena Gkinko et al. discussed during COVID-19, the usage of AI chatbots has surged and is still growing. By 2030, the market for chatbots is anticipated to be worth USD 3.99 billion. AI chatbots enable humans to communicate with computer systems via text or speech while adopting the natural language. AI chatbot agents are a subset of dialogue systems that let users search through many sources of information to discover the solutions to their queries. They simulate human oral and/or written conversations. The traits of AI chatbots set them apart from other technologies that businesses use. First of all, the underlying machine learning technology enables AI chatbots to develop and learn continually through the data produced by their use.

Nadrh Abdullah Alhassan et al. discussed the complexity of computer hardware increases with each generation, making it harder for end users to diagnose problems. Computer finding problems is a difficult task that requires a lot of information and expertise. Finding the root of a system problem and fixing it is the process of troubleshooting. Computer repair specialists typically bill $60 per hour worldwide. In addition, the hourly cost might vary between $40 and $90. Some of these fixes may be taken care of by offering the user assistance via a

chatbot. Additionally, a chatbot is one of the impressive uses of artificial intelligence that has lately demonstrated its effectiveness.

Takeshi Kamita et al. discussed the value of maintaining excellent mental health has gained widespread recognition, and research into online courses on mental healthcare has picked up. Even laws have been passed requiring businesses to maintain their employees' mental wellness. Recently in Japan, there has been a significant rise in the number of people who may benefit from mental therapy, the majority of whom are not ill, but not the number of psychologists or counselors who typically provide counseling. To address this problem, there is a strong need to provide people with the tools they need to take care of their mental health on their own and to use the information on employees' mental health to facilitate more efficient expert collaboration [12].

Tng C. H. John et al. Discussed the Xbox game "Full Spectrum Warrior" (FSW) is a well-liked title featuring robust squad AI. This game is a condensed version of the PC game "Full Spectrum Command." In reality, "Full Spectrum Command" simulates how the US Army would function in the field. Originally, the military employed this game to teach decision-making and leadership skills. The game consists of actual army tactics like "bounding" and ducking. The game's squad AI is its key component. The team AI in the game truly mimics people's behavior by drawing inspiration from reality. To complete a task, you must command two squads of troops in this game. Even if the game is fantastic, the team's AI strategy may use some improvement. After playing regularly, players may begin to believe that their opponents always appear in the same locations, like the main pathfinding methods used by the majority of team AI plans are the A algorithm or lookup tables. If the source and destination sites are the same, these strategies always result in the same path. However, even if the source and destination locations are identical, probabilistic can still cause deviations in the path. By making changes to the opponent's team plans, it is simple to give the game replay value. Players may struggle to guess where their opponents will be because they move differently when they have different plans than their opponents [13].

Jiageng Chen et al. discussed today's internet-connected world has seen tremendous development in cyber security protection. Huge amounts of data have been generated due to the widespread use of emerging technologies like the Internet of Things (IoT) and cloud computing. Data are produced and gathered. Although the data may be leveraged to better meet the corresponding business demands, they also present significant issues for the protection of privacy and cyber security. Finding malicious activity amid the enormous data in real-time becomes extremely difficult, if not impossible. As a result, machine learning, statistical inference, big data analysis, deep learning, and other AI-based technologies are used to power cybersecurity solutions [14].

3. METHODOLOGY

3.1 Design:

There are a few different approaches you can take to predict consumer responses to a chatbot. Here are a few options:

1. Use machine learning to train a model to predict responses based on past conversations with consumers. This can involve using techniques like natural language processing (NLP) to understand the content of the conversation and predict an appropriate response.
2. Use rule-based approaches to determine responses. This can involve creating a set of rules or decision trees that dictate how the chatbot should respond to specific inputs.

3. Use a combination of machine learning and rules-based systems to increase the accuracy of the predictions.
4. Utilize pre-determined response categories, such as "greeting," "inquiry," or "complaint," to determine the appropriate response for the chatbot to give.

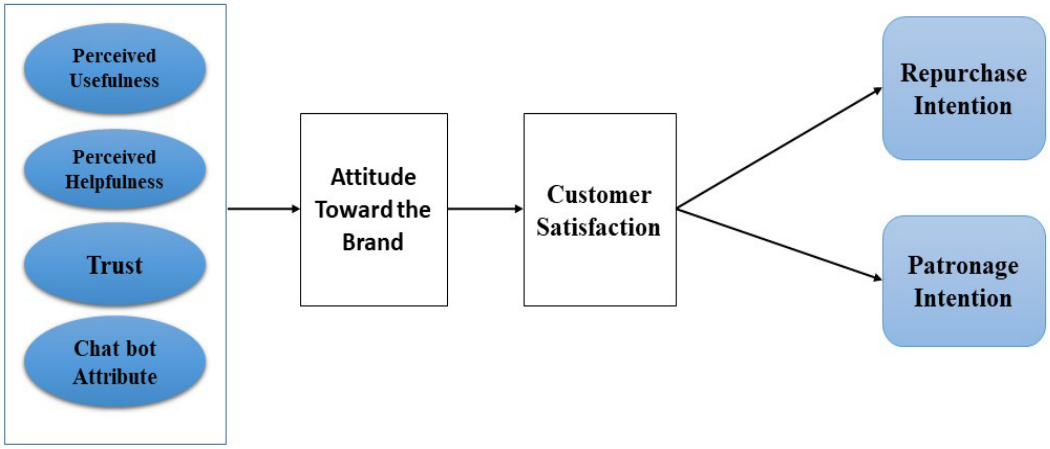

Figure 2: Demonstrates the Predicting of Consumer Response to a Chatbot.

In Figure 2 the prediction of different responses is done using the chatbot-like behavior of consumers to a particular product. Here the perceived usefulness, helpfulness, trust, and attribute of the chatbot is going through the brand attitude and the brand choice which is chosen by the customer that the customer can satisfy from the purchase of a particular brand which is shown in the purchasing of an of customer like repurchase intention and patronage intention. It's important to keep in mind that predicting consumer responses can be difficult, as people can be unpredictable and may not always respond in the way you expect. However, by using a combination of these approaches, you can improve the accuracy of your chatbot's responses and provide a better experience for your consumers.

3.2 Instrument:

Several instruments can be used in predicting consumer responses to a chatbot, including:

- Natural language processing (NLP) techniques, allow a chatbot to understand and interpret human language. NLP can be used to identify the specific words and phrases that a consumer uses, and to determine the overall sentiment or emotion expressed in their message.
- Machine learning algorithms can be trained on a dataset of past conversations with consumers to predict the likelihood of different responses based on the input they receive.
- Rules-based systems, use predetermined rules or patterns to determine the appropriate response to a given input.
- Pre-determined response categories, allow the chatbot to identify the general topic or theme of a consumer's message and provide an appropriate response based on that theme.

3.3. Data Collection:

To predict consumer responses to a chatbot, it is important to have a large and diverse dataset of past conversations with consumers to train machine learning algorithms on. This dataset

should include a wide range of different types of responses and cover a variety of topics and situations.

There are a few different ways to collect this data:

1. Record conversations between customers and human customer service agents, and use these as the basis for your chatbot training data.
2. Use online forums, social media, or other public sources of customer service interactions to gather a larger and more diverse dataset.
3. Conduct customer surveys or focus groups to gather specific data on consumer preferences and behaviors.
4. Use data from previous chatbot interactions to continually update and improve your chatbot's performance.

Eliminated information from those that might have encountered technical difficulties during the internet questionnaire using two methodological limitations. First, eliminated social position from any questions that had wrong ones. The survey platform's two posts were as follows:

a. List the quantity of the products available on the mobile shopping platform.
b. Include the number of a chatbot available on the mobile shopping platform. Additionally, based on the timing records, we deleted participant data when the number of pages in the video was fewer than the length of the corresponding video, suggesting that the films had not been seen whole or at all.

Table 1: Illustrates the Mean and standard aberration of contributors among the multi-chat interface and the single-chatbot boundary.

	Multi-chatbot edge			Single-chatbot edge		
	Male (n=42) M(SD)	Female (n=45) M(SD)	Total (n=87) M(SD)	Male (n=22) M(SD)	Female (n=35) M(SD)	Total (n=57) M(SD)
Apparent chatbot	4.72(.56)	5.81(.42)	5.11(.62)	5.87(.44)	6.87(.89)	5.19(.58)
Stage conviction ability	4.82(.59)	5.74(.54)	5.97(.68)	5.42(.54)	6.34(.65)	5.38(.52)
Stage conviction benevolence	4.91(.82)	5.12(.87)	5.82(.88)	5.74(.68)	6.95(.54)	5.09(.72)
Stage conviction integrity	4.88(.67)	5.47(.31)	5.95(.54)	5.24(75)	6.77(.62)	5.04(.41)
Acquisition through platform	4.54(.74)	5.85(.59)	5.48(.97)	5.04(65)	6.85(.59)	5.17(.48)

The respondents were all between the ages of 25 and 30, and there were 36% were men and 48% were women among them, according to the statistics. In terms of e-commerce knowledge, 42.4% of the participants had less than a year's worth, 53.6% had between one and six years' worth, and the remaining 24% had more than four years' worth. And over six years of e-commerce experience were held by 34%.The averages and standard deviations of the dependent variables for the single-chatbot interface and the multi-chatbot interface are shown in Table 1.

3.4. Pseudo Code:

Pseudo code for a chatbot that uses a combination of natural language processing and rules-based systems to generate responses:

PROCEDURE Chatbot

- **INPUT**: message from user
- **OUTPUT**: response from chatbot
- Tokenize message
- Extract nouns and verbs from message
- Determine sentiment of message
- **IF** message is a greeting
- **RESPOND** with a greeting
- **ELSE IF** message is a question
- **USE NLP** to identify key words and concepts in the question
- **IF** key words match a predefined topic
- **RESPOND** with information on the topic
- **ELSE**
- **RESPOND** with a default question response
- **ELSE IF**
- Message is a complaint
- **RESPOND** with an apology and a promise to address the issue
- **ELSE**
- **RESPOND** with a default non-specific response
- **LOG** the interaction in a database
- **END PROCEDURE**

4. RESULTS AND DISCUSSION

A report on an AI chatbot would typically include information on how well the chatbot performed in terms of meeting its goals and fulfilling its intended purpose. This could include data on the accuracy of the chatbot's responses, the satisfaction of users who interacted with the chatbot, and any other relevant metrics. It is also important to discuss any limitations or

challenges that were encountered during the development and deployment of the chatbot, as well as any potential areas for improvement. This could include issues with the quality or diversity of the training data, the effectiveness of the algorithms or techniques used, or the overall user experience.In addition to discussing the results of the chatbot, it is also important to consider the broader context in which the chatbot was used and consider its potential impact or implications for the industry or field it was designed for. This could include a discussion of the chatbot's role in customer service, its potential to automate certain tasks or processes, or its ability to improve efficiency or effectiveness.

There are many potential points of discussion when it comes to chatbots, including their use in customer service, their potential to automate certain tasks or processes, and their impact on the job market. One key discussion point is the role of chatbots in customer service. Chatbots can provide quick and convenient assistance to customers and can handle a large volume of interactions simultaneously. However, some people may prefer to speak with a human customer service agent, and chatbots may not always be able to provide the same level of personalized or nuanced assistance. It is important to consider the appropriate balance between the use of chatbots and human customer service staff.Another important point of discussion is the potential of chatbots to automate certain tasks or processes. While chatbots can be very effective at handling simple, routine tasks, they may not be able to fully replace human workers in more complex or dynamic situations. Figure 3 shows artificial intelligence Sales World Wide. It is important to consider the limitations of chatbots and their potential impact on the job market. Overall, chatbots are a powerful and increasingly prevalent technology with many potential applications and implications. It is important to consider the benefits and limitations of chatbots and to have ongoing discussions about their appropriate use and integration into various industries and sectors.

Figure 3: Illustrate the Artificial Intelligence Sales World Wide.

5. CONCLUSION

In conclusion, AI chatbots are a useful and powerful tool for businesses and organizations looking to improve their customer service, automate certain tasks or processes, or increase efficiency. By using natural language processing and machine learning algorithms, chatbots can understand and interpret human language and provide appropriate responses to a wide range of inputs. However, it is important to consider the limitations of chatbots and to balance their use with the needs and preferences of customers. Chatbots may not always be able to provide the same level of personalized or nuanced assistance as human customer

service agents, and they may not be able to fully replace human workers in more complex or dynamic situations. Overall, the effectiveness of an AI chatbot will depend on the specific goals and needs of the business or organization, as well as the quality and diversity of the training data and the algorithms and techniques used to build the chatbot. By carefully considering these factors and continuously monitoring and improving the chatbot's performance, businesses and organizations can maximize the benefits of using an AI chatbot.

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CHAPTER 25

COMMUNICATION BETWEEN HUMAN AND ROBOTS FOR INFORMATION EXCHANGES

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ABSTRACT: A kind of communication known as "human to machine interaction" involves human interaction with various technologies including actuators and sensor technology. The availability of smart gadgets, which provide sensory information and help with daily chores, can enhance quality of life. The objective of the study to discuss about the data interaction between the human and robots. The result of the study is that Human-Robot Interaction (HRI) is to offer robots with all the abilities required for human interaction. The conclusion of the study humans shouldn't be compelled to acquire new communication techniques to connect with robots as they become more and more prevalent in our culture. Robotics will boost productivity and economic growth while also giving many people throughout the world access to new professional options in the future.

KEYWORDS:Communication, Economic Growth, HRI, Information Exchanges.

1. INTRODUCTION

The last few of years have seen a noticeable growth in robotic technology. A few years ago, such advancements were still the stuff of science fiction for some. However, in this quickly changing environment, a robot like "A Human Following Robot" is now required in order to engage and coexist with them.

The use of robots in industry, medicine, and the military has considerably accelerated the advancement of robot technology. The work one does is quite risky in a variety of industries with hostile environments, such as underground mining, combat zones, medicine, construction, and space exploration. The lives of those providing assistance are likewise at danger. Human performance of tasks has various constraints of its own. Beyond human limitations in eyesight, speed, accuracy, adaptability, quality [1].

When a collection of robots must cooperate to carry out a certain task, communication inside the robot is essential. Multiple robots can coordinate with one another while they are geometrically separated from one another in a space thanks to communication. It could also be employed to assemble all the robotics to a central place to work together on a larger job, like a rescue effort. Social insects serve as excellent models for intercommunication because they efficiently carry out group tasks like finding and hunting for food in a variety of environments. Insects have employed vibration, sound, chemical signals, visual cues, and visual cues to communicate. Because of technological improvements, it is now feasible to think of deploying multi-robot systems that include several robots. When compared to a single robot, multi-robot systems have benefits including low cost, high resilience, and parallelism. A heterogeneity group of many robots must be used to execute tasks in environments that are intrinsically complicated because the needed capabilities are too great for a single robot to handle. The current environment, where everything from a few robots doing simple manipulation tasks to tens of thousands of robots performing several complicated jobs needs inter-robot coordination, internal robot communication is becoming more and more crucial [2].

Robotic communication is divided into four categories: goal-based, state-based, implicit, and explicit. Implicit communication occurs when robots leave traces and trails in their surroundings that other robots can use to recognize changes brought about by the robots' actions. Transmitting and receiving information using a specific protocol or vocabulary as a medium is explicit communication, which a robot is aware of. Due of the necessity for a separate procedure to deliver the information, this is less reliable than the implicit. Robots may communicate in states by observing one other's actions, such as when they make a gesture or their eyes change when they approach a light source [3].

The paper is divided into four sections the first section of the paper describes interaction between humans and robots and after that literature of the previous study is discussed in the literature review section, and then the discussion section discusses social robots and human relationships, visual communication between human beings and robots, non - verbal communication between human beings and robots, advantages of robot use robotics applications in daily life and finally study end with a conclusion section that explains the outcome and future of this study.

2. LITERATURE REVIEW

Joachim R. Höflich [4] examined the notion of robots as media and how humans view them. The study makes the case that robots are viewed as both a medium that "mediates" and a connection with a medium. This implies that while robots can unite humans and the environment, they can also create barriers between them. The suggested perspective conclusion broadens a dyadic model for human-robot interaction to a triadic analysis.

Andrea Bonarini [5] To demonstrated the many facets of human-robot interaction (HRI), showing that it incorporates all factors important in communication between living things and making use of all available sensor channels. HRI is not just confined to language-based interaction. The author Findings demonstrates that when sets of data and suitable methods are available, machine learning techniques may be used for particular objectives.

Fotios Papadopoulos et al. [6] compared participant preferences to a communication system without robots to see how an autonomous robot affects human-human distant communication and created a platform for online human-human conversation inside the framework of a team-based video game. Twenty pairs of respondents used video conferencing software to interact during the exploratory study. More social signs were displayed by participants when utilizing the robot and when they were exchanging gaming experiences with one another. However, examinations of how the participants interacted with the robot and each other reveal that it is difficult for participants to become comfortable with the robot rapidly, despite the fact that they can do the same activity more effectively using traditional technology. When constructing human-human distant communications networks with robots acting as social mediators, these challenges must be properly taken into account and handled.

Cory D. Kidd and Cynthia Breazeal [7] researched the deployment of a robot meant to assist people in changing their behavior while dieting on long-term engagement in natural user contexts. In a controlled trial, robotic losing weight coach is contrasted with a stand-alone computer and a conventional. The software architecture utilized in that application to develop a successful long-term HRI. According to the findings of author, while utilizing the robot instead of the other ways, participants track their caloric intake and exercise for almost twice as long and form a tighter bond with the robot. Both of these demonstrate the efficacy of social robots for long-term HRI and serve as markers of longer-term success in losing and maintaining weight.

Stefanos Nikolaidis et al [8] researched about human collaborators communicate verbally and nonverbally to efficiently coordinate their efforts. The author presented a formalism to enable a human's teammate to adjust to its robot equivalent in a collaborative endeavor by fusing verbal communication with movements toward task accomplishment. Since 100% of respondents were capable of adapting to the robot, as opposed to 60% of people in the non-verbal condition, the findings indicate that verbal orders were the most efficient method of communication.

Do Kyun David Kim et al. [9] examined practical HAIR implementation strategies in healthcare and patient services in light of the enormous potential for HAIR active application. It also offers advice for producing and disseminating autonomous HAIRs in healthcare facilities. The pandemic, coupled with the advancement of HAIR technology, sparked curiosity in deploying health care robots. Those robots have a number of important benefits over humans that help them combat the highly contagious pandemic virus.

Thomas B. Sheridan [10] Reviewed the current state of human-robot interaction (HRI), important issues facing the field of human aspects are described. The author outlined the issues facing human factors research as well as HRI advancements in four application areas. The author Results shows that Success is evident in live demonstration of robot competence under various types of human control, in addition to a profusion of academic articles.

Mariofanna Milanova et al. [11] researched on how can robots and humans interact more effectively? Based on the Johari window hypothesis, the author suggests a novel method for human-aware Artificial Intelligence (AI) systems and human enhancement. Humans and Automation technologies, such as robotic systems, must have shared objectives, have a mutual knowledge of one another, and be aware of pertinent elements of each other's current situations in order to interact in a safe and successful manner. The author findings shows that a successful strategy for improving human-robot communication may be to think about team building exercises that use the Johari Window paradigm and have less suffering and more benefit.

Shane Saunderson and Goldie Nejat [12] provide a thorough concentrating on the four primary nonverbal communication modalities of haptics, proxemics, kinesics, and chronemics as well as multimodal mixtures of these modalities. Because nonverbal communication predominates in social interactions, it is crucial to investigate precisely how robot nonverbal behaviors affect humans. The author findings shows that how these various nonverbal modes affect people in four distinct ways: by altering cognitive framing, evoking emotional reactions, inducing certain behavioral responses, and enhancing task performance. The nonverbal robot behavior in relation to the aforementioned impact kinds is covered in length, along with potential future.

Taishi Sawabe et al. tested three conditions: touch alone, speech alone, and touch combination, employing a robotic arm to execute a light touch paired with speech. Using subjective emotional reactions and evaluated the participants' subjective assessments of valence, arousal, and human likeliness. Furthermore, evaluated skin conductance levels (SCLs) as physiologically emotional reactions and recorded face electromyography (EMG) from the zygomaticus major and corrugator supercilii muscles. According to the author findings, touch and speech together produced greater transversus major EMG and SCL activity as well as higher subjective pleasure and excitement levels than touch alone. The findings imply that adding aspects of speech might enhance the beneficial emotional benefits of robotic touch.The previous paper examined positive emotions are increased by robot touch and voice. Human-robot collaborative effort: toward new measures for communication

technology selection, information exchange in human-robot interaction, in a distant human-human good interaction project, investigating the employment of robots as interpersonal mediators. The present paper discusses the exchange of information through human-robot communication.

3. DISCUSSION

Modern robots have become more autonomous and capable in recent years, to the point where they are able actively collaborate with a human companion to complete a task. Human-robot interaction (HRI) has emerged with the goal of enhancing the effectiveness and applicability of combined human-robot systems. The goal of the Human-Robot Interaction (HRI) area is to make it simple and natural for people to engage with robots. Natural communication is necessary in these situations. Although verbal communication usually takes center stage in encounters between people, nonverbal cues like eye contact and hand gestures may express emotions, support verbal messages, and reinforce. Comparatively to waving, body posture, and other actions, eye gazing is a nonverbal cue that is particularly significant since research in psychology reveals that eyeballs are a cognitively exceptional stimuli with certain "hard-wired" neural pathways in the brain devoted to their interpretation [3].

3.1. Relationships Between Social Robots and People:

Daily life is getting more and more mediated. Mass media now acts as a main source of information that gives people direction in life. This trend is accentuated by the Online and the range of online communication methods. This is due to both the fact that more people are utilizing the Internet for interpersonal contact and the fact that media is becoming mobile due to technical improvements. A new media, the robot, has recently emerged. The ability of the robot to move independently makes it the true mobile medium; in contrast, with mobile communication, the medium is not mobile but rather the users are. Dependent on the theoretical vantage point, a robot can be characterized in a variety of ways. A robot's point of view is not that of a mechanism, a sensomotoric machine, or an autonomously machine. Rather, it will be viewed as a medium. A media viewpoint is a position on transmission, and a medium is anything that "mediates," links, and relates to that perspective. It serves as a mediator between people and between people and their surroundings. Additionally, this viewpoint asserts that individuals have relationships with the media in which they are sort of "talking back" [13].

From this vantage point, it is possible to think of robots as a particular category of media; "interactive media" in particularly locates the interaction between robots and media. Compares relationships with media to interactions through media as well as other computer-mediated interpersonal communication (CMC) tools. People are able to interact directly with robots. Zhao (2006) says the following about humanoid social robots in this regard: "Humanoid social robots vary from CMC technology in that they serve as not a communication with which humans engage, but rather a platform with which person interacts. Humanoid social robots, which take the place of human surrogates, "expand the range of human expression, discourse, and communication into the digital environment."" Robots thus stand for "a unique form of communication that influences how view ourselves and interact with others. The meaning of a medium will be formed depending on how it is used, whether that usage is more or less personalized, and a unique relationship will also be built or sustained. These interactive media appear to have some type of presumable "communicative intelligence" or communicative abilities, regardless of whether they are material hardware or software agents. Whatever their effects, these changes point to a

diversification of social interactional modes. The communication behaviors in the context of social media consumption become more varied the more diversity a media environment offers. Human-robot interaction (HRI) researchers are interested in "understanding and influencing the exchanges between one or more people and one or more robots" [14].

3.2. Human-Robot Visual Interaction:

The robot must comprehend both the overt and covert bodily clues that humans use to communicate, particularly emotive expressions. Despite the fact that several methods have been developed to identify emotions from facial expressions, their accuracy is frequently fairly low, requiring unrealistically large expansions of the face in order to be identified and too abrupt shifts in interpretation. Work needs to be done on promote muscle and subtle signals, whose identification is similarly constrained by sensor sensitivity, learning models that cannot be overly complicated, and real-world interactions where individuals move quickly in front of the robot and move to locations outside the camera's field of view. Cameras are capable of recognizing explicit, large motions with ease, which are typically taken to be orders [15].

Since the majority of the models were created for monitoring or other entertainment-related purposes and require settings that are not always typical for robotic systems, such as image sensors that are fixed in the surroundings, the presence of a specific user, models created in structured conditions, and subjects that are distanced from the camera, more basic human actions can be recognized, at least under ability to control that are not so popular in social robotic systems. Additionally, only a small number of activities have been taken into account in the data sets utilized to develop the techniques to estimate, mostly using deep learning, and numerous actions that are pertinent to HRI are not contained in those sets. An unresolved research question is how to reliably identify typical movements in a natural setting using a phone's camera attached on a social robot. Shorter range sensors (sonar, thermal) that measure distance from an unknown object, maybe a moving person, are the foundation of a simpler but less informative communication channel connected to vision. When these signals' dynamics are analyzed, novel interactions may be created in low-cost, low-processing-power systems, such robotic toys used in gaming [16], [17].

3.3. Nonverbal Interaction between Humans and Robots:

Robotics has already made life better by replacing risky, dangerous, and boring professions, allowing people to pursue safer, more skilled activities. Autonomous mechanical arms, for instance, can weld automobiles in factories, and autonomously vacuum cleaners can maintain clean floors in thousands of homes. However, the majority of robotic systems now in use run mostly without human input and are often unable to interpret everyday human speech. Robotics research is shifting from these autonomously but isolated systems to customized personal robots as robotics hardware costs down and computational power rises. Home-based robots can assist elderly or disabled people with routine chores like getting dressed or preparing meals, which can improve their lives and their independence. As intelligence third hands, factory robots may increase worker productivity and safety on the job. Robot tutors can supplement traditional classroom instruction by giving pupils individualized, one-on-one sessions. Between people who have social disabilities, such as autism, and their careers or therapists, robot therapy assistants can serve as a social bridge [18].

Robots must comprehend and utilize the current human interactions frameworks in order to be effective social companions. While spoken language often predominates in interpersonal interactions, nonverbal cues like gestures and eye contact may supplement and expand

spoken language. Personal robots need to be capable of both recognizing and producing nonverbal actions since nonverbal communication occurs in two directions throughout an engagement. The behaviors to be chosen rely greatly on the environment, with various behavior types achieving various communicative objectives, such as controlling turn-taking in conversations or explaining information. This nonverbal understanding has to take place in continuous, unstructured encounters in instantaneously to be useful in the actual world [19].

3.4. Seven Benefits of using Robots:

Many people worry that robots or complete automation would eventually replace them in their occupations, but this is just untrue. Robots in the workplace have more benefits than drawbacks. They enhance a business's capacity for success while enhancing the lives of actual, living personnel who are still required to maintain operations. Share the benefits of investing in robots with your staff if you're considering doing so. You might be shocked by the number of them jump on board right away.

3.4.1. Security:

The most apparent benefit of using robotics is safety. A person can easily be hurt by heavy equipment, hot-running machinery, and sharp things. By giving risky activities to a robot, you're less likely to face a significant medical expense or legal trouble and more likely to face a repair bill. Robots' ability to reduce some dangers will be appreciated by workers who do hazardous tasks.

3.4.2. Speed:

Robots don't require breaks or are easily sidetracked. They don't beg for a day off or to depart an hour earlier. A robot can never become anxious and begin to move more slowly. Additionally, they are not required to be invited to staff meetings or training sessions. Because they can operate continuously, robots speed up manufacturing. They prevent your staff from overworking themselves to reach tight deadlines or impossibly high standards.

3.4.3. Consistency:

Robots don't have to split their focus between many tasks. Never is their work dependent on the labor of others. They won't have unforeseen emergencies or need to relocate to finish a separate urgent duty. They are constantly present and carrying out their assigned duties. Generally speaking, automation is far more dependable than human labor.

3.4.4. Excellence:

Delivering quality will never fail a robot. They're less susceptible to errors since they're designed to move precisely and repeatedly. In certain sense, robots serve as both a quality assurance system and an employee. The absence of preferences and peculiarities along with the elimination of human mistake will always result in a product that is dependably flawless.

3.4.5. Happier workers:

Employees will be more likely to be content since robots frequently handle occupations that people don't particularly love, such as menial labor, repetitive movements, or risky employment. They'll be concentrating on more interesting tasks that won't likely get on their nerves. They could desire to benefit from further educational possibilities, use your employee health program, or take part in a cutting-edge workplace initiative. They'll be content to delegate the task that leaves them exhausted to the robots.

3.4.6. Employment:

Jobs are not eliminated by robots. They just alter the occupations that already exist. Robots require human oversight and supervision. More personnel will be needed to develop the robots as our needs increase. You can keep your staff enthusiastic in their roles at your organization by teaching them to work with robots. They will see the developments and get the exceptional chance to learn fresh technical or engineering-related abilities.

3.4.7. *Efficiency:*

Everything cannot be done by robots. There are some tasks that can only be finished by a human. Your human employees will be available and effective if they aren't preoccupied with tasks that could have been completed by machines. They can interact with consumers, respond to emails and comments on social media, assist with advertising and marketing, and sell goods. When the drudge job isn't holding them down, you'll be shocked by how much they can do.

3.5. Uses of Robotics in Daily Life:

The science of robotics focuses on developing humanoid devices that can mimic human behavior and carry out certain tasks. AI enables robots to behave intelligently in specific circumstances. The humanoid robot can analyse the composition of an object to estimate how much force is needed to move it. The robot can, for instance, fill the dishwasher, handle heavy goods, pick up clothes, and achieve higher objects. The automated kitchen is already up and running. Everything in the robotic kitchen is configured for best robotics performance using tried-and-true industrial manipulators. The robot can open the water faucet, crack eggs, and utilize blenders. The cooking process is entirely automated. With the aid of a video recording of the cooking procedure and its vocal description, the robot was taught. Already surrounded by a number of robots applications. But most of the time, ignore them. Some of the most prominent instances of robots in daily life are shown here.

3.5.1. Robotic Entertainment:

The purpose of these robots is to amuse viewers. They can appear in a variety of ways, such as robotic dolls, clowns, and monsters from science fiction movies and amusement parks. Individuals utilize these robots for a variety of purposes, including to assist people unwind and rest, entertain kids, and some even think that humanoid robotics increases people's confidence in them. As a result, entertainment robots, particularly robotic toys, are becoming more and more well-liked globally. These robots make it easy and enjoyable for individuals of all ages to explore with robotics. Additionally, they are inexpensive, so any family can afford to buy at minimum one robotic for their kids to play with. These toys use machine learning to enable them to carry out actions or provide answers on their own. They may also be remotely manipulated via smartphones or other technologies, giving the impression that they are living things.

3.5.2. Households:

In order to decrease human labor, robots are now being used for personal purposes. Now have access to several completely automated and user-friendly devices thanks to the ongoing improvements in technology. These robots can assist with home duties. Although there aren't many robotically powered equipment on the market currently, they should be in the near future. Examples of robots that assist with home chores include:

- Even if you're not home, household robots can take care of your pets.

- Laundry, cooking, and even bathroom cleaning tasks can be performed by robots.
- Every day, home robots can keep an eye on your domestic chores, and some of them can even get things sorted for you. For instance, a few robotics can assist you with food preparation.
- Some robots can construct furniture for you and assist you with heavy items around the house.
- Robots can take care of it when you're not home and alert you if there are any disruptions nearby.
- There are some robots that can take your call and carry on a basic formal chat.

Artificial intelligence (AI), a technology that can use machine learning (ML) for improved operations, powers these robots. Domestic robots have a lot of potential uses, but they are currently unavailable. In addition, they are prohibitively costly even if they were to become accessible.

3.5.3. Medicine:

In the area of healthcare, the impact of robotics is evident. Surgical robots have recently been successfully developed by medical engineers. The finance industry has embraced this innovation and is making larger expenditures in medical research. Recently, Google and J&J were working together to develop a cutting-edge medical robotic system. Robots were formerly solely used in the healthcare industry as helpers. However, they are now being incorporated into the healthcare environment as a whole. Although it's not now practicable, it won't be long until robots take the place of physicians in operating rooms. Robotics developers are now putting a lot of effort into creating effective micro and Nano robots. This is due to their extraordinary performance and ability to accomplish things exactly. To reduce the dose of administration medications and their negative effects, these robots can, for instance, spatially concentration therapeutic payload around problematic locations while delivering pharmaceuticals.

3.5.4. Economic Robots:

In the manufacturing sector, industrial robots are employed mostly for activities that need a high level of endurance, precision, and speed. They can be seen working on assembly lines in a variety of sectors, doing tasks including loading supplies and welding pieces. Precision is their greatest advantage over humans; even while performing repetitive jobs, they don't get tired or make mistakes. Since these robots are computer-controlled, it is possible to pre-plan their behaviors. They employ a number of sensors to "see" when a task is finished and turn off automatically. This manner, even if the robots' coding is slightly off, it is feasible to guarantee that their motions are always precise.

Industrial robots also have a lot of safety features to prohibit them from hurting people, such sensors that recognize when people are too close and halt the machine. Industrial robots are especially helpful for activities that call for repeated labor and high levels of supervision due to their speed and precision. A robotic hand cannot repeat the same motion with the same level of accuracy that a robotic arm can. Because of this, industrial robots can clean components or join them together at rates that are faster than what a person could do. They are also well-liked in assembly operations because they do duties more swiftly and accurately than people can. This implies that goods are produced more rapidly, which is good for businesses since it lowers their costs.

However, such effectiveness is not without its drawbacks. According to many, the world is becoming overly dependent on industrial robots, and as a result, there will be job losses as

workers on production lines are no longer required. There are millions of automation technologies used in industries today, and this number is rising quickly. Many predict that soon robots will work in the majority, if not all, of the world's factories, which might result in high levels of unemployment and an economic downturn [20].

3.5.5. Education:

Today, robotics is a part of general-purpose technology. This indicates that it has the power to alter and have an impact on the social and economic systems of societies. Consequently, it is now normal to talk about robots in the context of education. Many pupils are afflicted with various illnesses. Because of their physical limitations, many of them must miss class. Now that robots have been developed, students may attend lessons from anywhere. These robots, which the pupil controls, act like people in the classroom. Its cameras serve as its eyes, while its body is used for social interaction. This allows a student to participate in all activities in the classroom whether at home or in the hospital.

Humanoid robots are a fascinating way that robotics is being used in teaching. Students with autism frequently find speaking with others to be highly difficult and perplexing. The humanoid robots often resemble people and are simple to converse with because of this. These robots can assist autistic pupils by teaching them social cues and providing educational instruction. In this industry, success rates are quite high [21].

4. CONCLUSION

As increasingly encounter robotics in our daily lives, from the production line to the supermarket checkout line, they are becoming more common. Several common instances of robots in daily life and explained how businesses use robotic staff enhancement systems across a range of sectors. This professional presentation and safety requirements while enabling humans to concentrate on more crucial activities. Their importance will only increase as technology develops and gets more sophisticated, and it is obvious that robots will increasingly likely determine the future.

Using human-robot interaction to exchange information. Social robots and human interactions, interaction among humans and machines in the visual and nonverbal domains, using robots has advantages, everyday applications of robotics. The human-following robot is a vehicle system with the capacity to detect obstacles, move, and adjust the robot's location with respect to the subject in order to stay on course. To accomplish its objective, this project employs an Arduino, motors, and many kinds of sensors. This project forced the team to work together, communicate effectively, and get a deeper grasp of how machine parts, electrical, and programming are all connected.

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