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Virtual Reality: Today and Tomorrow

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ABSTRACT: Virtual Reality (VR), also known as Virtual Environment (VE), has gotten a lot of attention in the last few of years. Virtual reality has been promoted mostly as a result of the videogame industry and lower-cost equipment. Few people, however, actually understand what virtual reality is, what its underlying criteria and outstanding challenges are. In this day and age, the COVID-19 Pandemic has achieved amazing change, but its planning is serendipitous. Through sensory-based virtual communication, Virtual Reality plays an important role in combating this pandemic. It provides a flawless user experience that may be composited with real-world settings.As Virtual Reality (VR) expands beyond the fictional world and pervades every aspect of our lives, it is becoming increasingly important for both specialists and students to comprehend the various aspects of VR. A historical overview of virtual reality, as well as essential terminologies and VR system types, are discussed in this study. Finally, the future of virtual reality is examined from two perspectives: technological and societal. There are discussions on new research directions, technical frontiers, and prospective applications. It's possible that virtual reality will have both beneficial and negative effects on ordinary people's lives.

I. INTRODUCTION

Computer graphics are now used in many aspects of our lives. It's difficult to envision an architect, engineer, or interior designer operating without a graphics workstation at the end of the twentieth century. It allows you to see the world around you in a different light and experience things that aren't possible in real life or even exist yet. Furthermore, the world is devoid of boundaries and limits, and it may be constructed and controlled as we see fit—we can even add a fourth dimension to it: the dimension of our imagination. But that isn't enough; the majority of people want more. Rather than staring at a computer screen, they prefer it.Virtual Reality is a technology that has become extremely popular and fashionable in the last decade (VR).

The ability of virtual reality to represent the real environment in a simple computerized machine has enabled useful coaching simulations that were before unrealistically depicted on a traditional monitor system. The word 'Virtual Reality' simply refers to being as close to reality as possible. VR refers to a computer-generated simulation in which the user can have a real-life experience in a simulated artificial environment using devices such as special goggles known as headsets that are equipped with sensors.These phrases are part of Paul Milgram and Fumio Kishino's notion of "Virtual Continuum." We find the subset of mixed reality, which has been described as all that exists between reality and a completely virtual environment (See figure 1).The study of virtual reality began in the realm of computer graphics and has since expanded to include a variety of fields. Virtual reality has been used in treatment and training for a wide variety of fields. Virtual reality has come a long way in the last decade, with substantial hardware and software advancements. Users using VR, on the other hand, encounter minor difficulties such as latency and nausea. VR-based enterprises are gradually incorporating Artificial Intelligence (AI) and cloud computing technologies to improve stronger environments in order to address some of these difficulties. It has been observed that 5G has the ability to alleviate issues such as nausea and latency.

In the current pandemic, the theories and elements given by VR propositions are frequently highly valuable in medical applications, and so are frequently effectively used to address many of the challenges that are cropping up these days. The most significant distinction between VR and a regular monitor-based system is that VR often employs a head-mounted device that attempts to immerse the user in the 360-degree reality. These devices allow for the reproduction of a realistic experience while reducing environmental distractions.

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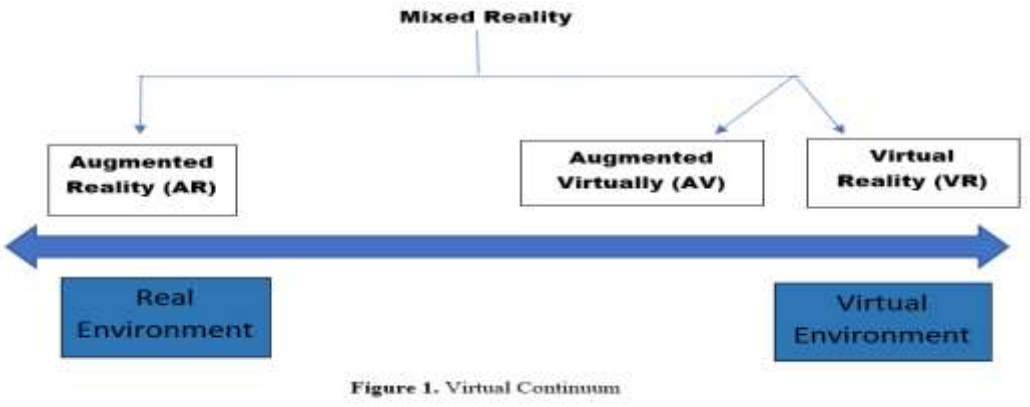

Figure 1. Virtual Continuum

II. LITERATURE REVIEW:

Paper 1: Virtual Reality: History, Applications, Technology and Future

Virtual Reality, sometimes referred to as Virtual Environments, has gained a lot of attention over the past few years. Wide media coverage is causing this interest to. But few people really know what VR is, what its core principles and open issues are. A comprehensive study is made of typically VR systems. All components of the VR application and their interrelationships are thoroughly examined: input devices, output - devices and software. Finally, the future of VR is viewed from two perspectives: technological and social. New research directions, technological frontiers and potential applications are indicated.

Paper 2: Importance of Virtual Reality in Current World

Virtual reality is considered an important technology, allowing a great leap forward for the opposing fields. Virtual reality, sometimes referred to as immersive multimedia, is a computer-simulated environment that can simulate a physical presence in real-world locations or in imaginary worlds. This paper brushes the importance of this stimulated reality by explaining how VR has experienced advancements offering us cutting-edge technology. It illustrates misconceptions about technology with its full development aspects and how we can overcome them.

Paper 3: Augmented and Virtual Reality Evolution and Future Tendency

Virtual reality has become popular mainly thanks to the video game industry and cheaper devices. But what was initially a failure in the industrial realm has resurfaced in recent years thanks to technological advantages in devices and processing equipment. In this study, an in-depth examination of different areas where virtual reality is used has been made. This study focuses on conducting a comprehensive coverage review focusing on these new technologies, where each will analyze their evolution in the most important categories in recent years and their evolution in the countries most involved in these technologies. Finally analyze the future trend of these technologies and the areas that need to be explored to further integrate these technologies into society.

Paper 4: Virtual Reality: History, Applications, and Challenges for Human Factor Research

Research into the viability of virtual reality systems dates back almost five decades. The following paper focuses on how virtual reality technology evolves into a viable tool during the research process. The paper concludes by discussing how virtual reality can be used in education and specific research conducted to examine the metacognitive skills of engineering students.

Paper 5: Historical Data Trend Analysis in Extended Reality Education Field

The paper is based on a review of the literature to discuss the history and social impact of virtual reality, augmented reality, and mixed reality. The research focuses on a case study that proposed a bright, interactive future with educational technologies. This document collected 269 citations from 2005 to 2020 and analyzed them and evaluated whether they belonged to a technical or theoretical paper. The paper uses the collected data to discuss industry development trends and suggests a possible future perspective based on the results of the data study.

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Paper 6: Evaluation of Virtual Reality opportunities during Pandemic

As virtual reality constantly expands from the fictional world and permeates all aspects of our lives, it becomes important for professionals and students to understand the various aspects of VR. The Covid-19 pandemic has brought unprecedented change in today's world, but its timing is accidental. Scientists are using sophisticated technology to accelerate development to end this danger. 1950s to the present. This paper discusses various VR applications such as medicine, entertainment, education, tourism, real estate and more.

III. CHARACTERISTICS

Experience, real-time, and interactive are the three main aspects of virtual reality. According to Speicher, the key characteristic of VR is the 360-degree experience. The term "360-degree experience" refers to the device's ability to give an immersive experience in the virtual environment. is Furthermore, users will be fully immersed in the VE in terms of visuals and motion. The real-time requirements are the second characteristic. Each 3D entity's activity should be updated in real time so that consumers are engaged in a pseudo-natural environment. Interaction the third feature.Users should be able to act on their VE behavior, such as moving around and manipulating, using the system's features.

IV. HISTORY

Ivan Sutherland proposed the original concept in 1965: "make the (virtual) world in the window look genuine, sound real, feel real, and respond realistically to the viewer's input." Let us take a quick look at the highlights of virtual reality research during the previous three decades.

Sensoram: It was a multi-sensory simulator built by Morton Heilig between 1960 and 1962. Binaural sound, fragrance, wind, and vibration experiences were added to a prerecorded color and stereo film. This was the first attempt to develop a virtual reality system, and while it had all the characteristics of one, it was not interactive.

In 1965, Ivan Sutherland proposed the ultimate virtual reality solution: a notion for creating an artificial environment that incorporates interactive images, force feedback, sound, smell, and taste.

The Damocles Sword: the first virtual system realized in hardware, not a reality system realized in hardware, and not a concept system. Ivan Sutherland constructs a device described as the first Head Mounted Display (HMD), with proper head tracking. It had a stereo vision that was refreshed in real time based on the user's head position and orientation.

GROPE: In 1971, the University of North Carolina (UNC) created the first prototype of a force-feedback system.

VIDEOPLACE: Myron Krueger established Artificial Reality in 1975, describing it as "a mental environment with no existence." The shadows of the users captured by the cameras were shown on a huge screen with this system. Thanks to image processing techniques that determined their positions in 2D screen space, the participants were able to engage with one another.

VCASS: Virtual Visual Environment Display — a stereoscopic monochrome HMD built at NASA Ames in 1984 with off-the-shelf hardware.

VPL: VPL is the firm behind the well-known Data Gloves (1985) and the Eyephone HMD (!985), which were the first commercially available VR equipment.

BOOM: The Fake Space Labs commercialized BOOM in 1989. BOOM is a tiny box with two CRT monitors that are visible through the eye holes. While the mechanical arm measures the location and orientation of the box, the user can take it, keep it by their eyes, and walk through the virtual world.

UNC: An architectural walkthrough application was developed at the University of North Carolina in the second part of the 1980s. HMDs, optical trackers, and the pixel-plane graphics engine are among the VR gadgets that have been developed to increase the system's quality.

Virtual Wind Tunnel: a NASA Ames programme developed in the early 1990s that used BOOM and DataGlove to allow the observation and exploration of flow-fields.

CAVE was first shown in 1992. CAVE (CAVE Automatic Virtual Environment) is a scientific visualization and virtual reality system. Instead of employing a head-mounted display, it projected stereoscopic pictures onto the room's walls (user must wear LCD shutter glasses). In comparison to HMD-based systems, this method ensures greater image quality and resolution, as well as a larger field of view.

Augmented Reality: "Presents a virtual environment that complements, rather than replaces, the actual world," according to the technology. A see-through head-mounted display (HMD) superimposes virtual three-dimensional items on real-world objects to accomplish this**.** This technique was formerly utilized to provide additional flight information to fighter pilots (VCASS). In the early 1990s, augmented reality became a focus of numerous research initiatives

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due to its enormous potential—the augmentation of human eyesight.

V. THE ULTIMATE HEAD MOUNTED DISPLAY

An HMD monocular optical system with a broad field of view and high resolution was intended to reconcile the contradiction between big field of view and high resolution in immersive virtual reality (VR) head-mounted displays (HMDs). The image source was a high-resolution LCD, and the system was built using aspheric technology with CNC grinding. In the form of partially overlapping fields of view (FOV) paired with a screw adjustment mechanism, an HMD binocular optical system with a wide-range continuously adjustable interpupillary distance was created using this monocular optical system.To address binocular vision inconsistency in the partially overlapping FOV binocular optical system, a fast image processor-centred LCD driver circuit and an image pre-processing system were also created. The distortions of a large-field-of-view HMD optical system were measured. Meanwhile, a calibration model for reverse rotations and translations addressed the optical distortions in the display as well as the trapezoidal distortions created during image processing. A high-performance not-fully-transparent VR HMD device with a big FOV [141.6°(H)×73.08°(V)141.6°(H)×73.08°(V)] was developed.The average angular resolution over the entire field of view is 18.6 pixels/degree. The device may be used to complete high-quality VR simulations in a variety of settings, and it can also be used for simulated training in aeronautics, astronautics, and other fields with matching platforms. The device that was created has a lot of practical value.

VI. APPLICATIONS

Military:

Virtual reality training is carried out using a head-mounted display (HMD) with data gloves and a built-in tracking system. Soldiers and other military personnel are given VR glasses to wear during battle visualisation, which produces a 3D depth of illusion. VR can be used to treat post-traumatic stress disorder (PTSD). In a 'secure' atmosphere, soldiers suffering from PTSD can learn how to manage with their symptoms. Soldiers are gradually exposed to the triggers for their trauma, which they acclimate to. This helps individuals cope with new or unusual events by lowering their symptoms.

Sports:

Players, coaches, and fans are all benefiting from virtual reality in sports. It allows coaches and players to train more effectively because they can realistically visualise and experience real-life situations, and they can improve their skills each time. It is utilised to aid in the analysis of approaches and the measurement of athletic performance. Some think it helps disabled athletes enhance their cognitive capacities by exposing them to virtual life-like games scenarios.

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It can also enhance the viewer's experience by allowing broadcasters to sell virtual tickets to live events, allowing anyone to attend any sporting event wherever in the world.

Mental Health:

VR technology has proven to be an effective treatment for post-traumatic stress disorder. This is accomplished through VR exposure therapy, in which a person can cope with and recuperate from a traumatic event by re-enacting it. It's also been used to treat anxiety, sadness, and phobias, among other mental health disorders. Virtual reality technology can provide a safe setting for patients to conquer their phobias in a regulated and safe atmosphere.

Education:

Students from schools, colleges, and universities all over the world have been affected by the COVID-19 outbreak, which has disrupted their education. Aside from the military and medical fields. Schools have also begun to use virtual reality in the learning and teaching process. In a 3D environment, students can communicate with their friends. Students with autism can benefit from virtual reality. Students are not limited to text descriptions or book illustrations when using virtual reality. Immersive VR combined with ICT aids in the visualisation of concepts and hands-on experience of how things work. A simple VR system, for example, may convincingly recreate a whole research lab.

Fashion:

Despite the fact that virtual reality is less well-known in the fashion sector, it has had a significant impact. For example, virtual simulations may be incredibly useful for merchants to develop and exhibit their products for commercial purposes without the constraints that would normally limit them in the real world. Some well-known brands, such as Tommy Hilfiger, Coach, and Gap, have already begun to incorporate virtual reality into their operations. Customers can try on items in VR as part of a whole fashion show experience.

COVID:

During the COVID-19 epidemic, virtual reality (VR) is in the spotlight because technology is allowing individuals to feel closer to one another despite social separation, and it is connecting people to their families and job. Many businesses are taking notice and experimenting with virtual reality as the benefits become clearer. COVID-19, which began as an epidemic, has now evolved into a full-fledged pandemic, with governments grappling to the point where lockdowns appear to be the only choice for reducing infection rates. The bare requirements must continue to flow in order for a lockdown to succeed. During this pandemic, virtual reality technologies will be an invaluable tool.In view of the problem of 'social distance,' pre-pandemic gatherings are an appropriate approach. VR technology has provided a number of options for dealing with this dilemma.

Real Estate:

The pandemic has wreaked havoc on the real estate market. To address the issues, start-up companies are digitising homes and using virtual reality (VR) to organise virtual 3D tours for potential buyers while adhering to retailer standards, allowing consumers to see what they're receiving before they buy. Furniture vendors, for example, provide virtual home decors through apps so you can evaluate how it goes in with your current décor.

Tourism:

Tourism has evolved into a charming, forgotten curio tucked away in the back of the reality shelves. Tourism and travel organisations, for example, are offering virtual museum tours of historic ruins and huge, breathtaking mountainous landscapes. With the outbreak of a pandemic, more people are turning to television, Netflix, and Zoom, but none of these options compare to actually being there in person. Virtual reality (VR) offers a unique dimension to how we see audio-visual content. Take a concert, for example, and place it in a virtual reality setting where we can move around as an avatar in a 3D space, interact with other people, and experience it more fully.This will have advantages and downsides as compared to a television concert, but it is a possibility that many producers are already actively considering. For a few years, virtual reality has been steadily sweeping over the world of sports, but with the current pandemic, now is the right time to deliver the live sports experience to the public in a simulated environment that replicates the in-stadium experience.

VII. FUTURE

Research Directions in VR

According to Sutherland's definition of the perfect virtual world, VR should be indistinguishable from "actual" reality (RR). The majority of today's VR applications are inaccurate and of poor quality, yet they are nonetheless incredibly helpful and compelling. Without a question, virtual reality has a lot of potential, but it needs a lot of work to make it more comfortable and easier to interact with virtual environments.It does not have to replicate reality in every detail: for training, the simulation should closely resemble

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real-world working conditions, but, for example, in the UNC's nanomanipulator application, there is no reference to reality at all (since humans cannot experience the interaction with molecules in real life).

Human considerations must be considered regardless of the application or its objective, or the system will not be considered or will not be adequately comfortable and intuitive. Mechanisms that allow people to quickly adapt themselves and their behaviour from VR to reality and vice versa are needed. To meet these needs more effectively than present systems, extensive research and the development of new technologies are required. Therefore. VR, according to Andries van Dam, is a "forcing function."

Tracking technologies in VR

Many restrictions exist in today's tracking devices. First and foremost, the recorded volume in many circumstances is really limited. In practise, the user is tethered to a specific location in space (the tracker reference point) and is unable to move freely. Furthermore, tracking quality is frequently insufficient - most currently utilised technologies are extremely sensitive to ambient variables (measurement quality drops substantially with distance) and add significant latency.

It is lightweight enough to be worn comfortably by the user. The interior tracking working volume should be large enough to allow free walking, such as in a large room. At the very least, the tracker should be impervious to any form of disturbance, ensuring that measurement precision is maintained throughout the volume. The "optical ceiling," which allows tracking of the user inside an area of around three by four unfettered movement freedom and equal tracking precision across the working volume, was developed at UNC as a partial solution for inside tracking.Although the inside-out tracking paradigm used in this system provides acceptable orientation measurement quality, position measurements lack the precision required. The entire setup is relatively costly (ceiling LED panels and proper management are required), and optical equipment (cameras) must be coupled to the HMD. However, for the time being, it is the finest option for complete inside tracking.

Outside monitoring is an intriguing concept that could lead to new VR applications, such as navigation systems and location-sensitive information services. The current Global Positioning System (GPS) does not yet provide sufficient position measurement quality for virtual reality, but additional research and development in this field may bring the necessary improvements. In combination with source-independent orientation tracking devices, such a high-precision GPS could provide a solution for medium-quality, low-cost, and widely used global VR or AR systems.

User interfaces in VR:

"Virtual reality means there is no need for an interface": every type of human-computer contact should be so natural and intuitive that no learning or adaptation is required. However, we are still a long way from this: today's interfaces are awkward, requiring hefty hardware, complicated calibration stages, and non-intuitive interaction paradigms. As a result, they are difficult to operate for the inexperienced user.

Better input and output devices should be used in future interactions with virtual worlds. Every input device should also function as an output device capable of providing suitable haptic feedback. This is necessary because every action taken in the actual world on an object causes that object to react. These cues allow humans to manipulate objects without seeing what happens because our sense of touch alerts us! Other senses, such as audio output and voice recognition for spoken contact with the computer, as well as taste and smell, must be integrated in the interaction process.Combinations of all of these feelings would increase the number of information channels between the computer and the person, making virtual reality more lifelike.

The first attempt to improve high quality haptic interfaces is with feedback gloves, dexterous and exoskeletal manipulators (for the hand and even the entire arm). A force feedback suit that delivers haptic sensations to the entire body could be developed as an extension of them. Existing prototype devices, on the other hand, are highly complex mechanical structures that are heavy and inconvenient to use.

Computer-generated voice feedback (speech-audio) does not appear to be an issue at this time. Speech recognition is also required to meet the need for human-computer communication (e.g., with computer produced autonomous actors or agents). There are a few commercial systems that claim high recognition accuracy, with prices ranging from $150 to $30,000 USD. However, only a small number of them enable large dictionaries and continuous speech processing (whole sentences vs single words). While simple orders are straightforward to recognise and evaluate, the real challenge is teaching the computer to grasp what the user wants (in fact it is the Artificial

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Intelligence problem).Furthermore, considerable computational power for recognition and extensive user training are necessary

Biomedical Research in VR:

Some of the most expensive components of VR systems are sophisticated input and output devices. The advancement of microelectronics gives reason to believe that new, high-power "silicon designs" will be developed quite quickly. Current "standard" output and input devices, on the other hand, are far from satisfactory. The cost of improving them (higher resolution, precision, etc.) is prohibitively high, owing to technological limitations.

Biomedical signal processing could be utilised for both input and output to solve these issues. It could be detected via biomedical signal processing. The positions of body components could be traced by analysing these signals. Furthermore, this approach can be utilised to augment existing motion prediction techniques (e.g., how the head reacts to muscle input) so that future position and orientations of the lead can be predicted more precisely.

Computer output can be directly connected to human nerves: instead of developing high-resolution displays (which are still too low for the human eye), images may be delivered directly into the eye nerves in various sections of the body, and so on. Finally, direct stimulation of brain cells to create manufacture sensations seen by human senses is a possibility. As envisioned in William Gibson's science-fiction writings, one may simply "plug" oneself into the computer.

VIII. SOCIAL ASPECTS

Expectations:

Virtual reality has already found a wide range of applications in several fields of study. Architects, designers, physicists, chemists, doctors, surgeons, and others found it to be an invaluable tool. All of these professions, however, are out of reach for the common person, and virtual reality is beginning to resemble a fantasy - something both fantastic (a Promised Land?) and inaccessible.

VR was hidden behind laboratory walls until the end of 1980 because to the exorbitant cost and fragility of the technology. However, at the start of the present decade, media curiosity drew it to widespread attention. Furthermore, the development of low-cost, high-performance hardware facilitated the expansion of numerous public installations. The first were arcade games, which were computer games enhanced by the use of a head-mounted display (HMD) and a tracking system. Due to their enormous success, new entertainment systems like as multi-user car races, dungeon games, flying simulations, and others have appeared on the market.

Apart from adventure games in cyberspace, there are few other applications that have the potential to have a significant impact on people or society. Nonetheless, successful initiatives to use VR systems in medicine (e.g., the treatment of mental diseases, phobias, and persons with disabilities) and education have already been made. Virtual reality technology will have a rapidly rising impact on practically every aspect of our lives in the future:

• **education** – school, various training systems (e.g., driver's licence courses, sport coaching, flight simulation, military or astronauts training, etc.), programmes explaining natural laws (e.g., by placing the user between molecules, inside a hurricane, or allowing him/her to explore the galaxy), and even virtual universities without lecture rooms will become commonplace in the near future.

• **information retrieval, processing and searching** - today's society is referred to as a "information society," and the demand for new sources of easily accessible data will continue to grow. Virtual libraries (not just books, but films, music, stock-exchange data, and so on), office electronic data-files, and guided sight-seeing tours (seeing virtual museums, buildings, cities, and territories, among other things) will provide the most convenient access to knowledge. The fact is that, as networks (i.e., data highways) expand, anyone will be able to rent a network line (similar to a telephone or cable TV line today) and link it to his or her personal workstation (computer with an HMD). The use of virtual reality in daily life will then become as widespread as the use of telephones, vacuum cleaners, television sets, films, automobiles, or aeroplanes is today.

• **augmented reality** – Additional information can be displayed to the user using see-through HMDs, pointing his/her attention to important objects in the real world, showing the way to the specified goal (e.g., by highlighting the right way through the city), or explaining the next step that must be performed to complete some tasks – ranging from complex tasks such as repairing complicated electronic devices or space shuttle elements in open space to simple tasks such as operating fax machines or laser-primed printers.

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• **new senses** – Every piece of information that can't be gathered by human senses but can be collected by technical sensors could be viewed by the user. A doctor, for example, may have direct access to a patient's body, an electrician may see wires in walls while repairing house wiring, or an engineer may view pipelines beneath the ground while digging, and so on.
• **passive entertainment** – As the next information medium of the twenty-first century, virtual reality (VR) will supplant the bulk of passive entertainment activities such as reading books, watching movies, watching TV, and listening to music. In actuality, they will all be merged into a single virtual multimedia system.

• **active entertainment** – Some computer games become more realistic, and thus more interesting, as a result of VR technology. Other leisure pursuits, such as performing music or participating in sports, are likely to be affected by VR technology in the near future.

• **communication and collaboration** – People routinely exchange massive volumes of data through communicating with other individuals at work and at home. Physical encounters are substituted with talking on the phone or on-screen teleconferencing sessions when they are not possible due to large distances or other obstacles. Meetings in virtual space, virtual phone conversations, virtual mailing, and many other possibilities abound (in practise, VR can replace any media). These communication paradigms are not constrained by distance, and they offer a promising alternative to current collaboration technologies.

• **remote operation** – A remote-controlled television set is nothing special nowadays. The use of virtual reality technology can help to improve the fundamental concept of teleoperation. It can encompass extremely difficult jobs that necessitate human skill. Teleoperated robots may soon be able to take over jobs that are potentially detrimental to people's health. This covers, for example, nuclear power plant maintenance, work at heights, work with chemicals or viruses, and so on.
• **interactive design** – With the use of virtual reality, every engineer will be able to create and test his or her projects (engines, body aerodynamics, or even entire mechanical constructions) in the future. Testing a car's road behaviour, acceleration, and other characteristics is a fun and inexpensive alternative to today's lengthy design processes.

Ordinary people will eventually be able to create their homes, hairstyles, and clothing interactively and see the results right away. Every appointment with a hairstylist, tailor, or interior designer would begin with a VR session.

This list of expectations (or, more accurately, wants) can be endless and will never be comprehensive.

Fears:

With the entrance of virtual reality into society, there is a need to establish ethical guidelines. People should also be aware of the possible dangers of new technology, such as the negative or even destructive effects it may have. Humans have a remarkable ability to adapt to new circumstances: they will, in the end, always find their place in new (even virtual) realities. Nonetheless, it is preferable to avoid than to repair. Future virtual reality systems can be classified into four categories based on two criteria: social vs. non-social, and creative vs. non-creative.

A single user can interact with the surroundings in non-social virtual environments. This can be an interaction with a prefabricated (i.e., pre-programmed) environment (which is referred to as a non-creative system) or with an environment that can be adjusted according to the user's needs and preferences (which is referred to as a creative system) (they are then called: creative systems).

On the other hand, social virtual worlds allow numerous users to interact with each other as well as the surroundings. The environment can be pre programmed or built and adjusted by the user or a group of cooperating users, much like in non-social systems.

Different sorts of virtual reality systems can have varying effects on people's minds. People may get isolated in their "own worlds" as a result of non-social virtual realities. This has already happened in part — forcing some of the most devoted computer-game players to return to reality is nearly impossible! It can only become worse with more convincing and realistic systems...non-creative apps (such as games) may have a secondary negative effect: enclosing the user in a world that cannot be changed goes against human nature and might lead to a loss of imagination.

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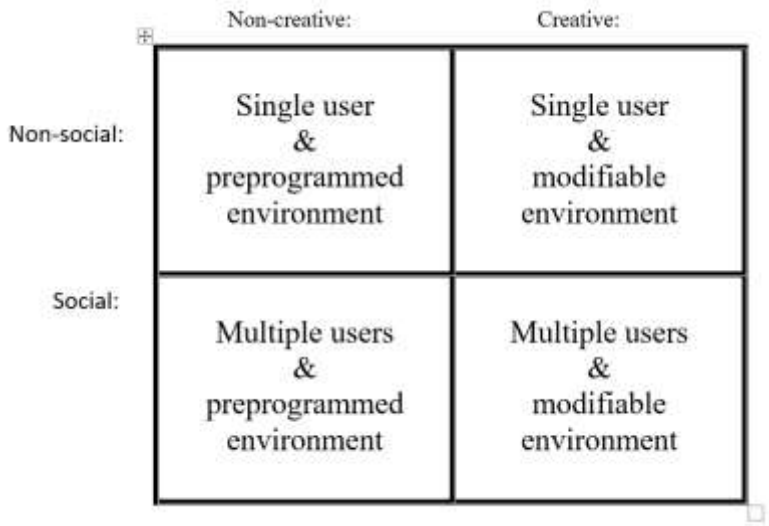

IX. CONCLUSION

Virtual reality has applications in education, the military, fashion, sports, and entertainment, according to this study. It has been observed that virtual reality (VR) offers a lot of market growth potential in the health care sector, particularly given the present pandemic situation. This also indicates the suggested use of communication and digital facilities, as well as current technologies, to address the major difficulties that have arisen as a result of the current COVID-19 pandemic. Virtual reality is expected to increase dramatically by the end of this decade, according to experts.

VR has a critical role to play in efficiently dealing with the present pandemic instances. Virtual reality has discovered a method to demonstrate to the rest of the world that it is the answer to many problems. One thing is to invest in virtual reality capacity building. As a civilization, we will have to adjust to new methods of coexisting with our environment and people in the post-COVID-19 period. Virtual reality, which is as near to reality as we can go, is the best way to accomplish this.

As far as the future of VR is concerned, it is expected that by 2050, we will have a virtual reality that perfectly replicates sight, sound, and smell. It's also possible that it has good haptics and flavor emulation. Virtual assistants that can read our moods and minds are also being created. VR is rapidly gaining popularity as a result of a recent spike of VR-compatible smartphones. Compliance training is another popular topic being researched. Virtual reality (VR) can be utilized in "safe" safety training. It allows learners to feel the consequences of risky activities and rule infractions. Virtual Reality would be the next great thing in technology, offering a variety of problem-solving options.

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