Exploring the Mind-Bending Connection between Virtual Reality and Human Perception: Review

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***Abstract*- Despite many distinctions in the human perception and virtual reality, they exhibit a connection to each other which makes the experience in the virtual reality immersive and interactive for the user. Technological advancements in the field of simulated environments have led the human to be able to connect and perceive the virtual environment generated by the software but there are still some drawbacks of the virtual reality due to which the humans are still unable to connect to the simulations on a larger scale. This is because the human eye and other senses are still more capable than the senses imitated by the devices used in virtual reality. However, efforts are being continuously made to curb the lack in the technology of the virtual reality, it is still a great help with the existing technology in many fields.**

This research work represents an understanding of the study of theory of human perception and the technology of the virtual reality along with its types, Comparison and challenges.

Keywords: Virtual reality, VR, User, Human perception, Real, Environment and Experience.

I. INTRODUCTION

Human perception is the process by which living things interpret their surroundings through the use of their five senses of sight, noise, touch, taste, and smell. It also includes a collection of senses that include the capacity to perceive changes in body postures and motions. The sensory experience of the world and its interpretation is referred to as perception.

Virtual reality is a technology that is a simulation created by the software which is as near to reality and has real world experiences that the human perception is tricked and is made to believe the reality of the virtual reality. Consequently, virtual reality brings to us a version of the real world which is actually a simulation but our sensory nerves of the brain force us to perceive it as reality.

The human perception and virtual reality are able to connect to each other due to the two main aspects of the technology of virtual reality which are immersion and interaction. Though there is a connection between the human perception and virtual reality, it still lacks the authenticity as that of the real world because the human eye has a very huge number of photoreceptors and a large number of electromagnetic radiations which makes it more capable than any VR technology discovered till date [1].

But with the effectiveness of the connection, we have been able to establish has led to the usage of the virtual reality in many fields such as education, military and medical training, sports, fashion and gaming. It is also used to treat traumas and maintain proper mental health.

The virtual reality is progressing at a great speed and will get much better in the future than it is in present times. The new improvements in the VR will greatly enhance the experience of the simulated world. The lack in the hardware when upgraded will result in more authentic and original frame of view and better spatial audio experiences.

With the advancement in the technology, brilliant software developers, academicians and business executives will be able to create applications which will impart life-like simulation experience through excellent immersive and interactive techniques.

II. DISTINCTION BETWEEN HUMAN PERCEPTION AND VIRTUAL REALITY

There are some differences between human perception and virtual reality which are as follows:

Human perception is the process by which living things perceive their surroundings by utilising their five senses of sight, hearing, touch, smell, and taste, as well as by recognising environmental cues and responding to these inputs [2].

VR is a technology that brings into being a computerized simulation which has real world experiences perceived by mainly the sensory powers of sight and sound and can be harmonised and explored by the humans, whereas, Reality is what is truly there. Perception is the awareness of reality as it is, without interpretation or colour from your thoughts and conditioning. Virtual reality is a simulation of something that exists someplace else that is shown in front of you but does not exist there.

In human perception, there is no interference of the hardware in the real world that makes the human perception

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of the world the most authentic. But in VR, there is a hardware interface between the human and the simulated world which creates a lack in authenticity of the experience of the world [3].

III. Connection Between Human Perception And Virtual Reality

VR has the potential to significantly alter vision research as well as the way medical researchers perceive visual data in the brain. Some believe that visual processing goes beyond merely interacting with the environment and instead tries to replicate it.

The study of vision and the processing of the sensory data has seen new opportunities due to the property of immersion in the virtual reality. Environment simulations that are realistic and multimodal are now achievable with the current technology.

The stimulus received to the user can be constrained in ways with the help of VR that would not have been possible in the actual world. This can take place without hindering the environment of the user which is the major distinction between definitive experiments and the real world. Certain experimental parameters fluctuate significantly throughout the testing based on the user's reaction with the stimulus [4].

The consumers should ideally be uninformed that they are taking part in an examination. They can playing online games or become engrossed in a pursuit without understanding that their motions and activities are being observed and evaluated. The experiment would not interfere with the users' activities and the researchers can research on the behaviour on the sensory systems spontaneously in real life rather than during the experiment.

The usage of immersive VR in exploring human perception in a systematic and restricted manner makes the experimenters close to their aim yet receiving a realistic stimulus which can be investigated by the users. This kind of valid ecology is not feasible to attain with the standard procedures of testing but is very much closer to the interaction between humans and the environment in the real world. The signals in the simulation can be modified to create an environment that can be rearranged according to the movements of the user in the virtual world such as the changing of the scale and rotation [5].

The removal of bias suggests that users use specific visual cues in more realistic settings that enable them to accurately estimate object qualities, and that the absence of these signals in the constrained context of reduced-cue perception results in perceptual bias. The intrinsic challenges of isolating single signals and the ongoing debate over how to generalise from single-cue to multi-cue scenarios are both major contributors to these issues.

The issues of cue employment and integration cannot be wholly solved by VR but a blend of it with classical experimental ways can provide a channel to study sensory perception in a controlled and ideal way. This infers that the virtual reality can recreate the original manner in which the human perception and behaviour are interallied in the real world.

IV. Obstacles In Connecting Human Perception And Virtual Reality

There are some factors due to which the human does not feel fully immersed in the virtual world even with usage of best technology currently available. The factors are as follows:

A. ***Field of View***: Human eye can see the surrounding world in roughly around 200 to 220-degree arc around their head and there is a 114-degree arc when the left and right eyes overlap in a 3-D environment.

The headsets present today are not capable to harbour the full field of view of the average human eye. They mainly focus on delivering the 114-degree arc to experience the 3-D virtual environment.

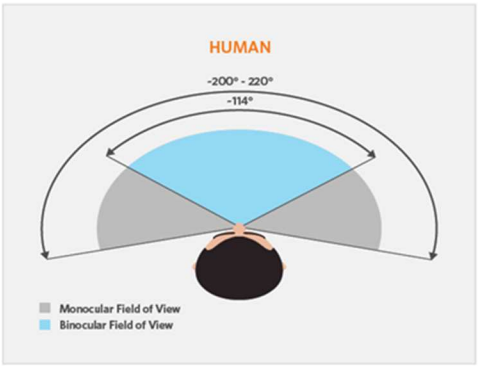

Figure 1. Field of View [6]

B. ***Frame Rate***: The human eye can see up to 1000 frames per second (FPS) but all of those frames are not received by the human brain because of the loss of data during its transfer by the optic nerves. Humans can detect up to 150 FPS.

When the FPS is less than 60, the developers of the VR have encountered that the users feel headaches, queasiness, and bafflement. Due to this fact, most of the designers aim to keep a FPS of about 90 which comes under a certified range. Efforts are also being made to achieve a frame rate of about 120 frames per second.

C. ***Sound Effects***: The sound effects are created by a technology called "spatial audio" which creates a virtual audio landscape that fits with the visuals of the simulation. It is a technique in which the developers can create stereo audio using a set of headphones that imitates the exact sensation.
Though, this type of audio experience is very immersive in a "head-locked" space such as a movie theatre. This

type of technology is quite lacking for a VR experience because it is difficult to balance the audio level and movement of the user in the virtual world.

D. ***Head and Position Tracking***: The main aspect of the virtual reality is the movement and positioning of the user. There are two types of head and position tracking systems used in virtual reality devices which are: 3DoF and 6DoF.

3DoF system is proficient in tracking rotational movements. Whereas in 6DoF system, the user's position and movement can be tracked effectively.

V. Solution To The Obstacles

As VR experiences get more sophisticated, quantifying the impact each part of the experience makes to someone's perception inside a VR headset becomes more challenging. There is a requirement of a strategy to investigate VR in a reductionist fashion, reducing the clutter before gradually reintroducing each feature to examine the outcomes on the user's experience of presence.

The maximum likelihood estimate proposes the idea of combining the computer technology with psychology and illustrates how we combine information from all of our senses and integrate it to inform our perception of the world. In its most basic form, it asserts that humans optimally aggregate sensory information; each sense provides an estimate of the world, although it is noisy.

There is a requirement of instil the quality of multi-sensory environment to give more immersive VR experiences. All sensory signals should be collectively used to for practical uses.

VI. The VR Requirements

According to the researcher stated that one must assume "information processing constancy" and that it follows the same pattern for word processing in our world, which includes discrete management, specialised techniques for mathematical difficulties, and limited memory treatment. VR processing is therefore thought to work in the same way. The study [7] also uncovered the following prerequisites:

A. ***Finite Processing Allocations***: This need plans how the optimization divides processing among a limited number of VR conducts in order to make it behave like the real world. Based on the idea that each unit of time, space, and power had a "limited information capacity," the restricted optimal assignments were created. Autonomy: The idea that the VR will behave as the actual world does without the introduction of additional data and knowledge is referred to as autonomy in this context [7].

B. ***Calculability***: Calculability means that the VR must constantly calculate and behave like the real world. Any computation in a VR system that is finite and does not trend to infinity should be included in the source. For instance, "Some many-body calculations, for example, have processing requirements that balloon to incalculability."

All of the above conditions have an impact on the system's ability to be VR. The criteria are similar to real-world limits for creating VR. Another researcher [8] stated in his study that the three key prerequisites for developing the VR environment are:

- ***Performance***: The VR experience necessitates minimal latency and a high frame rate. If the performance of VR surroundings is inadequate, it is inconvenient for the user. Then, VR systems must take use of existing resources such as sophisticated graphics gear and CPUs.
- ***Flexibility***: The equipment and software utilised in the VR environment, need to be configured to work with those devices and applications. That arrangement must be brand new.
- ***Ease of use***: The user must quickly learn and setup the fundamental VR environment. The development of apps requires the usage of APIs and programming languages that are "clearly specified and should abstract the system's profound complexity" [8]

The user interface for all three types of virtual reality systems relies on interaction. Because interaction "determines the demarcation path between the user and the VR reality and specifies how the environment will respond when the user interacts with the input devices," interaction is crucial in VR systems [9]. Users are able to walk around and travel in the virtual environment thanks to interaction technologies.

Navigation, object selection and manipulation, and system control are the three categories of interaction technique techniques [10].

C. ***Navigation***: Choosing an orientation in space to establish the precise position of an item is referred to as navigation [11]. The tracking that allows users to move and travel inside virtual worlds is known as navigation . The interactive navigation job is further broken into three major areas. Exploration, searching, and manoeuvring. It enables the user to place the viewpoint at more advantageous points to execute a certain job [9].

D. ***Selection and Manipulation of Objects***: The user can choose an object for manipulation and route it with their hand in the VR environment. A mouse, keyboard, joystick, or other input device can be used, as well as head movements, eye movements, and hand gestures, to help the user make their choice. System control (view control) is referred to as interactivity [12].

System control enables the user to communicate with a virtual environment (3D world) as well as with other users.

System control functions similarly to a command sent to modify the system's activity or manner of interaction.

VII. Essential Elements Of Vr

The VR system is made up of four fundamental components. Researchers Sherman and Craig [13] determined these components as the following are the elements:

- ***Virtual World***: It is a computer-generated planet. The virtual world is made up of items and spatial principles. Those items and principles are linked together via relationships.
- ***Immersion***: It changes the world's sensitivity since the user lives inside it and can touch it. Immersion is not simply seeing the world without experiencing it.
- ***Feedback from sensors***: This element enables the user to arrive at a reasonable conclusion depending on the user's input. Sensitivity is also determined by the user's location, behaviour, and navigation.
- ***Interactivity***: It is in charge of providing the realisation and depicting the virtual environment. It enables the user to interact with items in a virtual world environment. These four parts are the fundamental components of a computer-based VR system.

VIII. Types Of Vr Systems And Hardware

There are six types of virtual reality which are all unique in their characteristics and the type of the interaction they have with the user of the simulation are as follows:

Figure 2. Types of Virtual Reality

- ***Fully-immersive or Immersion Systems***: This type of VR furnishes the users with the most authentic experience achievable, which also includes sight and sound. the user's movements.
  The user can view high-resolution content with a wider range of sight with the help of the VR headset.

This type of VR is provided with hand gloves, body connecters and motion sensors which are all connected to a very powerful computer system.

A helmet-mounted display (HMD) that records the user's head motions and modifies the view is required for immersion VR systems [14], [10]. Technology that is entirely immersive includes CAVE technology. To address and treat the problems associated with creating a one-to-many visualisation tool that utilises massive projection displays, CAVE was developed and built [15].

In order to create a truly realistic experience, this type of VR technology isolates the user's aural and visual awareness within the virtual environment. This type of technology is expensive and has a number of disadvantages, including burdensome design and environmental concerns with simulators. The user feels as though they are a part of the virtual world when using full immersion VR technology. Building tours conducted virtually using this type of VR are one use of complete immersion [16].

Figure 10 depicts examples of employing full immersion VR. It depicts a completely immersed "Light Vehicle Simulator" utilised for training reasons. This sort of simulator teaches users how to cope with and respond to emergencies and perils when operating vehicles on mine sites.

- ***Non-Immersive System***: Non-immersive virtual reality is a computer-based virtual experience in which the user can control some of the characters or activities involved in the simulation but there is no direct interaction between the user and the simulation.

The user can control the characters within the simulation which have their own unique motions and traits. This implies that the user is technically interacting with a virtual environment, but is not the focus of the simulation. Instead, all the actions or the features of the simulation interact with the characters included therein. This type of virtual reality is used in making strategic games and puzzles.

Because it is a window to the virtual world without the need of extra equipment like HMD, the non-immersive system is also known as Window on World (WoW) systems [17], [18]. It is also known as desktop virtual reality (without any input devices) and is based on the displayed screens. The most popular VR system is the desktop model, which uses a regular computer monitor to display the virtual environment. These systems can achieve adequate

levels of graphic quality, user comfort and convenience, and lower costs despite having a lesser degree of presence and perhaps less interactivity [14].

The least priced VR system is the desktop model, which offers the least immersion. The most frequently used application of non-immersive VR in education is learning.

Video games and other examples of desktop VR systems depicts a non-immersion system based on a screen with only 3D display and no interactivity. It mixes virtual reality with real-world features by incorporating computer visual items into a real-world setting, but without interacting with the things on screen [9].

A virtual world is another type of desktop VR system. It is implemented in education to aid learning and improve the user's ability to comprehend and perceive information. Interactions between humans are provided via virtual world systems that connect multiple avatars. To create virtual worlds, many open-source software packages are available, including "Second Life, Active World, Open Simulator, and Open Croquet" [19].

- ***Semi-Immersive System***: In this type of virtual reality, the user experiences a hybrid of non-immersive and fully-immersive virtual reality. It can be in the form of a 3-D area or a virtual world in which the user can walk about independently using a computer screen or a VR headset.

  In the semi - immersive environment, the user is not capable to make any physical movements rather can only experience the virtual reality visually through the sense of sight by using the mouse, touch or swipe to move about the place.

  It is now used primarily in the field of education of the training pilots using flight simulators which consists of a moving cockpit and a virtual environment on the screen. It enables pilots to learn without the dangers associated with flying an actual plane.

  A hybrid system is the third type of VR device. A desktop VR development environment called semi-immersive is available, and it comes with extras like Data Gloves. It uses real models and maintains the desktop VR system's simplicity while offering a high level of immersion. The displayed virtual environment is superimposed in a semi-immersive manner on the recognised real world. The creation of semi-immersive systems requires display, tracking sensors, and user interfaces [15].

  By including computer-generated objects in the reality situation, the semi-immersive technology integrates virtual reality (VR) with aspects from the real world. Users of this type of technology enter data and manage input utilising a mouse, keyboard, interaction styles, glasses, and joystick [9]. The user can interact with it by using their hands, as well as occasionally by donning glasses or Data-Gloves.

  The display's text, graphs, and image elements protrude onto the translucent screen, enabling the user to interact with the real environment.

- ***Augmented Reality***: It is a type of reality in which an entity or gadget appears to be present in the real world but is not. In other words, it does not take the user in the simulation but creates a simulation in the real world. The entity is only visible through the device and is not present in the actual world. For example: the google feature of viewing objects in 3-D makes us able to interact with the object by placing it at a place in our room with us. But it is only visible when viewed through a device (e.g. android phone) and is not visible to us in the real world. Augmented reality is sometimes argued to be a unique technology in itself rather than a type of VR but due to its functionality of placing virtual entities in the real world, puts it in the category of VR.

- ***Collaborative VR***: In this type of VR, individuals from different places are able to interact inside a virtual environment which generally in a 3-D arrangement or created characters. The main aspect of this technology is to create interaction and collaboration between people. The users can interact with each other through the microphones, headsets and chatting. It is used to conduct virtual meetings, debate and various other competitions, virtual convocation ceremonies and for playing multiplayer games.

- ***Mixed Reality***: The notion of mixed reality (MR) is one of the freshest advancements in virtual reality. It disengages the user from screen-bound exposures by allowing the users to engage with the data instinctively in the real world. Mixed reality is a combination of physical and digital worlds making it similar to the augmented reality. But in contrast to the AR, the virtual components in the MR can interact with the actual world which leads to authentic VR experience. The MR is used to interact with 3-D holograms of people or objects to gain better experiences.

IX. Application Of Virtual Reality

Virtual reality systems are used to train the human perception in a simulation before performing those tasks in the real world. The experience of training in the virtual reality is appealing because it provides nearly equal experience to that in the real world. The major applications of the virtual reality are as follows.

Figure 3. Applications of virtual reality (education, millitary, medical, sports, mental health, fashion and gaming)

A. Education: VR has long been used for teaching and training, and different simulators for diverse jobs such as aircraft exercising, submersible, power sources, tanks, choppers, ships, cranks, trains, surgeries, vehicles, and flight control have been produced [20].

The technology of VR is extended to schools/colleges and is adopted for teaching and learning. Students can engage with one another in a 3-D environment. It is also used to take virtual trips such as to museums, planetariums or time tours which enable us to travel through different eras of the history. It has also been beneficial for students with special needs such as Autism Spectrum Disorders (ASD).

B. Military Training: Virtual reality is used in all the branches of the armed forces: army, navy, marines and coast guard and has proven to be an efficient method of training the candidates. It can locate the trainee to numerous places, situations and environments for different types of training.

VR is used for a variety of purposes, including aviation simulators, warfare simulations, medical training, vehicle simulation and virtual boot camp by the military. The advancement in the flight simulators, human-computer interfaces and AR systems has hinted to the prospect of immersive control systems for increased performance.

C. Medical Training: Medicine One of the most significant and viable applications of VR technology is in the realm of medicine, where it may be used for a range of activities such as computational neuroscience, molecular modelling, phobia treatment, ultrasound echography, and others. The medical application field includes simulated virtual reality training which is used to hone surgeons' surgical abilities, with the key benefit nonetheless that neither animal or humans are harmed [14].
The medical and dental students have started using virtual reality to rehearse operations and procedures on virtual patients before performing it in the real world. This reduces the risk of inflicting injury or making a mistake when practising on actual patients. The use of virtual reality in the medical business has proven to be an excellent approach to provide a wonderful potential to reduce expenses.

D. Sports: Sports may also make advantage of VR. Large projection displays, for instance, can be used to simulate a golf course and allow players to hit balls to simulated greens. Furthermore, a bicycle may employ virtual reality systems to enhance their perceptible experience while utilising riding vehicles by using huge projection displays that refresh the display based on the trooper's pace. Real-time VR is being used in TV cartoons. For instance, the puppeteer of the children's television show Ratz the Cat from the BBC uses a tracking device to animate the character in real-time during a live broadcast [21].

Virtual reality is continuously revolutionizing the field of sports for the players, coaches, and the viewers. They can see and experience specific circumstances again and again which helps in improving each time. It is used as an aid to assess sports performance and technique. VR is also utilised to improve the viewing experience of a sporting event. The games are live broadcasted using virtual reality and the future technology also plans to sell virtual tickets for a global attendance to any sporting event and cost effectiveness.

E. Mental Health: One of the most effective methods to deal with mental and emotional trauma is to confront it. The use of VR exposure therapy lets the person enter the recreated environment of the traumatic event so as to explore the issues and try to heal them or at least come to terms with them.

The VR has also been used to treat anxiety, fears and melancholia. For example, some anxious patients find that meditation with VR is an excellent way to control stress and increase coping strategies. It can also be used to overcome fears while facing them in the simulation in a controlled manner.[18]

F. Fashion: Virtual models of store environments are incredibly valuable for retailers in designing their signage and product displays without completely committing to the build as they would in the real world. It is also used for cost effective designing of the fashion accessories as the designers can predict the durability of the design by watching it in the simulation before implementing the design in the real world. It is also used in fashion shows as it gives a 360-degree experience and lets customers to try on the clothes virtually.

G. Gaming: The virtual reality has always proven to be gamers' ideal place. The players are able to witness all the features and sound effects in the simulated environment and play the games assuming themselves a character of the game rather than just witnessing them on screens and controlling them through mere remote controllers. The VR gaming experience also helps in developing the intelligence of our brain by solving puzzles and making strategies.

H. Engineering and Architecture: Engineering is an essential application of virtual reality. Engineering component descriptions might be thought of as static perspective projections, some of which were animated along a predetermined course within a 3D model. According to the investigator in, the use of virtual reality has entitled dynamics to be produced in simulation, analysed, collected, and tried with minimal cost and laborious prototype manufacturing. Designer, for example, may use the simulation to walk himself or their customers around the rooms or structures they are developing. This helps the architect and customer to get a genuine sense of the concept and envision potential design adjustments. The benefit of employing virtual reality for run-throughs instead of CG animations is that the spectator is not limited to a certain path; they may freely traverse the design in simulation.

I. Data Visualization: It is the use of graphical depictions to emphasise particular qualities or ideals. This is particularly accurate for displaying complex 3D data sets, such as those produced by Computational Fluid Dynamics (CFD) simulations. Typically, data is shown by mapping geometric objects, such arrows or particle clouds, to data values. For instance, arrows could be used to indicate air flow, with the width of the arrow signifying volumetric flow rate, the colour of the arrow representing temperature, and the direction of the arrow representing air flow direction [14].

J. Augmented Reality: Augmented Reality (AR) is a virtual reality update in which simulated stimuli are placed on actual stimuli. [10]. Making use of this programme, the signalled imperceptible informatics may be comprehended and interpreted. As , in the medical industry, at the time of abscission, insights from the inner body are artificially displayed.

An additional use of augmented reality is presenting key data on a panel in commercial and military gear. Tourism, advertising, and mobile phones all employ augmented reality. In a mobile phone, the location of user can be assessed to provide details about the nearby street with all the areas and signposts.

K. Construction Progress Monitoring: It lies in the class of critical factors contributing to the accomplishment of a construction venture. Whereas enhanced control, perfect dimensions, and other appropriate stages can be completed timely. As a result, even if the framework swerves greatly from the primary framework, it will almost definitely be simple to aid the performance to be as near to the anticipated conclusion as feasible. Nonetheless, data collecting and utilisation in building progress monitoring has always been laborious.

The intricate character of building projects results in precise growth vigilance difficult. Present building growth vigilance methods entail the presentation of frequent reports and are constrained by their reliance on manual processes and sparse support for recording perceptible information [23]. Recently, image-based visualisation techniques have enabled building progress to be reported via "interactive and visual ways" [24].

X. Comparisons Among The Three Types Of VR Systems

Table 1 gives the detailed comparisons as follows:

TABLE I. Comparisons Between Different Types Of VR Systems [29]

	Fully immersive	**Semi-Immersive**	**Non-immersive**
Angle/Field of Vision	Nearly 360 degrees of simulation	Edges of the real world are visible	Full awareness and vision of surrounding environment.
Resolution	High	High	Medium To Low
Interaction	High (interacts with objects within the programmed space.)	Medium (The activities in the simulated environment focused on the user.)	Low (Here the environment is not directly interacting back.)
Price	Expensive	Moderately Expensive	Low
Activities & Control	Can be experienced through a computer and users are allowed to control characters and activities from within the software.	This system does not utilize physical movement and here the experience of immersion is strictly visual.	Here player equipped with wearable technology into a virtual world & experiences a sense of being present in a simulated environment

XI. Benefits And Limitations Of VR

The most notable asset of VR is the ability to adjust the surroundings around operator making them feel the genuine scenarios. Precisely, VR may assist users in observing a computer-modelled environment and allowing them to test and attempt items that are not generally available in our reality or have not yet created [25]. The following are some of the primary benefits of VR [26][27]:

Any method system might have various aspects that are either too tiny or too huge. In the conventional scale system, the VR allows the user to screen, manipulate, and watch that feature.

- The user to experiences a scenario or circumstance that can be quick or sluggish.
- Virtual reality technology allows users to see and monitor from a variety of perspectives.
- VR technology supports and enhances distant learning by avoiding real-world dangers, breaking time constraints, and providing a wealth of instructional tools for students to explore learning autonomously. It improves self-learning.
- Virtual reality is more secure than the actual world. As a result, it is utilised to improve education, training tools, and experience. Students are introduced to actual situation and interactivity using VR.
- VR is the most popular technology for improving engineering training, architecture, and roadway safety, in medical and tutoring, as evidenced by VR applications.
- Simulate the interaction and its speed or faster that in the real world.
- The majority of VR systems allow users to repeat tasks until they do them professionally and with the appropriate abilities.
- The virtual environment is far safer than the real one.
- VR does not require users to show themselves in the same location of training.
- Cultural knowledge might be displayed in 3D models from various viewpoints utilising 3D simulation in virtual reality technology. It enables individuals to perceive and comprehend real-world social science, landscape, and customs.

These benefits are not merely advantages; besides they might represent the core qualities of VR. The benefits of virtual reality cannot be quantified, thus the qualities listed above are only a few instances.

In contrast, this is little questioning that VR has encountered some significant restrictions and challenges. Because virtual reality permits users to engage concurrently which necessitates the employment of a digits processor that can alter the simulated environment concurrently, much like in reality. "Changes made to the virtual prototype must be reflected in real time; else, the finest visual effects provided by this technology would be perished" [28].

Certain types of VR systems, such as full-immersion systems, need significantly more money to develop. Furthermore, as the world and skills evolve, VR technology should be constantly enhanced and evolved.

XII. Future Of Virtual Reality With Human Perception

The virtual reality is progressing at a great speed and will get much better in the future than it is in present times. The new improvements in the VR will greatly enhance the experience of the simulation. The lack in the hardware when upgraded will result in more authentic and original frame of view and better spatial audio experiences. The Head Mounted Displays (HMDs) are likely to become significantly more light-weight and less bulky thus, making them much easier and less obtrusive to use unlike the HMDs present today which limit the range of motion of the user.

The tracking systems will become mark less thus enabling the tracking of every object present in the simulation unlike the current marking systems which require a marker to be placed on every object to trace it.

As the technology will advance, there will be applications created by brilliant software developers, academicians and business executives which will impart life-like simulation experience through excellent immersive techniques. Thus, it is concluded that we are far closer to the dawn of the virtual reality than we are to the end as there will surely be a lot of fantastic advancements in the field of virtual reality in the near future which will take this technology to a whole another level.

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