



Introduction to virtual reality

Rinku Raheja¹, Anubhuti Srivastava², Divyanshi Verma³

¹Assistant Professor, ^{2&3}Students.

National Post Graduate College, Hazratganj, Lucknow.

ABSTRACT

Virtual Reality (VR) may be a technology that enables a user to interact with a computer-simulated environment, whether that environment may be a simulation of the critical world or an imaginal world. It is the key to taking experience, having a feel, and touching the past, present and future. It is the medium of making our world our customized reality. It could range from creating a game to having a virtual strolling across the world. We will experience the foremost intimidating and grueling situations with a video game by playing safe and with a learning perspective. Very few people know what VR is, its basic principles, and its open problems. This paper presents a historical overview of computer games, and basic terms of VR systems are listed down. An insightful research of typical VR systems is finished and finds the challenges of the video game. Finally, the longer-term of VR is taken into account in two categories: Technological and Social. The new research gives way to the technological frontiers, and potential applications are known. The positive and negative influence of VR on the lifetime of ordinary people is speculated.

KEYWORDS: Augmented Reality, Virtual Reality, Stimulation, Nausea, Visualizing;

INTRODUCTION

Nowadays, computer graphics are employed in many domains of our life. At the top of the 20th century, it was not easy to imagine an architect, engineer, or decorator working without a graphics workstation. Within the last years, the stormy Development of microprocessor technology has brought faster

and faster computers to the market. These machines are developed with better and faster graphics boards, and their prices fall rapidly. Even for a median user to maneuver into the globe of tricks, it becomes possible to even for a median user. This fascination with a brand new reality often starts with computer games and lasts forever. It allows us to determine the encompassing world in other dimensions and to experience things that do not seem to be accessible in the real world or maybe not yet created. Moreover, the planet of three-dimensional graphics has neither borders nor constraints and might be developed and terminated by ourselves as we wish – we will enhance it with a fourth dimension: the dimension of our imagination.

However, not enough: people always want more. They require to step into this world and interact with it – rather than just watching an image on the monitor. This technology that has become more popular and trendy within the current decade is named video game (VR). Unfortunately, it has been an extended time since much research has been done, and the status quo.



WHAT DOES PREVIOUS RESEARCH ABOUT VIRTUAL REALITY SAY?

Let us look into a short glimpse at the past three decades of research in virtual reality.

Sensorama – within 1960-to 1962, Morton Heilig created a multi-sensory simulator. A pre-recorded colorful film and stereo were augmented. This was the primary

approach to making a virtual reality system, and it had all the features of such an environment, but it had not been interactive.

The Ultimate show – in 1965, Ivan Sutherland projected the last word resolution of virtual reality: an artificial world construction idea that enclosed interactive graphics, force feedback, sound, smell, and taste.

"The Sword of Damocles" – the first is the primary game system realized in hardware, not van Sutherland constructs a tool considered thanks to the first Head Mounted Display (HMD), with appropriate head tracking. In addition, it supported a stereo view that was updated correctly with the user's head position and orientation.

GROPE – the prototype of a force-feedback system realized in 1971.

VIDEO PLACE - Artificial Reality created in 1975 by Myron Krueger – "a conceptual environment, with no existence." during this method, the silhouettes of the users grabbed by the cameras were projected on an outsized screen. The participants were ready to interact with one another thanks to the image processing techniques that determined their positions within the 2D screen's space.

VCASS – Thomas Furness at the U.S.A. Air Force's Armstrong Medical Analysis Laboratories developed 1982 the Visually Coupled Mobile Systems machine – a complicated machine. The pilot wore an HMD that increased the out-the-window read by the graphics describing targeting or best flight path data.

The VPL company manufactures the favored Data Glove (1985) and thus the eye phone HMD (1988) – the primary commercially available VR device.

BOOM – came in 1989 by the Fake Space Labs. BOOM is additionally a tiny low box containing two CRT monitors, which can be viewed through eye holes. The user can grab the box, keep it by the eyes and move through the virtual world because the mechanical arm measures the position and orientation of the box.

UNC Walkthrough project – within half the 1980s, at the University of North Carolina, an architectural walkthrough application was developed. In addition, several VR devices were constructed to spice up the standard of this method, like HMDs, optical trackers, and the Pixel-Plane graphics engine.

Virtual construction – was developed in the primary age of the 1990s at the NASA of the Ames application that allowed to observe and investigation of the flow fields with the guidance of BOOM and Data Glove.

CAVE – presented in 1992 CAVE (CAVE Automatic Virtual Environment) is additionally a game and scientific visualization system. Rather than using an HMD, it projects stereoscopic images on the walls of the realm (user must wear LCD shutter glasses). This approach assures superior quality and, therefore, the backbone of viewed images and a wider field of consideration than HMD-based systems.

Augmented Reality (AR) – A technology that could be achieved by employing a see-through HMD that superimposes virtual three-dimensional objects on real ones. This technology was previously accustomed enrich fighter pilots' views with additional flight information(VCASS). However, because of its great potential – the enhancement of human vision – augmented reality became a spotlight of the many research projects within the primary 1990s.

WHAT IS VR? WHAT IS VR Not?

At the start of the 1990s, the event within the field of virtual reality became far more

stormy, and also the term virtual reality itself became extremely popular. we will hear about Virtual

Reality is nearly an altogether form of media, people use this term reasonably often, and they misuse it in many cases. The explanation is that this new, promising, and engaging technology captures the best interest of individuals.

OR

Virtual reality may be a term aware of describing a computer-generated virtual atmosphere that will be stirred through and manipulated by a user in a period. A virtual atmosphere is additionally shown on a head-mounted display, a laptop monitor, or an outside screen. Head and hand chase systems square measure utilized to change the user to observe, move around, and manipulate the virtual atmosphere. The foremost distinction between VR systems and ancient media (such as radio and television) lies in 3 dimensionalities of computer game structure. Immersion, presence, and interactivity square measure peculiar options of computer games that draw it far away from alternative objective technologies. The computer game does not imitate actual reality, nor will it have an objective operation. VR has full-grown into a replacement section and becomes an exact field at intervals the planet of computing. The utility of VR has already been researched in automotive-style, golem style, medicine, chemistry, biology, education, and building style and construction.

HISTORY

No doubt that at present, computer graphics are at their peak. Soon by the end of the 20th century, it will be difficult for us to find an architect or engineer working without a graphics workstation. The Development of technology in microprocessors is bringing more good and efficient computers into the market day by day. It has become so more accessible that now even a person with less knowledge of computers or an average user can move into the world of computer graphics.

The craze over computer games lasts forever, and it begins with the rise of virtual reality. The basic meaning of virtual reality is experiencing and imagining things in our surroundings that are from another world that is not yet seen or are accessible in reality which is not even created, and after all, it cannot be created in the real world. So it is just that we can create a virtual world through this.

Due to the rapid change observed in the world, people now always want more, and now they do not like watching the picture on the screen or monitor. Here is where this technology comes into play, and the fascination with virtual reality is increasing day by day among people. People now want to interact and feel the world of Virtual Reality (VR).

Ivan Sutherland 1965 first brought this in front of the world and let us make this (virtual) world look authentic from the window screen. It should look natural, feel real, and react to the viewer's commands realistically.



SOME BASIC TERMS and DEFINITIONS of VIRTUAL REALITY

To dive into virtual reality, we have to gain knowledge of a few terms to get involved with Virtual Reality. If you are willing to adopt new immersive technologies, some terms have to be fixed very well.

Let us begin:

Augmented Reality

- **Augmented reality** is the feature that places digital data elements above the real world, adding reality to it, and in this way, it allows us to experience and interact with both the imaginary and also the real world.
- Augmented is still yet to flourish in today's world, but things like Microsoft HoloLens are making it possible. In a few years, the world will start visualizing this technology, and then we will experience everything in mixed realities.

Field of View

- Approximately 200 degrees is the average human field of view. It is also known that as a field of vision or FOV. This means all that we can see around while looking straight. For example, when you use virtual reality headsets, you will notice that a specific field of view is set. The larger the field of view, the more immersive environment you will see in front of your eyes and have a great experience.

Frames per Second

- FPS (Frames per Second) refers to how each second image on the screen is refreshed. This is an essential feature of virtual reality as the slow and steady motion could create **nausea**.
- The higher the frequency of FPS, the greater the experience of Virtual Reality because the motion will be smoother and more comfortable the virtual reality experience.
- For a great VR experience headset, you buy must be of at least 90 Frames per Second.
- FPS is also known as Screen Refresh Rate.

Motion Tracking

- The ability to track your movement and the movement of objects in real-time is known as Motion Tracking.
- This will give the same experience as when you learn to look at an object closely; you will notice that object closer to yourself in real-time.
- Motion Tracking is essential to give you the natural feel of the virtual world just like the real world; it triggers your senses to make you feel the same as in real-time.

Presence or 'Sense of Presence'

- This means the sense of finding yourself actually in the virtual world while, in reality, you are somewhere else.
- The **stimulation** and interaction play an active role in making you believe that you live in the virtual world. However, unfortunately, this makes you forget that the experience you are currently feeling is created by technology.

Screen Resolution

- The realistic image quality depends upon the screen resolution. This feature refers to the number of pixels displayed on the screen. The higher the number of pixels on a monitor or screen, the more improved quality of image or realistic image will be visible.
- The clearer the image quality, the greater the experience VR will be experienced.
- The mini screen resolution of 2160*1200 is suitable for the mid-level or high-end VR headset.

Spatial Audio (also known as 3D audio)

- To create an impressive experience in Virtual Reality, sound plays a significant role. Spatial Audio is used for creating sound from a particular point in the virtual world.
- It allows you to listen to sounds in the virtual world and responds to your movement in real life, like when you move your head.
- For example, if you hear some footsteps coming toward you and turn your head to your right to see, you will feel like they are coming closer to you or in

front of you, just like in real-life situations.

- This feature is essential in horror experiences, and it takes the experience to another level.

Automotive industry

- Virtual reality offers great help to automobile engineers and designers as before implementing things in reality; they can visualize things on a real-life basis and prepare their models accordingly. In addition, this helps them reduce their expenses in buying expensive stationaries required for models.
- Many multinational automobile companies such as Jaguar, Mercedes, and BMW use VR to see the early designs before buying any model parts.

Healthcare

- Immense use of VR, particularly in medicine, can be seen nowadays; from pain reduction in burn injuries to critical operations or transplants, VR plays a crucial role. For example, in reducing chronic pain in adults, the FDA recommended and approved the use of EaseVRx. The technology behind this feature is that it uses comprehensible behavioral therapy and methodologies like shifting of attention, long-duration relaxation, and other somatic sensory system awareness.
- Doctors can also use VR to train the juniors for operation theatres by explaining them and giving them the feel of actual operations.
- There are also features today in which doctors can practice surgeries or operations on virtual bodies through VR by interacting with virtual devices.
- It can also be used in treating mental health issues.

Retail

- Already the e-shopping technique has dominated the whole world, but we are all set to introduce new dimensions of VR in the retail industry. Using Virtual Reality, we could now use body-scanning technology, which will help us try the clothes visible virtually and give us a feel of what they would like in reality.
- This process is not only effective in an economical way for the retail industry, but it has several other benefits for customers. For example, it is now convenient for them to confirm their order before purchasing as they examine the product in terms of size and shape, and also this will give a massive benefit to the environment as the cost of shipping and manufacturing will be reduced.

Real estate

- Now it is no more a tedious task to search for a property or house. We can visualize the models of properties or houses through VR to experience the space without actually visiting the site. This benefits both the customers and the dealers, saving time and cost. Also in this way you can choose the best out of better.

Architecture

- Using **immersive** models of space has helped architects explore and understand the building of space more efficiently. For example, if an architect wants to add something new to the design, he can use VR and add the extensions virtually to the model of the building and see how it would look in real life and get the real-time feel of the model. Then, after analyzing all the situations and problems of the designs, the architect can perform the changes in real life. This saves the cost and time and improves the understanding of 3D models.
- Architects are exploring more with their work through virtual reality as now they know how the space will look and how it will feel.

ADVANTAGES OF VIRTUAL REALITY

This technology does come with several benefits, and several areas have been positively affected by implementing this technology. The advantages of virtual reality are described below:



Feels Like Real

- As the name suggests the meaning virtual reality gives an amazingly realistic feel to the users that make them experience something beyond the world of reality while watching movies or playing games.
- While playing virtual games, the user feels that he is inside the game, experiencing every move as if everything is happening in the game. This is the impact of virtual reality that makes people attracted to it.

Safe Practice / Simulation

- Probably the best feature of virtual reality is that it enables to conduct the training or practice by simulating risky and dangerous tasks such as operations or surgery, pilot training, combat, etc. With this technology
- Among countless other astounding benefits of VR technology, one can say that the opportunity to conduct training and practice by simulating potentially dangerous real-world operations like surgery, combat, flight, etc., would be the best practical advantage of this technology. One can quickly learn to perform operations, fly a plane, and many more without risking their and/or others' lives.

Healthcare and Wellbeing

- Virtual reality is good for treating any phobia or disorder. For example, with the help of VR, we can treat the patients with a fear of heights under proper guidance, creating a virtual illusion for them suppose, walking on a high bridge or something like that. Not only this, VR helps doctors in finding creative and innovative ideas to treat patients.
- VR pediatrics can help doctors cure children more quickly and painfully. It has many applications in physical therapy and rehabilitation as well.

- The efficiency in productivity and minimizing the risk of dangerous operations are a boon of Virtual Reality.

Tourism

- Visualizing trips will be in massive demand in the upcoming years. Already, services like Google Street View are in widespread use today.
- For example, if you have a travel agency website or App, VR could allow a virtual tour to the individuals at their favorite destinations. This will increase the tourism industry's productivity and benefit the people as they would already know the feeling of being present there. In addition, this reduces their cost and time, and also they will know about the pros and cons of situations after being there.
- Moreover, traveling projects like riding the boat and going to the top of the mountain walking alongside the beach have already been developed, which is fascinating the today's generation.

Education and Training Programs

- Creating a natural environment stimulation is one of the essential characteristics of virtual reality. This benefits a lot to the education and training industry. For example, students can now actually understand the historical concepts by **visualizing** the actual wars and incidents at that time. In addition, they learn fascinating geography lessons by memorizing the trips across the continents.
- VR helps change traditional and old learning into a much more interactive and effective way of learning and experiencing things.
- Learning about fire safety or airplane training through VR training stimulators are the best and prime examples of advantages of VR in the education industry.

DISADVANTAGES OF VIRTUAL REALITY

Intransigent

- Virtual reality doesn't allow to make flexible changes in the pre-set program schedule, and this is a significant disadvantage that it offers. So, for example, if someone does not want to experience trekking and wants to experience paragliding, he cannot change the sequence so easily. Furthermore, if paragliding is unavailable, the user has to avail of the trekking facility, unlike in the real world, where we are free to do anything.

Obsession

- Many people are fascinated with specific games or activities, including violence or illegal activities, and they become obsessed with them. They start liking things and are involved in them so much that they are more likely to commit crimes in the real world.
- Anything within a limit is good, and everything in this world has a disadvantage; though VR has given us a new technique of living, we cannot deny the fact that it is not real. Reality is the system of the universe.

Expensive

- Though VR provides unique technologies and a new way of learning and experiencing things, everyone cannot afford it as it is costly to install in everyday life. Therefore, most of the population still cannot afford the VR setups despite their reduced price.

Isolated

- Spending high time in the virtual world rather than in the real world has made people lonely and isolated from the real world. Several problems such as anxiety and depression are arriving among youngsters entirely involved in the virtual world as they devote their full time and potential to it. This is also the cause of significant health issues such as weaker eye-sights and nausea, lethargic behavior, and several mental health issues.

CHALLENGES

The significant challenges in virtual reality are developing better trailing systems, finding many natural ways to permit users to act at intervals in a virtual setting, and decreasing the time it takes to make virtual areas. At the same time, their area unit has some tracking system corporations that area unit around since the earliest days of **virtual reality**. Likewise, there are not several companies that area unit performing on input devices specifically for VR applications. Most VR developers have to be compelled to believe and adopt technology originally meant for however another discipline and that they ought to hope that the company producing the technology stays in business. As for making virtual worlds, it will take a long time to form a convincing virtual setting. The more realistic the setting, the longer it takes to create it. It might take a team of programmers over a year to duplicate an actual area accurately in the virtual area. Another challenge for VE system developers is making a system that avoids unhealthy engineering. Several systems rely upon the hardware that encourages a user or his choices with other physical tethers. While not well-designed hardware, a user could have hassle at the side of his sense of balance or inertia with a decrease at intervals the sense of telepresence, or he might expertise cybersickness, with symptoms which may embody disorientation and nausea.



FUTURE WORK

The way forward for virtual reality depends on the existence of systems that address problems with 'large scale' virtual environments. As additional analysis is finished in the returning years, we tend to be sure to see VR become a mainstay in our homes and at work. As the computers become quicker, they will be ready to produce additional realistic graphic pictures to simulate reality higher. It will be interesting to check; however, it enhances artificial reality in the years to come. Potentially, we will be human action with virtual phones in the future. In Japan, Nippon Telephone and Telegraph (NTT) is developing a system that can enable one person to see a 3D image of the opposite exploitation VR techniques. The future is Virtual Reality, and its advantages can stay immeasurable.

CONCLUSION

Virtual reality is currently concerned everywhere. You cannot imagine your life while not the employment of VR Technology. During this paper, we tend to outline virtual reality and its history. We tend to additionally outline some significant development that offers birth to the current new technology. We use mail or conference for communication when the person is not sitting with us. However, thanks to technology, distance does not matter. This technology offers enormous scope to explore the globe of 3D and your imagination. It is several applications, from Development to diversion. It is still noticeably within the development stage, with several users making their custom applications and setups to suit their desires.

REFERENCE

- <http://vrology.com/virtual-reality-glossary-of-terms/>
- <https://virtualspeech.com/blog/vr-applications>
- https://www.researchgate.net/publication/2617390_Virtual_Reality_-_History_Applications_Technology_and_Future
- https://www.researchgate.net/publication/2617390_Virtual_Reality__History_Applications_Technology_and_Future