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An Introduction on Virtual Reality and Its Challenges

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Abstract

In the last few years virtual reality has become most popular than other technologies. In this paper, a short introduction of virtual reality, basic terminology, present and future of virtual reality and application of this technology in daily life are mentioned. Virtual reality makes users feel in a virtual environment (VE) by using computer hardware and software. Sometimes, virtual reality (VR) is also called virtual environment (VE).

Keywords: *Virtual reality, Sensorama, HMD, VCASS, BOOM, VR*

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INTRODUCTION

The definition of virtual reality has come from 'virtual' and 'reality'. The definition of 'virtual' is near and 'reality' is what we experience as human being. So, the term 'virtual reality' basically means 'near reality' [1]. In other words, virtual reality (VR) is the fantasy of a three-dimensional communication, PC produced reality, where sight, sound, and some of the time even touch are reproduced to make pictures, sounds, and protests that really appear to be genuine.

Virtual reality has become enormous in the course of recent years; however, 2016 resembles the most essential year. Virtual reality (VR) is the utilization of personal computer innovation to make a recreated domain. Not at all like customary UIs, has virtual reality put the client inside an ordeal. Instead of viewing a screen in front of them, users are immersed and able to interact with three-dimension world. We know the five senses: smell, touch, taste, sight and hearing. These are however just our most clear sense organs. In all actuality, people have numerous or larger numbers of faculties than this, for example, a feeling of adjust for instance. Virtual reality involves giving our faculties a personal computer produced virtual environment that we can investigate in some fashion.

In specialized terms, virtual truth is the term used to depict a three-dimensional, personal computer created environment, which can be investigated and connected with by a man. That individual turns out to be a piece of this virtual world or is immersed within this environment and whilst there, is able to manipulate or perform a series of actions.

In present time, virtual reality gives many opportunities to researcher and student to find something new. Virtual reality is a better user interface. In virtual world, most important input device used is trackers. Trackers are tracking three-dimensional positions.

We can divide virtual reality into three groups according to the degree of immersion interactivity. These three groups are: immersive system, non-immersive system and hybrid virtual reality system. Immersive systems change our view of the real world with the PC produced pictures that connect to the position and introduction of the client's head. A non-immersive system leaves the users visually aware of the real world but is able to observe the virtual world through

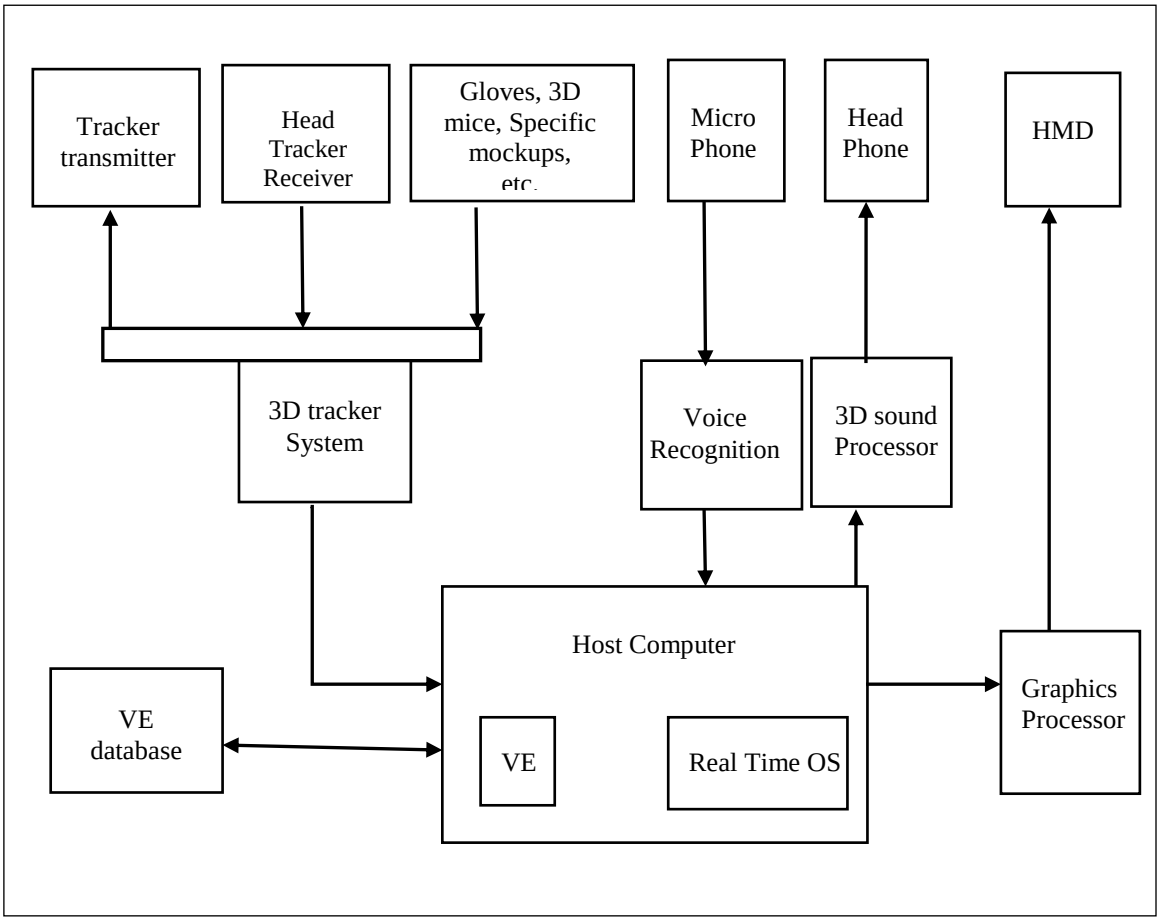

Fig. 1: *Connectivity between Elements of a Virtual Reality System.*

graphics workstation. A hybrid virtual reality system permits the user to view the real world with virtual images superimposed over this view. Such systems are known as "Augmented Reality" systems [2].

The report is organized as follows: First, we present the introduction, then literature surveys, result and discussion, conclusion, applications of virtual reality, references and advantage and disadvantage in physical life (Figure 1).

LITERATURE SURVEY

In present time, computer graphics is used in many domains of our life. It is difficult to imagine an architect, engineer, or interior designer working without a graphics workstation at the end of the 20th century. But not enough, people always want more. They need to venture into this world and interface with it instead of simply watching a photo on the screen.

This innovation, which becomes overwhelmingly popular and fashionable in current decade, is called virtual reality [3]. HMD, BOOM, CAVE are common virtual environments now, and virtual globe is an upcoming technology in virtual environment.

SENSORAMA

In 1950s, the first references to the concept of virtual reality came from science fiction. In the mid-1950s cinematographer, Morton Heilig developed the Sensorama which was an arcade-style theatre cabinet that would stimulate all the senses, not just sight and sound. It features stereo speakers, stereoscopic three-dimension display, smell generators, and a vibrating chair [4].

The Ultimate Display

The ultimate solution of virtual reality was proposed by Ivan Sutherland in 1965. In the ultimate display included interactive graphics, sound, smell and taste. In this concept,

computer hardware was used to create the virtual word and maintain it in real time [5]. That concept included these points: A virtual world through a HMD, computer hardware to create the virtual world and maintain it in real time.

Head Mounted Display

In 1960, Morton Heilig's invented the Telesphere mask and the first head-mounted display (HMD). The headset provided stereoscopic three-dimensions and wide vision with stereo sound. HMD provides its wearer with unseen world of virtual reality [6]. In addition, it also provides virtual images by continuously tracking the position and orientation of the user's head. This allows viewer to look around and walk through the surrounding virtual environment. However, head mounted display has cables which restricts our movement [7].

Head Sight-First Motion Tracking HMD

In 1961, head sight was the first step in the evolution of the virtual reality head mounted display. It incorporated a video screen for each eye and a magnetic motion tracking system. The head sight was not actually developed for virtual reality applications, but to allow for immersive remote viewing of dangerous situations by the military [8].

Videoplace

Myron Krueger made artificial reality in 1975 "without presence, a calculated circumstance". In this structure, the blueprints of the customers grabbed by the cameras were foreseen on a substantial screen.

VCASS

Visually coupled airborne systems simulator was developed by Thomas Furness in 1982. VCASS is advanced flight simulator. In this technology, the fighter pilot wore head mounted display that augmented the out of the window view by the graphics describing the target.

VPL

The first commercially available virtual reality devices were made by the VPL company, it gave the first popular data glove in 1985 and the eye phone head mounted device in 1988. So if you can talk about VPL, it is a success device made by VPL company.

BOOM

The binocular omni-orientation monitor (Boom) was commercialized in 1989 by the fake space labs. Binocular omni-orientation monitor is a small box containing two CRT monitors that can be viewed through the eye holes. BOOM from fake space is a high-resolution stereoscopic viewing device. Screen and optical system are housed in a box that is attached to a multi-link arm. The client investigates the case through two openings, sees the virtual world, and can control the container to any position inside the operational volume of the gadget [3].

CAVE

CAVE is cave automatic virtual environment. It was presented in 1992. Cave automatic virtual environment is a virtual reality and scientific visualization system. CAVE sees like a square box used in scientific visualization, but cave automatic virtual environment is so costly and everyone cannot afford it.

Augmented Reality

Augmented reality is the most important term in virtual reality technology. Augmented reality creates virtual fell and smell. Augmented reality is closer to real world because augmented reality creates virtual world with the help of real world. Augmented reality is used in video game and virtual reality related movie. You see it with the help of head mountain device. Augmented reality is not virtual reality.

Sega VR Headset

Sega is a company which is announced Sega virtual reality headset for the Sega Genesis in 1993. In this virtual reality, headset included a head tracking devise, stereo sound, and LCD screen in the visor. It is a good device combination but it was a huge flop for Sega company history.

VR in the 21st Century

In 21st century, virtual reality became the most famous technology. In this time, many great devices have been launched in the market and they are success like Google Cardboard, oculus rift etc. According to researchers, 21st century is century of virtual reality. In 2013, some scientists tried to give more realistic three-dimension effect on a two-dimension television.

TECHNOLOGY

Virtual reality and virtual environment are used in computer community interchangeable. Virtual worlds are known as artificial reality, artificial worlds, and synthetic experience. In technical terms, virtual reality is so hard because it contains many hardware devices and software. If you want to use virtual reality in desktop, then you require some input and output hardware devices and software. If you talk about virtual reality hardware devices, then you have a head mountain device, three dimension mouse, head tracker and eye tracker, and desktop which you use is virtual reality in desktop.

It is a contribution of extra virtual reality hardware devices that create immersive virtual reality system; is not true. But these devise are used in special considerations by creating a project and special software, below are given some points related to virtual reality technology:

1. The visual presentations that inundate the client in the virtual world and shut out conflicting tactile impression from the present reality.
2. The design rendering framework that creates the constantly changing picture at 20 to 30 frames for each second.
3. Users' position and orientation of the used movements are tracked by a tracking system continuously.
4. The database development and support framework to fabricate and keep up a point by point and reasonable model of the virtual reality.
5. A sound system that can produce high quality directional sound and simulated sound fields, but you have a good quality sound system.
6. Gadgets like followed gloves with push button to empower clients to determine their collaborations with the virtual articles.

In present time, every virtual reality product making companies only work for three categories that are related to virtual reality. There are three categories are: hardware, software, and content creation. Hardware means headset and input device. Software creation is related to making software for interfacing with the hardware. And last, content creation is related what you see (Figure 2).

HOW VIRTUAL REALITY WORKS

The working of virtual reality is very simple. The headset set-up that is being utilized by Sony, HTC, Google, and Samsung normally required three things: a personal computer, smart phone, a headset which secures a show before your eyes and some sort of info-head following, controllers, voice, on gadget catches or track cushions.

The three dimension representation segment empowers the client to see three dimension situations by utilizing a show technique like a head mounted gadget. Commonly, the three dimension pictures superimpose the genuine environment by utilizing one of the show, screen based or projection based. The screen based virtual environment by and large uses a fantastic show screen as far as determination and shading, or a head mounted gadget alongside the sound framework as yield gadgets. A console, mouthpiece, head following sensors, finger trackers, signal acknowledgment framework, a joystick or comparable apparatuses are utilized as information gadgets. At the point when client moves the rigging or joystick, makes move of the head, or presses any key on the console, the objects of the screen are changed likewise in a way that client feels in the event that he/she is specifically controlling the items and situations on the screen.

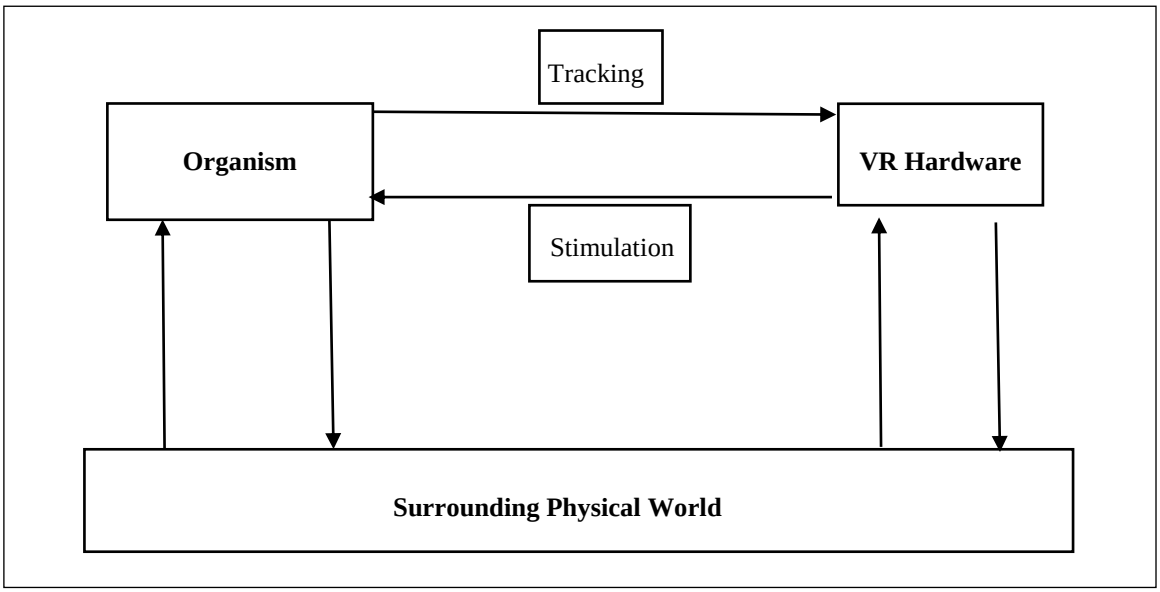

Fig. 2: *A Third-Individual Point of View of a Virtual Reality Framework [10].*

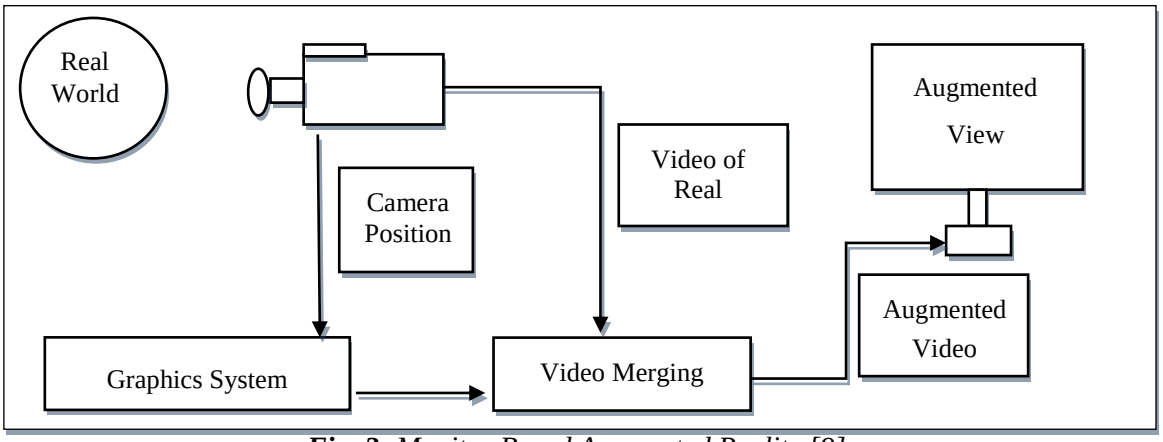

Fig. 3: *Monitor Based Augmented Reality [9].*

A fast capable processor forms the sources of info (Figure 3). An application programming interface (API) gives the interface to the information gadgets associated with the framework and also to standard gadgets like mouse and console. The timings and relationship amongst information and yield gadgets are perfect to the point that client feels a submersion with the virtual environment [9].

The other strategy used to make a virtual domain is projection based, which is more immersive than the screen based technique. The show pictures are anticipated on the multi-screen spaces running from two to six screens. A six screen's would improve a virtual domain. Both floor and roof utilize a back projection while the other four screens yield expansive encompassing perspectives for both panning activities and looking down. Therefore protests inside the space could be strolled around and virtual importune to be touched. So, everything needed to be done with a personal computer is doing its best to trap your cerebrum. A virtual reality headset demonstrates to you a picture and when you move your head, it adjusts the picture to make it appear as though you are truly there. Three dimension sounds can likewise upgrade the experience and make you overlook your physical environment.

RESULT AND DISCUSSION

Virtual reality changes the human behavior and its thinking skill. If you use virtual reality like play a game or see a movie then you

become a part of virtual world and you think according to virtual world, so if a person uses virtual reality logger time then he works according to virtual world in real world, so you can say that virtual reality can change the human thinking power. Virtual reality is basically used in playing multi-user game and single-user game, military, engineering, and film industry. But if you see a video or play video game in virtual reality then cheap devices not give better experience and better devices are most expensive.

In present time, you can feel three dimension movie and video game experience with the help of virtual reality headsets. Mobile virtual reality headset is divided in three parts: cardboard virtual reality headset, fiver headset, and GR VR headset. Mobile virtual reality headset was launched in 2010 and it is success. If you talk about mobile virtual reality headset then Oculus Rift is most famous headset. If you want to feel experience of virtual reality then you see problem of lack of content. You cannot see your every favorite movie or game in virtual reality. Every mobile does not work with different virtual reality headset.

APPLICATIONS

Everybody knows the term of virtual reality but they do not know the use of this technology. Many people cannot use virtual reality in their professional life. Basically people use virtual reality for entertainment. In present time, video game industry and film industry make many virtual reality relative high-tech video games and movies. Virtual reality is used in video game industries, entertainment industries, military, education, space agencies, and healthcare. These are some areas, where virtual reality used [10].

Virtual Reality in the Military

Many countries' military (Army, Navy, and Air force) use virtual reality technology to provide real environment to the soldiers in training time and provide real war environment. Military (Army, Navy, and Air force) use virtual reality in fight simulation, battlefield simulation, vehicle simulation etc. This technology is very cheap, according to military to provide virtual battlefield. So, you can say, virtual reality changes the military training system [11].

Virtual Reality in Education

In present time, virtual reality technology is used in education, but use of virtual reality in education is limited because lack of education is the barrier in the use of virtual reality in education sector. Virtual reality is used in education for teaching, learning, and research. Students feel new experience by using virtual reality. Virtual reality makes large group of students and teachers interact with each other in three dimension environment. In present time, virtual classroom is the best example of virtual realities used in education [12].

Virtual Reality in Video Game

According to present data, video game industry perfectly uses virtual reality technology. Virtual reality gives dangers' effect in game. Graphics, sound, and input technology in virtual reality related video game gives something new effect. Video game related virtual reality hardware equipment is very famous in this year. In present time, very large number of population play virtual reality technology used video games. Video game industry is a part of entertainment industry. Virtual reality is adopted by whole entertainment industry like film industry, because many numbers of films are made in virtual reality. So, you can say, video game industry plays an important role in the success of virtual reality technology.

Virtual Reality in Healthcare

Virtual reality is used in healthcare for surgery simulation, robotic surgery, skills training etc. Virtual reality makes easy to understand critical problems in healthcare. Medical students can create a virtual world related to human body and learn different body parts' surgery skills. So, you can say, virtual reality is a path of learn to something new in healthcare or other sectors [13].

Virtual Reality in Engineering

You can say virtual reality is illusion of three dimensions and it is used in engineering to

visualization techniques, as a part of the design process. You understand the project in three dimensions with the help of virtual reality technology, and you can see how to it works. An architecture engineer can design his/her project in virtual reality and understand how it felt and add something new.

CONCLUSION

Every coin has two sides, one is positive and other is negative. Same thing is there in virtual reality, but in present time, advantage of virtual reality is more. Virtual reality is an interesting technology and you can use in your daily life, but it is hard to understand its different features.

In present time, everybody only wants to know its strength not its disadvantage because people feel to some new experience and it is right advantage of virtual reality or more.

Recently, a South Korean boy could not decide the difference between virtual world and real world because he was spending so much time on virtual reality devices, and it is a huge side effect of virtual reality technology.

One of key elements of virtual truth is intuitiveness. So, HCI (Human-Computer Interaction) is one of control factors in virtual reality researchers [14]. If you talk about advantage of virtual reality then you understand why everybody talks about advantage of virtual reality. It is simple to understand that virtual reality gives some new experience and to know to something new. Virtual reality has been used in education, entertainment industry, video game industry, military; and space agency also used virtual reality for scientific visualization. So, you can say that virtual reality technology changes the human life and human sense power.

If you talk about technical term of virtual reality; it has two different points. First is, if you want to feel virtual reality experience first time, it is not so expensive. Google cardboard is one option to feel virtual reality because Google cardboard device is so cheap. Second is, if you want to use virtual reality profoundly like playing video game then it is very costly.

As a conclusion, human factors and lack of content are some complexities of virtual reality. Feeling of virtual reality is perfect definition of virtual reality because with using virtual reality you cannot define virtual reality. In future use the advantages of virtual reality technology as more as possible.

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