

Introduction to Virtual Reality:

Virtual reality is an artificial environment that is created with software and presented to the user in such a way that the user suspends belief and accepts it as a real environment. Virtual Reality (VR) is the use of computer technology to create a simulated environment.

In this type of view instead of viewing a screen in front of them, users are able to interact with 3D worlds. Users are able to simulate as many senses as possible, such as vision, hearing, touch etc. Unlike traditional user interfaces, VR places the user inside an experience.

Virtual Reality can be divided into;

- i) The simulation of real environment for training and education.
- ii) The development of an imagined environment for a game or interactive story.

VR has five main components as;

- i) Dimensionality
- ii) Motion or animation
- iii) Interaction.
- iv) Viewpoint.
- v) Immersion through enhanced multisensory experiences.

Advantages:

- Virtual Reality creates a realistic world.
- It helps user to experiment with an artificial environment.
- VR is more personal than electronic mail or instant messaging.
- VR helps to get the knowledge of different things more easily and with comfort.

Disadvantages:

- It consists of complex technology.
- Equipments used in virtual reality are very expensive.
- In VR environment we can not move by our own, like in the real world.

Application Areas:-

- i) In Education
- ii) In Health care
- iii) In environment.
- iv) In engineering
- v) In Scientific Visualizations
- vi) In Media
- vii) In Telecommunications.
- viii) In Construction.

Immersive meaning
→ Process of generating 3D image which appears to surround the user.

* Types of Virtual Reality:-

- i) Non-Immersive → Non-Immersive simulations are the least immersive implementation of virtual reality technology. In this only the subsets of the user's senses are simulated allowing for peripheral awareness of the reality outside the virtual reality simulation. Users enter into these three-dimensional virtual environments through a portal or window utilizing standard high resolution monitors typically found on conventional desktop stations.
- ii) Semi-Immersive → Semi-Immersive simulations provide a more immersive experience, in which the user is partly but not fully immersed in a virtual environment. Semi-immersive simulations are powered by high-performance graphical computing systems.
- iii) Fully-Immersive → Fully-Immersive simulations provide a most immersive implementation of virtual reality technology. In fully-immersive simulation, hardware such as head-mounted displays and motion detecting devices are used to simulate all of the user's senses. These type of VR are able to provide very realistic user experiences by delivering a wide field of view and high resolutions.

⑦ 3D positional tracking:-

Positional tracking is a technology that allows a device to estimate its position relative to the environment around it. It uses a combination of hardware and software to achieve the detection of its absolute position. It is an essential technology for virtual reality (VR), making it possible to track movement with six degrees of freedom (6DOF).

Positional tracking VR technology brings various benefits to the VR experience. It can change the viewpoint of the user to reflect different actions like jumping, ducking or leaning forward. It increases the connection between the physical and virtual world.

⑧ Key Components in a Virtual Reality System:-

1) PC / Console / Smart phone → Computers are used to process inputs and outputs sequentially. To power the content creation and production significant computing power is required for making PC/console/smart phones important part of VR systems. They act as the engine to power the content being produced.

2) Head-Mounted Display → A head-mounted display is a type of device that contains a display mounted in front of user's eyes. This display usually covers the user's full field of view and displays virtual reality content. Smart phone displays, including the Google Cardboard and Samsung Gear VR. Head-mounted displays are often also accompanied with a headset to provide for audio simulation.

3) Input Devices → Input devices provide users with a more natural way to navigate and interact within a virtual reality environment. Some of the most common forms of virtual reality devices are: Joysticks, Tracking Balls, Data Gloves, Motion Platforms etc.

⊗. Visual computation in virtual Reality:-

Visual computation is a computation that lets us to interact and control by manipulating visual images either as direct work objects or as objects representing other objects that are not necessarily visual themselves. The visual images can be photographs, 3-D scenes, block diagrams or simple icons. Visual computation is generally used to describe following two things:-

- 1) Computer environment in which a visual ~~paradiagram~~ paradigm rather than text paradigm used.
- 2) Applications that deal with large or numerous image files, such as video sequences and 3-D scenes.

⊗. Augmented Reality:- Augmented Reality is the result of using technology to superimpose informations like sound, images and text on the world we see. Augmented Reality (AR) is the technology that expands our physical world, adding layers of digital information on it. There are four types of augmented reality today: markless AR, marker-based AR, projection-based AR and superimposition-based AR.

⊗ Virtual Reality (VR) vs. Augmented Reality (AR):

Virtual Reality	Augmented Reality
<ul style="list-style-type: none">→ Virtual Reality creates an entire virtual world.→ In this case, it is hard to differentiate between what is real and what is not real.→ This is generally achieved by wearing a helmet or goggles having VR technology.	<ul style="list-style-type: none">→ Augmented reality is a mix of real world and the virtual world.→ It lets people interact with both worlds and distinguish clearly between both.→ This is achieved by holding smart phone in front of us.