Unit - IV

Virtual Reality

- Virtual Reality (VR) is a computer generated environment with scenes and object that appears to be real, making the user feel they are immersed in their surrounding.
- Virtual Reality is a technology that creates a simulated environment, making you feel like you are in a different place or world.

  Ex - Playing video game with VR headset

Importance

- VR is important because it offers new ways to learn, train and experience entertainment. It allow people to practise skills in a safe environment, explore places they couldn't visit and enjoy highly immersive entertainment
- This technology has the potential to revolutionalize many field by making learning and training more effective and experiences more engaging.

Application -

1. Gaming - Providing immersive game experience.
2. Education - Allowing student to explore historical place or human body.
3. Training - Helping professionals like pilots and doctor practise their skills.
4. Virtual tours - Letting people visit museums or real estate properties from home.

Types

Virtual Reality can be classified into 3 types :-

(1) Fully - Immersive VR System

It makes us experience the highest level of immersion. It provide the closest feeling of being in the virtual world. This VR system is expensive than others. Toots and gadget used in this system are advanced. and not so common to us.

(2) Semi - Immersive VR System

Semi - immersive VR system also make us to experience a high level of immersion but the tools and gadgets used are not so advanced and costly. and common to us.

(3) Non - Immersive VR System

Non - immersive VR system is less immersive to us. It is not expensive to use this system. It is also known as desk-top VR system because the gadgets used are limited to glasses and display moniter.

Virtual Reality System

A virtual reality system is the combination of hardware and software element that allow user to interact with a virtual world, creating an immersive experience.

Components of VR System

- Input devices
- Output devices
- Software

① Input devices

Input devices in VR are the tools for the user to interact with virtual world. Using input devices the user communicate with the computer

Ex - 3D mouse

② Output Devices

Output device is used to represent the virtual world and its effect to the user. It generate the feeling of the immersion to the user.

③ Software

It is used for the handling Input and Output devices, data analysis and generate feedback. Software controls and synchronize the whole environment.

Augmented Reality

- Augmented Reality is made up of the word "augment" which means to make something great by adding something to it. So, Augmented reality is a method by which we can alter our real world by adding some digital elements to it
- Augmented Reality is a way by which technology can change how we perceive the world around us.

Difference between Augment Reality & Virtual Reality

→ Augment Reality

- The system adds to reality, augment the real-world environment
- Experience is 25% virtual and 75% real
- User have a sense of being in the real world.
- User are partially immersed into the action
- No special AR devices are needed.
- Higher bandwith for top quality experiences
- Ex - Google maps AR

→ Virtual Reality

- The system replaces reality, completely stimulate the virtual environment
- Experience is 75% virtual and 25% real.
- Visual senses are under the control of system.
- User are fully immersed into the action
- Special VR devices are needed.
- Lower bandwith requirement.
- Ex - Play station VR.

Advantage & Disadvantage of Virtual Reality

→ Advantage

- Provide immersive learning experience.
- Risk free practise.
- Enhance collaboration & communication
- Enable Hand on learning

→ Disadvantages

- High cost
- Technical difficulties
- Lack of social interaction
- Limited content
- Health concern

VRML

- Virtual Reality Modeling Language.
- VRML (virtual Reality modeling language) is a file format used to create 3D interactive scence and object for the web.
- It was created in the 1990s as a way to represent virtual reality environment is a standard format that could be easily shared and viewed over the internet.
- VRML files contains information about the geometry, appearance and behaviour of 3D object and can include texture, colour, animation and interactivity.

Key concept

- Nodes - VRML uses nodes to define geometry, appearance and behaviour of object.
- Transformation - VRML allow for the transformation of object such as rotating, position change.
- Interactivity - VRML provide a way to add interactivity to virtual environment.
- Animation - VRML provide a way to animate object.

- Texture - VRML provide a way to add texture to the object

Application of VRML

(1) Architecture and design

Allowing architects and designer to showcase their work to client

(2) Product visualization

VRML was used to create 3D models of products allowing customer to view and interact with product before purchasing.

(3) Gaming

VRML was used to create simple game and virtual environment that could be played in web browser.

(4) Education

VRML was used to create interactive educational content.

(5) Military & defence

VRML was used to create virtual simulation for training and decision making purpose.

Steps to Run VRML files

Step 1 :- Write code in any editor

Step 2 :- Save it with '.wrl' extension

Step 3 :- To run VRML files either you can use a web browser or a 3rd party website.

Application of Virtual Reality

(1) Industry And Manufacturing

Engineers can design and test product in virtual environment, reducing production cost and shortening the time to market. Allowing employees to learn how to operate new machinery.

(2) Military And Defence

The use of virtual reality in military training provide soldiers with realistic combat simulation. These simulation help soldiers develop the necessary skill to handle high risk situation.

(3) Education And Training

Students can take virtual journey to any environment from prehistoric to depth of space. In chemistry classes they can visualize the interaction between molecules in three dimension.

(4) Healthcare And Medicine

VR is used for both education and therapeutic purpose in helthcare sector. Surgeons can practise operation in a virtual environment before performing them in real life, improving their skills and reducing their risk.

(5) Entertainment and Gaming

Virtual reality is one of the most widely used areas in the entertaiment and gaming industry. VR games offers players an immersive experience, making them integral past of the game.

Critical - Time Rendering

- Real - time rendering means rapidly changing a 3D environment to produce the illusion of motion. Using rendering optimization techniques, and advanced hardware, VR headset need to render images quickly to create the illusion of an interactive experience while, at the same time, accepting input in real time.

- Optimizing Rendering is a big challenge for Virtual Reality experience. VR headset cannot rely on processing application in huge desktop PCs like traditional video game. To make VR games and application enjoyable advanced tricks and techniques are needed.