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Virtual Reality Technology

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ABSTRACT

In this modern world the technologies plays vital role in each and every activity. Day by day these different technologies are enhancing the services as user friendly. VR is the technology with multimedia interactive environment for the user virtually. It is the simulation process on real or virtual with three dimensions such as width, height and depth by adding interactive feel as virtually with sound and tactile. VR is the method for users to visualize, manipulate the complex data. It provides an artificial environment with software and hardware makes the user to feel like a realistic nature.
KEYWORDS: Virtual Reality, VR components, Virtual Environment.

1. INTRODUCTION

Virtual Reality is a technology. Nowadays virtual reality systems use either VR headsets or multi-projected places to generate realistic images, sounds and other sensations that simulate a user's physical presence in a virtual environment. A person using virtual reality equipment is able to see around the artificial world, move around in it, and interact with virtual features or items.
VR can simulate real workplaces for workplace occupational safety and health purposes, educational purposes, and training purposes. It can be used to provide learners with virtual environment where they can develop their skills without the real world consequences of failing. It has been used in military, astronaut training, flight simulators, architectural design, driver training, and bridge inspection. Immersive VR engineering systems enable engineer to see virtual prototypes prior to the any availability of any physical prototypes and most commonly it can be used in entertainment application such as video games and 3D cinemas and educational purposes.

2. NEED OF THIS TECHNOLOGY

Virtual reality is now a day's playing most important role to satisfy the needs of customers; it has made human life simple and easy. Some of the needs of this technologies are as follows :

- By the use of computer software, hardware dynamically Simulate the real environment.
- With help of VR people can feel to have physical presence in the real world as well as in artificial world.
- People can be part of the virtual safe world without any real danger.

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WORKING PRINCIPLE OF VIRTUAL REALITY

It works on the following methods:

- In the first step from the real world it tracks the physical movements, then reflect those movements in the virtual world using computer.
- Then output is sent to HMD or head mounted display. Using this HMD the user feels "immersed" in the imaginary world as if they are in the imaginary world itself they can watch is their rendered actions in virtual world.

VIRTUAL REALITY HARDWARE STRUCTURE

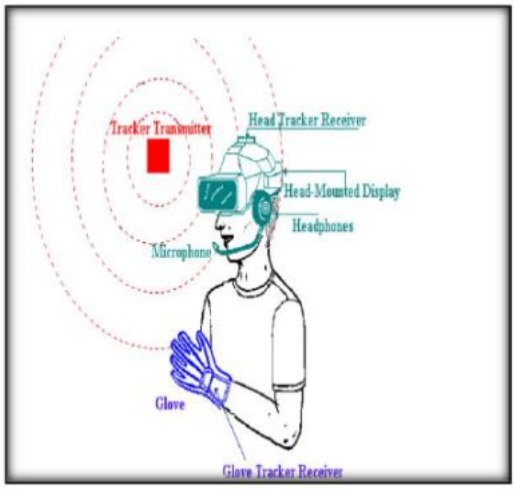

FIG NO 1

3. ARCHITECTURE

ARCHITECTURE FOR VIRTUAL REALITY

FIG NO 2

Different aspects of virtual reality are:

- Input method

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- Simulation method
- Rendering method

INPUT METHOD

The main objective of the input method is to fetch the coordinated data from the input devices like 3D position trackers, keyboard, and voice recognition system to the rest of the system.

SIMULATION METHOD

This simulation method is playing the important role in the virtual reality program. It is used to handle the interactions. Which actions to be taken place in the virtual world is decided by simulation method.

RENDERING METHOD

This rendering method creates output data to the user or other network processes. There are various rendering methods like:

VISUAL RENDERING METHOD

- Visual Rendering is also called as rendering pipeline process. It related to the computer animations & graphics. It has various sub processes which are involved to generate each frame.
- Its starts with information about object, lighting and camera (eye) location in the world space.
- The algorithm & actual pixel rendering will be done by transforming the objects geometries into the eye coordinate system.

AUDITORY RENDERING METHOD

- It generates the sounds based on the physical model displayed. It is create mono, stereo or 3D audio.
- There are many aspects of our head & ear shape that affect the recognition of 3D sound. Hence , the HRTF is app-lied to the sound.

HAPTIC RENDERING METHOD

It is a growing technology. It allows the creation of reaction forces between the virtual tool being manipulated by the user and object. That reaction forces are feedback to the haptic device for creating the sense of human touch at the hand of users.

VIRTUAL REALITY COMPONENTS

These components are used for building and getting experiencing about VR. These are classified into two main components. They are hardware and software components.

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HARDWARE COMPONENTS

The hardware components are classified into five components: computer workstation, tracking system, and process acceleration cards, sensory displays, and input devices.

COMPUTER WORK STATION (OR) SMART PHONE

The workstation is also known as mainframe computer terminal or a personal computer (PC) and Smartphone are important part of the VR system. This is used to process the input and outputs sequentially.

SENSORY DISPLAYS

It helps the users to view simulated virtual world. The HMD for 3-Dimensional visual and headphones for 3-Dimensional audio and VDU are most commonly using sensory displays.

HEAD MOUNTED DISPLAYS

HMD has a display screen in front of user's eyes at all times. It helps the users to view the objects from different angles or can change their view by simply moving their heads. It uses CRT or LCD technology. It creates an image very clear and realistic image. A set of optical lens and mirrors are used to enlarge the view. And allows the user can experience the virtual world.ss

HMD

FIG NO 3

BOOM

BOOM means Binocular Omni-Orientation Monitor. Some of the drawbacks in the HMDs can be solved by using a BOOM display. Like HMD users don't need to wear a BOOM display. Because is mounted on a jointed mechanical arm with tracking sensors device located at the joints. To see the virtual world, the user must take hold of the monitor and keep their face up to it. Then the system will generate an scene based on the position and orientation of the joints on the mechanical arm.

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BOOM

FIG NO 4

(VDU) OR MONITORS

VDU means Visual Display Unit. VDU is classified into two types. The CRT monitors and the LCD monitors. It helps the users to view an image very clear and realistic image.

PROCESS ACCELERATION CARDS

These cards use to update the display with new sensory information. Eg: 3D sound cards and 3D graphic cards.

TRACKING SYSTEM

Position and orientation of the user in virtual world is track using this tracking system. It is classified into: electromagnetic, ultrasonic, mechanical, and infrared trackers.

INPUT DEVICES

Input device gives the users the sense of immersion and allow the users to communicate with the system. It helps the users to interact with virtual object in virtual environment. Most commonly used input devices are bodysuits, motion trackers, tracking balls, joystick (wand), instrumented glove, keyboard, voice recognition etc.

SOFTWARE COMPONENTS

The software components are divided into four sub-components: 3D modeling software, 2D graphics software, digital sound editing software and VR simulation software.

DIMENSION MODELING SOFTWARE

Using this software user can create a mathematical representation of a 3-dimensional object or shape. It enables users to create photorealistic illustrations. It can be used in variety of industries.

DIMENSIONAL GRAPHICS SOFTWARE

It is used to create image and illustrations and manipulate texture to be applied to the objects which enhance their visual details.

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DIGITAL SOUND EDITING SOFTWARE

It is used to merge and edit audio that objects make within the virtual world.

VR SIMULATION SOFTWARE

It is used to set the rules and behavior to objects in the virtual world by brings all the components together in the virtual world.

CATEGORIES OF VIRTUAL REALITY SYSTEMS

Several categories of virtual reality exist, but below we discuss only three major categories:

NON-IMMERSIVE CATEGORY

This category is also called as Window on World (WoW).It has use the desktop system for implementing VR. Users can view the virtual world through window by utilizing a standard high resolution monitor. Interaction can be done with the virtual world with the help of mouse or trackball, keyboard.

NON IMMERSIVE CATEGORY

FIG NO 5

SEMI-IMMERSIVE CATEGORY

This category increases the immersive experience of the users. It uses the high performance graphics computing system and integrated with either a large screen projection system or multiple television projection system to exactly simulate the user's visuals.

SEMI - IMMERSIVE CATEGORY

FIG NO 6

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IMMERSIVE (FULLY IMMERSIVE) CATEGORY

This category provides more realistic experience of virtual world to the users by either wears on head mounted display or uses some form of head-coupled display and motion detecting devices.

IMMERSIVE CATEGORY

FIG NO 7

VARIOUS APPLICATIONS OF VR

Day by day the uses of VR technology will get increased. Here I have mention only important area of use is as follows:

COMPANIES

This VR technology is being used in a more number of ways in companies for increasing their profits which includes.

- Providing Training to new employees.
- Any product we can view in 360 Degree view.

COMPANIES

FIG NO 8

TRAINING

- VR technique can also be used for training purpose.
- Using VR technology we can able to train the users and improve their skills without any real dangerous.
- Eg: training for the military, flight simulators, battlefield simulators for soldiers, etc.

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TRAINING

FIG NO 9

DESIGN & ENGINEERING

- VR technology increasingly used in engineering and designing process.
- It gives the clarity about design and it also provides the facility of changes in design wherever needed.
- It helps to save the time and reduce the cost.
- Eg: vehicle designing and construction of Building etc.

DESIGN & ENGINEERING

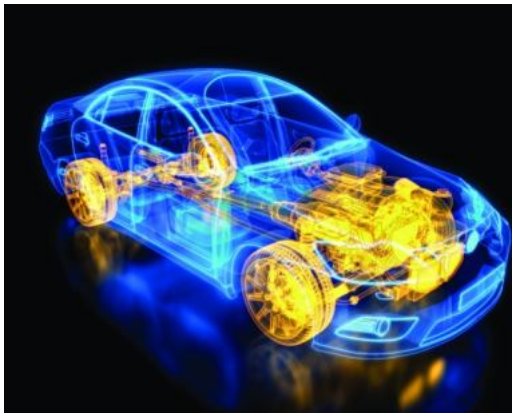

FIG NO 10

GAMES & ENTERTAINMENT

- VR playing vital role in 3D games and entertainment. It gives the experience of being in a three dimensional virtual reality entertainment world.
- Eg: gallery, virtual museum, virtual games, theme parks, exhibitions etc.

ENTERTAINMENT

FIG NO 11

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EDUCATION

Using VR technology in the education will make the teaching and learning exciting and enjoying.
Using this VR concept student can understand complex concept easily.

Using various virtual reality simulation a students can practice new thing rather than reading them in books.

EDUCATION

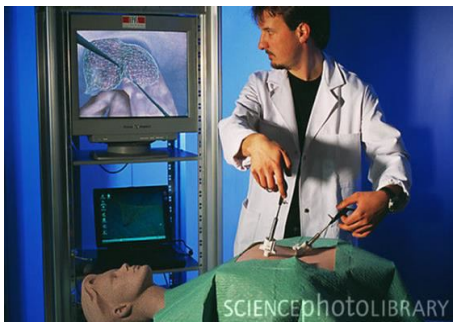

FIG NO 12

ASSEMBLY VERIFICATION

Using Virtual reality can check whether the components are assembled properly without spending cost.

ASSEMBLY VERIFICATION

FIG NO 13

PROS OF VR

- In education field students will definitely feel more motivated to learn and it will create interest among the students.
- It will improve the quality of education in different fields.
- It gives the chance to experience things that are impossible in real life.
- In various fields we can use this virtual reality technology to train the people without real dangerous.
- It may help the disabled people to experience a virtual world those who can't able to do in real world.

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CONS OF VR

- To implement this technology more costly hardware and software are necessary to develop imaginary world.
- It will damage the relationship among the people.
- People may addict to this virtual world so they may forget their real life responsibilities.
- We can't able to use this head mounted display continuously because it may cause some health issues.

4. CONCLUSION

It is a growing technology its main objective is to give the user an environment as realistic as possible. This technology may change our life styles. Currently different applications developed using VR technology may be in future many more applications will be developed.

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