IJFEA

INTERNATIONAL JOURNAL FOR ENGINEERING APPLICATIONS AND TECHNOLOGY

Virtual Reality:The Next Frontier

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Abstract

VR is a currently-expanding field which gives the users an experience of being in a real environment. Experiencing high-quality VR for the first time, whether it be computer-generated or the result of streaming video and audio from a remote location, elicits a compelling experience of presence (being within a realistic 3D environment).Presence in VR is indeed fascinating and, as a result, has become the focus of scientific and philosophical inquiry. But even more fascinating is the presence experienced in everyday life. Oculus a platform for many other experiences.Enjoying a court side seat at a game, studying in a classroom of students and teacher all over the world or consulting with a doctor face-to-face in a virtual environment by wearing VR headsets in your home.The of live streaming of 360° video and audio is now also referred to as ''VR.''

Index Terms:*Virtual Reality (VR), Oculus Rift, VR headsets, 3D environment.*

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1. INTRODUCTION

VR comes, naturally, from the definitions for both 'virtual' and 'reality'. VR is computer-simulated 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. VR is the real-time and interactive technology.
VR can be divided into:

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

The VRModelling Language (VRML) allows the creator to specify images and the rules for their display and interaction using textual language statements and standard language for interactive stimulation within the World Wide Web. Allowingto create "Virtual Worlds" networked via the internet and hyperlinked with the World Wide Web.
The important term related to VR is Latency. Lag time between when user acts and when the virtual environment reflects that action is called latency.Current online social networking sites (Facebook, Twitter, and the like) are just precursors of what we will come to truly witness when social networking encompasses immersive VR technology. At its most basic, social VRallows two geographically separated people (in the form of avatars) to communicate as if they were face to face. They can make eye contact and can manipulate virtual objects that they both can see. Current VR technology is in its inception since headsets are not yet able to track exactly where eyes are pointed, by instead looking at the person to whom one is talking. Moreover, current state-of-the-art VR technology is unable to read detailed facial expressions and senses. Finally, and perhaps the biggest caveat, is that most powerful VR prototypes are wired with cables because the amount of transmitted high-resolution video at high frame rates simply cannot be done using today's wireless technology (4G/LTE), let alone the fact that a perfect user interface is still in the making.
VR allows us to communicate 'face-to-face'. Video conferencing has been integral in facilitating remote interactions between business professionals, and has seen great success through platforms such as Skype and GoogleDuo.Two business professionals, from opposite ends of the world can 'meet' virtually in the same space to conduct a conversation face-to-face.Aside from reaching out to shake hands and putting a hand through thin air, that interaction can be as real as actually being present in the same room.Ultimately,VR will provide the most personal experience with the closest screen, providing the mostconnected, most immersive experience witnessed thus far.

2.TRENDS IN VR

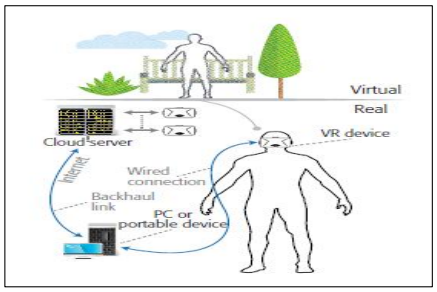

Fig-1: Current VR

A wearer has to put the Head Mounted Display (HMD) which has the cable attached to the PC or portable device which is then connected directly to the server. Video is sent from the console or computer to headset via a HDMI cable in the case of headset such as HTC's and Rift. Rift has built in display but needs to connect to a powerful PC. A HMD attached to a computer which enabled the wearer to see a virtual world. Wired VR are more immersive and has more clear graphics. Cables are more obstacles because it not only creates players mobility, but also creates a tripping hazard. Wired VR requires a dedicated space for it. It is a computer generated VR i.e. created entirely from computer generated content. Computer generated VR can only be pre-rendered and not reactive.

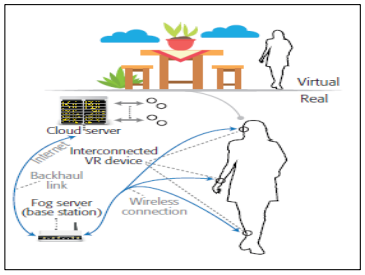

Fig-2: Interconnected VR

HDMI cables are eliminated here and wireless device are used which are interconnected with the base station (Fog server).At the moment, the most familiar kind of VR headset is wireless. These include the primarily cheaper devices into which you slot your smartphone like Google Cardboard but mid-range products like Gear VRare also wireless. Mobile VR can be used anywhere and at any time. Obviously, the biggest benefit of wireless VR is complete freedom from cables, but they also tend to be heavier and less comfortable. Content is streamed from a PC to the headset using a proprietary wireless signal operating at the 60GHz band. It could be UWB (ultrawide band) technology, which is faster than Wi-Fi.The ultimate goal of VR, is to deliver more life-like images at high frame rates from multiple sources. Future VR headsets could be full blown computers and have cloud-based VR elements like on Optoma's headset. VR headsets capture eye movements andfacial expressions.

3.PROPOSED WORK

For understanding the working of Oculus Rift, we first need to understand the working of any head mounted display in VR. The principle in general is called as closed (video only) HMD. Here, the monitor is mounted very close to the eye.

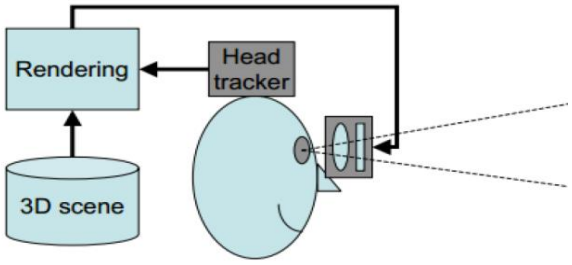

Fig-3: Creating VR using HMD

Looking real can be achieved by wearing a head-mounted display (HMD) that displays a recreated life size, 3D virtual environment without the boundaries usually seen on TV or a computer screen. Feeling real can be achieved through handheld input devices such as motion trackers that base interactivity on the user's movements. By stimulating many of the same senses one would use to navigate in the real world, VR environments are feeling increasingly more like the natural world.

3.1Components in VR

Inside of each VR head-mounted display (HMD) is a series of sensors, individual eye displays, lenses, and display screen(s), among other various components. These sensors work together by measuring the user's motions and direction in space. Their ultimate goal is to achieve true six-degrees-of-freedom (6DoF), which covers all the degrees of motion for an object in space.

- *Magnetometer* - The magnetometer tells your device which direction it is facing on the surface of the earth. The magnetometer acts as a sort of compass for the device. As such, it is able to do this by measuring magnetic fields.
- *Accelerometers* - The accelerometer tells your device which way up it is. To do this, your device will have several accelerometers to work together measuring things like gravitational pull in relation the accelerometer measuring the device's orientation.
- *Gyroscopes* - A gyroscope calculates the orientation of your device. It does this to either help your device maintain a particular orientation or make sure it properly changes orientation when it should.

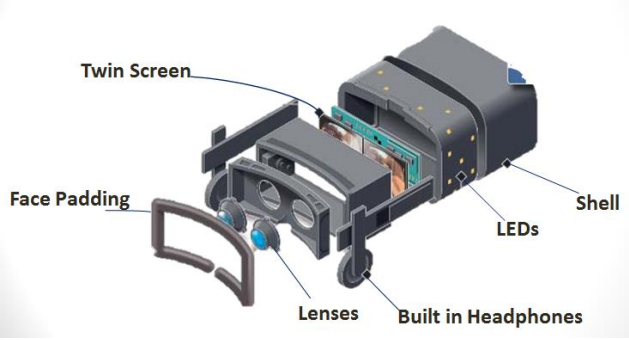

Fig-4: Headset

All this feeds into the headset, which connects to your head via vertical and horizontal straps, with the uppermost strap including the HDMI and USB cable. Further customization is achieved with two pairs of lenses, which magnify the screen so it fills your field of view without causing any blurring or motion sickness. “It feels like you just put on a pair of glasses". It also includes built in headphones which gives audio of depth and also LEDs are hidden behind the fabric shell which are tracked by sensors. Position tracking i.e. IR camera lets you know where you are in virtual space and final consumer version is going to keep tabs on you via small microphone-shaped pole on top of your desk.

Lenses

Lenses lie between your eyes and pixels on the display screen. They focus and reshape the picture for each eye by angling two 2D images to mimic how each of our eyes take in views of the world (also called stereoscopic). This creates an impression of depth and solidity, which we perceive to be a three-dimensional image. Lenses on each VR device are not one-size-fits all and have to be adjusted for initial use as all devices have different lens properties.

Display Screen

Display screen show the images that user view through the lenses. They are typically LCD and receive video feed from the computer or smartphone. Depending on the headset, the video feed is either sent to one display or two displays (one per eye). This happens via wireless connection, smartphone connection, or HDMI. The most common type of VR display technology is a LCD screen, similar to the kinds used in smartphones and computer monitors. An alternative display technology is an Organic Light-Emitting Diode (OLED) screen.

Processing

The processing power required by VR systems can be broken down into several categories:

- Input Processor – Controls the devices used to input information to the computer. They retrieve and distribute data to the rest of the system with minimallag time. Examples include keyboards, mouse, 3D position trackers, and voice recognition systems.
- Simulation Processor – Takes the user inputs along with any other tasks that are programmed from the natural world and determines the actions that will take place in the virtual world. This is a core component of the VR system.
- Rendering Processor – Creates the sensations that are output to the user. These include visual, auditory, haptic and other sensory systems. Separate rendering processes are used for each sensory system.

3.2 Devices used in VR

Cable

Fig-5: Cable

Video is sent to the Oculus Rift via HDMI(High-Definition Multimedia Interface), with an optional DVI adapter for laptops and newer graphics cards. It also includes USB, which carries data and power to the device. This 10-foot cable is just the right length to provide a consistently good signal without any degradation, while remaining reasonably light so you don't feel like a dog chained to a lamppost.The headset also includes a USB port so you could potentially connect a controller, or some USB headphones, or a novelty singing cactus.

Oculus touch

Fig-6:Oculus Touch

Oculus Touch is a new VR input device. It's actually a pair of tracked controllers designed to deliver a "hand presence", which is something that Oculus VR has described as "the sensation of feeling as though your virtual hands are actually your own".So, Oculus Touch is supposed to make it feel as though you're using your own hands - rather than a gamepad like the Xbox One controller - in a VR environment.

4. APPLICATIONS

4.1Education

Education will be another big early use case for virtual worlds. Imagine kids being able to attend class or tutoring by putting on an HMD and being immersed in interactive educational materials on subjects such as physics or chemistry, while being led and questioned by their teacher exactly as if they were seeing them in a real classroom .The value to student of distance learning using one will be easily worth the investment.

4.2Architectural visualization

In this area, VR allows the future customer to “live” in his/her a new house before it is built. He/she could get a feel for the

space,experiment with different lighting schemes, furnishings, or even the layout of the house itself.VR has been used to establish models of architectural models and buildings before construction begins.It can also be used to reconstruct building which is collapsed or damaged or to determine how this happened and the steps needed prevent the situation in the future.

4.3 Business/Conferencing

VR is being used in a number of ways by the business communitywhichincludes:Virtual tours of a business environment,training of new employees, a360 view of a product.Think Skype for Business on steroids. VR has the potential to bring digital workers together in digital meetings and conferences – real time event coverage – imagine Facebook Live with VR. Rather than merely seeing the other person on a screen, you'll be able to feel as if you are in the same room with them, despite being miles away. With the rise of the freelancer economy, virtual meetings may become the norm rather than the exception.

4.4 Virtual War Training/Rescue Mission:

United States uses VR as flight simulator to train pilots. With VR training huge saving of fuel, electricity, wears& tear could be affected.In some sectors, VR is used to train employees, especially in dangerous environments. For example, when a soldier goes he has no idea what he going to face or when he goes to a rescue operation, the unpredictable circumstances make it quite difficult to complete the mission. That puts soldiers or hostage's lives on stake. What if these soldiers are already trained in same virtual environment? Soldiers would be able to fight terrorism in a better way. These training would save lives of many brave soldiers and will help to eradicate terrorism from this world. E.g. in aviation industry pilots are trained in simulated environment so that they don't make mistakes in real life situations.

5. LIMITATIONS

One worry is that as VR environments become much higher quality and immersive, they will become attractive to those wishing to escape real life.The amount of time one can spend navigating a virtual world visualized in a head-mounted display is limited. This is subjective but after a prolonged time of between 45 and 60 minutes, users can experience motion sickness.

6. CONCLUSION

VR holds out the promise of allowing us to literally show one another what we mean rather than merely describing it with crude verbal approximations. VR offers the possibility of evolving our communication into a kind of telepathy, ultimately bridging the gap between our discrete imaginations. It allows you to step into virtual spaces, look around in any direction and let you to interact and can rendered in virtual environment. Real time event coverage with help of HMD rather than merely seeing the other person on a screen, you'll be to feel as if you are in same room with them and despite being mile away.VR at its best shouldn't replace real life; just modify it, giving us access to so much just out of reach physically, economically. If you can dream it, VR can make it.

ACKNOWLEDGEMENT

Apart from our own, the success of this paper depends largely on the encouragement and guidelines of many others. We are especially thankful to my guide Prof. J.H.Saturwar who has provided guidance, expertise and encouragement.

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