OCULUS RIFT

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ABSTRACT:

Virtual reality (VR) is a burgeoning field that has the inherent potential of manipulating peoples mind with a superlative 3D experience. The Rift is an upcoming virtual reality head-mounted display, being developed by Oculus VR. In this paper, we review Oculus Rift, which arguably has taken the immersion in virtual reality to a whole new level. The device is a lightweight virtual reality headset that blocks your view of your surroundings and fully immerses you in a virtual world.

Keywords:

Virtual Reality, Oculus Rift, Immersion, Head Mounted Display, Gaming.

INTRODUCTION:

Let us start by discussing about Virtual Reality, because Oculus Rift, in the end, is the end product of virtual reality. Virtual reality (VR) has not only been the stuff of science fiction novels and movies for decades, but it's also been an actual thing. The widely accepted idea of virtual reality remains the same - using computer technology to create a simulated, three-dimensional world that a user can manipulate and explore while feeling as if he were in that world. But it is a very ambiguous subject and there have always been debates in what exactly constitutes virtual reality, but in general we always find the following points:

• Three-dimensional images that appear to be life-sized from the perspective of the user

• The ability to track a user's motions, particularly his head and eye movements, and correspondingly adjustthe images on the user's display to reflect the change in perspective.

When we talk about virtual reality, immersion has to come up, virtual reality and immersion go side by side. In a virtual reality environment, a user experiences immersion, or the feeling of being inside and a part of that world. So, immersion can be seen as a measurement for the level of virtual reality. For immersion to be effective, a user must be able to explore what appears to be a life-sized virtual environment and be able to change perspectives seamlessly. Another important term related to virtual reality is Latency. Lag time between when a user acts and when the virtual environment reflects that action is called latency. Now that we have developed the basic understandings of the common terms related to virtual reality, let us move on to the main topic, Oculus Rift. It's the first of several headsets poised to bring realistic VR into the realm of possibility for the average user. As of early 2014, inaddition to the consumer version, the Oculus Rift is currently out in a developer's kit version with the aim of encouraging the creation of content for the device before an improved consumer version goes to market.

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The device is a lightweight virtual reality headset that blocks your view of your surroundings and fully immerses you in a virtual world. The Rift lets you step into a game, look around in any direction and see the game environment all around you rather than on a flat screen surrounded by your living room decor. And you see it in 3D.

Figure 1: Oculus Rift

Technical Specifications:

The Oculus Rift Development Kit version 1.1 includes the Oculus Rift head set. The kit also comes with a control box that's permanently attached to the headset via a 6-foot (1.8-meter) cable, a removable over-the-head strap for added comfort and stability, three pairs of vision lenses of different focal lengths, an HDMI cable, a USB cable, a DVI cable, an HDMI to DVI adapter and a 5-Volt switching US-standard power supply along with international power adapters. All of this comes housed in a hard case. The Oculus Rift dev kit goggles weigh less than a pound -- a mere 369 grams -- and the future consumer model may be even lighter. The developer headset allows for head-tracking with 3 degrees of freedom (DOF), ultra-low latency and a field of view (FOV) of 110 degrees diagonally and 90 degrees horizontally for convincing immersion. The Rift incorporates a flat 7-inch (17.8- centimeter) 60Hz LCD display screen with a resolution of 1280 by 800 pixels (around 720p high-def resolution). The screen is divided into 640 by 800 pixels per eye, with a 2.5-inch (64-millimeter) fixed distance between lens centers. The user views the screen through two lens cups. There are plans to make the consumer model's resolution at least 1080p, and the company has already demonstrated two 1080p prototypes (the HD and

Crystal Cove models). The display inputs include DVI-D Single Link, HDMI 1.3+ and USB 2.0 Full Speed+, all fed to it through the single control box cord.

Figure 2: The Rift without its immersion-producing lenses

Figure 3: The Rift with its immersion-producing lenses

2.1 System Requirements:

The Oculus Rift device and Software Development Kit (SDK) support Linux, Mac OS and Windows operating systems. There are no specific minimum system requirements, however some recommended guidelines include:

- Windows (Vista, 7 or 8)
- Mac OS 10.6 or higher
- Linux (Ubuntu 12.04 LTS)
- 2.0+ GHz processor
- 2 GB RAM
- Direct3D 10 or OpenGL 3 compatible video card

The Oculus SDK is publicly available and open source, meaning that anyone can obtain, use and even modify and distribute the code.

WORKING:

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.
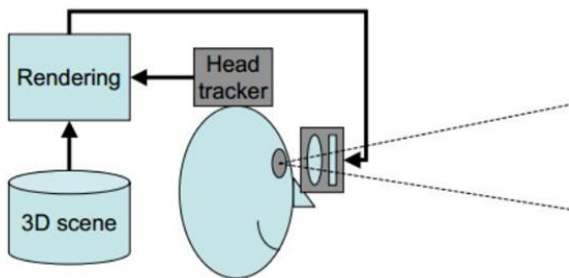
Figure 4: Creating VR with a HMD

The Oculus Rift works like a conventional head-mounted display, but packs a few features that make it ideal for gaming. For example, the Rift offers impressive head tracking capabilities; stereoscopic 3D rendering; a wide field of view (110 degrees -- most headsets only offer around 40 degrees); and several inputs (DVI/HDMI and USB). When wearing the Oculus, each eye gets close and personal with a 640x800 LCD screen for a total resolution of 1,280x800 (720p).
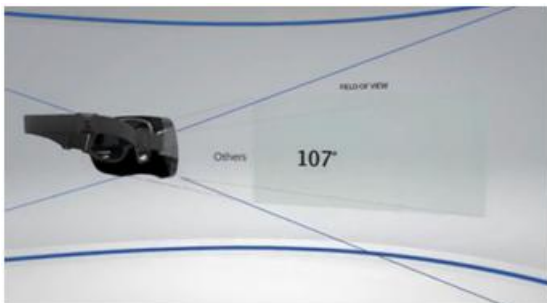
Figure5: Oculus Rift's Massive field of view

Adoption:

Games and game platforms must be specifically designed to work correctly with the Oculus Rift. Oculus is producing a software development kit (SDK) to assist developers with integrating the Oculus Rift with their games. The SDK will include code, samples and documentation. Since its introduction, many developers have been working on integration. Team Fortress 2 was the first game to add support for the Oculus Rift, and is currently available to play with the Oculus Rift development kit by use of a command line option. Although at the time of this writing the consumer version of Oculus Rift isn't out yet, there are already some games from major developers that have been created or ported to work with the device. These include:

• Doom 3 BFG Edition by id Software - the first Oculus-ready game.

• Eve: Valkyrie by CCP Games - an exclusive launch title for Oculus Rift.

•Team Fortress 2 by Valve - a port that can be played in VR mode.

• Half Life 2 by Valve - another port that can be played in VR mode.

•Hawken by Meteor Entertainment and Adhesive Games.

Unfortunately, not just any 3-D game can be played with the device just yet. Due to the unique properties of the Rift, including its wide field of vision and head-tracking abilities, games and other applications will have to be specifically made to work with the device.
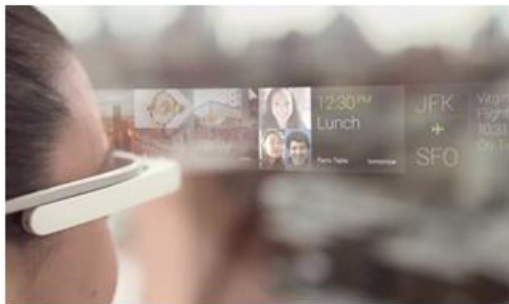
Figure 6: Team Fortress 2 on Oculus Rift

Similar Technologies:
5.1 Google glass:
Google Glass is a type of wearable technology with an optical head-mounted display (OHMD). It was developed by Google with the mission of producing a mass-market ubiquitous computer.

Figure 7: Google Glasses

For some reason people always compare Oculus Rift with Google glass. Apart from the fact that they both are a type of Head Mounted Display, they are completely different and they were built for totally different purposes and for different audience too. Oculus Rift is designed explicitly for gaming purposes, whereas Google glass is built for a more general purpose of mobility and connectivity.

5.2 Sony's Project Morpheus:
Project Morpheus is the codename for an upcoming virtual reality headset produced by Sony Computer Entertainment. It is designed to be fully functional with the Sony PlayStation 4 and work with the PlayStation Vita.

It is currently a prototype and will be released sometime after 2014. Project Morpheus can truly be considered as a competition to Oculus Rift. Like Oculus Rift, Project Morpheus is designed primarily for gaming purposes and also both the products will be targeted to the same audience. Neither headset is anywhere near the finished product though and both companies insist that the design and technical specifications may change significantly before release.

Figure 8: Morpheus

5.3 HTC VIVE:
HTC Vive is a virtual reality headset developed by HTC and Valve Corporation. The headset is designed to utilize "room scale" technology to turn a room into 3D space via sensors, with the virtual world allowing the user to navigate naturally, with the ability to walk around and use motion tracked handheld controllers to vividly manipulate objects, interact with precision, communicate and experience immersive environments.

Figure 9: HTC Vive

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Conclusion:

Early impressions of the developer model have been largely positive. Many people think the Rift is incredibly cool. On the other hand, there have been the expected complaints about nausea and dizziness, and some concern about using glasses with the Oculus Rift. The Rift lets you step into a game, look around in any direction and see the game environment all around you rather than on a flat screen surrounded by your living room decor. And you see it in 3D. Not quite the technology that we see in fictional movies yet, but a good step in that direction. As it always does, technology has improved by leaps and bounds, graphics have gotten better, and now with the Oculus Rift, it sounds like more enjoyable and believable VR is within our grasp.

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