

Augmented Reality vs. Virtual Reality: Differences and Similarities

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Abstract- This paper presents an overview of basic aspects of Augmented Reality (AR) and Virtual Reality (VR). It describes the main fields in which Augmented and Virtual Reality is applied nowadays and important AR and VR devices. Some difference and similarities of Augmented Reality and Virtual Reality will be discussed and this paper will provide an overview of them.

Keywords- Augmented Reality, Virtual Reality, AR device, VR device.

I. INTRODUCTION

What is Augmented Reality?

Augmented reality (AR) is a live direct or indirect view of a physical, real-world environment whose elements are augmented by computer-generated sensory input such as sound, video, graphics or GPS data.[1] Unlike virtual reality, which creates a totally artificial environment, augmented reality uses the existing environment and overlays new information on top of it.[2]

In 1990, researcher Thomas Caudell coined the term augmented reality, to describe how the head-mounted displays that electricians used when assembling complicated wiring. Today, Google glass and heads-up displays in car windshields are perhaps the most well-known consumer AR products, but the technology is used in many industries including healthcare, public safety, gas and oil, tourism and marketing.[2]

Augmented reality application are written in special programming language that allow the developer to integrated animation as well as digital information in the computer program. AR applications for Smartphone's typically include global positioning system (GPS) to locate and detect the exact

location of user. Some of AR programme used in military for training purpose ,which may include object recognition and gesture recognition

How does it work?

Using a mobile application, a mobile phone's camera identifies marker, often a black and white barcode image. The software analyses the marker and creates a virtual image overlay on the mobile phone's screen, tied to the position of the camera. This means the app works with the camera to interpret the angles and distance the mobile phone is away from the marker.

Due to the number of calculations a phone must do to render the image or model over the marker, often only Smartphone's are capable of supporting augmented reality with any success. Phones need a camera, and if the data for the AR is not stored within the app, a good 3G Internet connection.

Displays:

There are basically different type of display of Augmented Reality. They are as follows:

1. Handheld Device:

In handheld device we can include portable device such as mobile phones and personal computer



Fig.1 Handheld Device

2. Spatial display:



Fig.2 Spatial display

Spatial display makes use of projected graphical displays onto fixed surfaces.

Applications:

Some of the future applications of Augmented Reality are as follows:

1. Gaming:

Augmented reality allows gamers to experience digital game play in a real world environment. In the last 10 years there has been a lot of improvements of technology, resulting in better movement detection.[1]

2. Medical:

Augmented reality can reduce the risk of an operation by giving the surgeon improved sensory perception. Medical students use the technology to practice surgery in a controlled environment. This technology can be combined with MRI or X-ray systems and bring everything into a single view for the surgeon.[3]

3. Military:

The Heads-Up Display (HUD) is the typical example of augmented reality when it comes to military applications of the technology. A transparent display is positioned directly in the fighter pilots view. [3]

4. Navigation:

GPS systems are using augmented reality to make it easier to get from one point to another point. Using the phone's camera in combination with the GPS, the users see the selected route over the live view of what is in front of the car.[3]

5. Education:

Augmented reality applications can complement a standard curriculum. Text, graphics, video and audio can be superimposed into a student's real time environment. Textbooks, flashcards and other educational reading material, when scanned by an AR device, produce supplementary information to the student rendered in a multimedia format. Students can participate interactively with computer generated simulations of historical events, exploring and learning details of each significant area of the event site.[1]

Advantages of AR:

- Now days augmented reality can be use for increase user knowledge and information.
- People can share experiences with each other in real time over long distances.
- Games that provide an even more "real" experience to the user.

Disadvantages of AR:

- Openness: Other people can develop their own layers of content to display. That could cause information overload and augmenting without permission.
- Interoperability : The lack of data portability between AR environments.
- Regarding user experience, socially using Augmented Reality may be inappropriate in some situations.
- Spam as it is easy to imagine that spam could overwhelm the augmented world with unwanted advertising or unwanted information of any kind.
- Price – as the technology is still developing it may be quite expensive to use it in everyday life and it might be less accessible for small businesses.

What is 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 belief and accepts it as a real environment. Virtual realities artificially create sensory experience, such as sight, touch, hearing, and smell.[4]

The term "artificial reality", coined by Myron Krueger, has been in use since the 1970s. The term "Virtual Reality" was used in *The Judas Mandala*, a 1982 science-fiction novel by Damien Broderick. Virtual Reality in its modern usage was popularized by Jaron Lanier through his company VPL Research. VPL Research held many of the mid eighties VR patents, and they developed the first widely used HMD: EyePhone and Haptic Input DataGlove [5]

How does it work?

Virtual reality are often referred to as Head Mounted Display (HMD). Holding up Google Cardboard to place your Smartphone's display in front of your face can be enough to get you half-immersed in a virtual world.

The goal of the hardware is to create virtual environment without the boundaries we usually associate with TV or computer screens. So whichever way you look, the screen mounted to your face follows you. Video is sent from the console or computer to the headset via a HDMI cable in the case of headsets such as HTC's Vive and the Rift.

VR headsets use either two feeds sent to one display or two LCD displays, one per eye. There are also lenses which are placed between your eyes and the pixels which is why the devices are often called goggles.

Applications:

Some of the future application of virtual reality are as follows:

1. Education and training:

The Application of VR in a training purpose is to allow professionals to conduct training in a virtual environment where they can improve upon their skills without failing the operation.[7]

2. Retail:

Lowe's, IKEA, and Wayfair have developed systems that allow these company's products to be seen in virtual reality, to give consumers a better idea of how the product will fit into their home, or to allow the consumer to get a better look at the product from home.[5]

3. Media:

On December 8, 2015, the production company Skybound announced their VR thriller titled, "Gone". In collaboration with the VR production company WEVR, and Samsung Gear VR, the 360 degree video series was released on January 20, 2016.[8]

4. Video games:

Several Virtual Reality head mounted displays (HMD) were released for gaming during the early-

mid 1990s. These included the Virtual Boy developed by Nintendo, the iGlasses developed by Virtual I-O, the Cybermaxx developed by Victormaxx and the VFX1 Headgear developed by Forte Technologies..[5]

5. Urban design:

Now days, virtual reality can be used for urban regeneration and planning and transport projects.[9]

Advantages of Virtual Reality:

- One of most important advantage of VR can create a realistic world so that user can explore world.
- Virtual Reality in education field makes education more easily and comfort.
- Through Virtual Reality user can experiment with an artificial environment.

Disadvantages of Virtual Reality:

- VR is becoming much more commonplace but programmers are still stuck with how to interact with virtual environments.
- The idea of escapism is common place among those that use VR environments and people often live in the virtual world instead of dealing with the real one.
- Training with a VR environment does not have the same result as training and working in the real world. This means that even if someone does well with simulated tasks in a VR environment, that person might not do well in the real world.[10]

II. Similarities in Augmented and Virtual Reality

1. Technology:

Augmented and virtual reality both have the same types of technology, and both exist to serve the user with an enhanced or enriched experience.[11]

2. Entertainment:

Augmented and virtual reality both technologies enable experiences that are becoming more commonly expected and sought after for entertainment purposes. Leading tech companies are investing and developing new adaptations, improvements, and releasing more and more products and apps that support these technologies for the increasingly savvy users.[11]

3. Science and Medicine:

Both virtual and augmented realities have great potential in change the medical field by making things such as remote surgeries a real possibility. These technologies been already been used to treat and heal psychological conditions such as Post Traumatic Stress Disorder (PTSD).[11]

III. Differences in Augmented and Virtual Reality

Augmented reality add something to the existing environment to enhance the real world, whereas virtual reality actually create an entirely new artificial world.

Augmented reality needs the environment so just use a camera integrated in our devices such as Smartphone, tablets, PCs,. Virtual reality needs the opposite, a device which can fully isolate us in virtual world, this is, specific devices.[11]

Augmented reality is having more acceptance in formation and marketing field, whereas Virtual reality is better for videogames and other leisure options.

IV. Future work in Augmented and Virtual Reality

In upcoming years, the most exciting, disruptive developments coming in AR and VR.

1. Screen resolution matches visual brain input.

This will happen sooner than we think likely in the next few generations of head-mounted display product iterations from companies like Oculus and HTC.

2. Eye tracking adds both presence and control.

Eye tracking and eye interaction technology has advanced tremendously. Companies like Eyefluence are paving the way for a new technology interaction model based on our eyes.

3. Face tracking from head-mounted displays perfectly conveys your real appearance.

Along with eye tracking, face tracking will be a pivotal development if AR/VR are going to be widely adopted.

4. The End of Displays and Screens

Augmented reality companies are working hard to replace all "displays and screens". In success, your Magic Leap headset will allow you to view a virtual TV anywhere, on any wall, or a mobile phone screen .

V. CONCLUSION

We have seen that both virtual reality and augmented reality are similar in the goal of immersing the user, though both systems do this in different ways. We believe both AR and VR will

succeed; AR may have more commercial success, while VR is a new technology and is emerging fast.

Both technology is becoming cheaper and more widespread. We can expect to see many more innovative uses for both technology in the future and perhaps a fundamental way in which we communicate and work thanks to the possibilities .

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