# Augmented Reality VS Virtual Reality

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**Abstract:** *Technology is advancing at a brisk pace as many things that were not possible a few years ago are possible now. Augmented Reality (AR) and Virtual Reality (VR) are a part of these advanced and innovative forms of technologies that were thought as a part of fiction even a few years ago. But now they are a vital part of the daily reality. The biggest confusion in the world is the difference between Augmented Reality and Virtual Reality.*

*Augmented Reality is a synthetic, computer simulated reality or recreation of a real-time environment where a user can interact with the replicated real environments, whereas Virtual Reality is completely immersive. It immerses the user by making them feel that they are experiencing the real environment not the simulated one by means of auditive, visual, and tactual simulations. Virtual Reality (VR) and Augmented Reality (AR) Optical Head-Mounted Displays (OHMDs) are on the brink of becoming commodity hardware available to the users and is easy to use as a tool for 3D activities. Some OHMDs include front-facing cameras, enabling Augmented Reality (AR) and Virtual Reality (VR) functionality. Apart from avoiding clash with the surroundings, interaction with virtual objects may also be affected by seeing the real environment.*

*For almost all tasks it is not known whether Augmented Reality (AR) has any advantage over Virtual Reality (VR).*

## 1. INTRODUCTION:

In Augmented Reality, users participate in the physical environment and with other users directly along with computer simulated virtual objects embedded in the environment. In Virtual Reality, users participate in the visual environment that is completely mediated. The participation of a user in virtual environment gave us a new research area in dualistic interaction between the mind and the body: how do the user's mind and the virtual environment interact with one another and affects the user's response to the environment.

Presence, sense of being present in the environment, may be a psychological state connected with both mediated and unmediated experience. In Virtual Reality, the user fails to sense or accept the existence of his surroundings and reacts as if the environment is not there, whereas in Augmented Reality, the user can sense and accept the existence of his surroundings and accordingly reacts to his environment i.e. Virtual Reality is completely mediated perception of reality and Augmented Reality is unmediated perception of reality

Augmented Reality and Virtual Reality systems use OHMD's (Optical Head Mounted Displays). OHMD's consist of various sensors such as IMU's (Inertial Measurement Units) that consists of accelerometer, gyroscope, and magnetometer. It also has a sound capture system, which consists of various microphones, and a camera to display virtual objects, environments, etc. The OHMD's generate a convincing sense of being in the mediated environment and consciousness of user's body in the computing environment.

## 2. EXAMPLES OF OHMD's:

**a)Microsoft HoloLens:** Microsoft astonished the technological world with the introduction of HoloLens during its launch event of Windows 10 on 21$^{st}$January 2015; at its Redmond, Washington Headquarters. It is a shiny headset with transparent lenses. When a user puts on the headset, the world around him is transformed –with 3D objects floating in midair, user's living room filled with virtual characters going berserk and virtual screens on the walls. It is the first fully untethered holographic OHMD enabling the user to interact with high definition holograms in the environment. The HoloLens combines AR,VR and live video to offer a new computing experience. The user interacts with the environment through gaze, voice and hand gestures. HoloLens does not replace the real world with a virtual one but simply enhances and modifies the real world.



Fig 1. Microsoft HoloLens

**b) Oculus Rift:** Oculus VR, a division of Fb Inc., developed and manufactured Virtual Reality headset called Oculus Rift. It was released on March 28, 2016. It is based on the Virtual Reality. Oculus Rift has a stereoscopic OLED (Organic Light Emitting Diode) display. It has integrated headphones which provide 3D audio effects. It also consists of rotational and positional tracking sensors.

Oculus Rift creates a 3D environment, allowing the user to use the HMD while walking, sitting and standing in the same room but not wandering too far.

Oculus Rift blocks the user's view to the outside world and aim to pull the user into a fully virtual world. When a user uses the HMD, staring at the dual screen in-front of his eyes, he dives into another, more distant and detached world and tends to lose all sense of the real world. Oculus Rift is mainly intended for seated experience only (i.e. at one place).



Fig.2. Oculus Rift

## 3. AUGMENTED REALITY VS VIRTULAL REALITY:

Both Augmented Reality and Virtual Reality have the same goal of immersing the user into a virtual world. With AR, users continue to be in contact with the real world while interacting with the virtual objects around them, whereas with VR the user is far away from the real world while completely immersed into the virtual world.

Table. i

AR vs VR

|  | Augmented Reality | Virtual Reality |
|---|---|---|
| What It Does? | AR is the fusion of real world and the virtual world. The digital content is simulated on the real world | VR changes the reality by immersing the user in a fully imaginary world |
| Where It Stands? | Introduced in the form of Google Glass. HoloLens is the most famous device. Many companies are working on its prototypes. | VR has been around for a long time. Oculus Rift is the most famous device. Many companies are working on its prototype |
| Applications | Video Games, theme parks, simulation exercises, employee training, commerce | Videogames, theme parks, entertainment apps, video, collaboration, employee training, simulation exercises |
| Biggest Players | Microsoft, Vuzix, Skully, Epson | Oculus RV, Samsung Gear VR, Sony, HTC |

## 4. CONCLUSION

Augmented Reality and Virtual Reality allow experience that are evolving more commonly than expected and are attaining high standards in various fields like entertainment, science, medicine, visualization and annotation, robot path planning, military aircraft, etc.

Augmented Reality is ahead of Virtual Reality, as there are several products already in the market. Virtual Reality has its limitations. Despite of providing whole immersive experience it blocks the user's interaction with the surroundings. Augmented Reality devices are more commercially successful as they do not completely disconnect people from the real world. Virtual Reality OHMD's also have been associated with VR-induced sickness and nausea, which can be a problem for some people. AR headsets do not require users to stand at one place; they can move around and remain productive while attending other tasks as well. This is also an important reason why – despite being behind VR on the current development curve, AR is expected to have a bigger impact on the enterprise market.

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# BIOGRAPHIES

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