

Professional Services, Software & Solutions Group

AUGMENTED REALITY AND VIRTUAL REALITY



1. Introduction:



Until recently, Augmented Reality (AR) and Virtual Reality (VR) technologies have served primarily as inspiration for fiction writers and special effects teams.



The term Augmented Reality was coined by Thomas Caudell while making attempts to apply VR technology to Boeing's manufacturing & engineering processes. The verb 'augment' refers to the action of adding to something in order to make it more substantial. It derives from the Latin 'augere' meaning 'to increase'.



Morton Heilig is known as the "father of virtual reality" for his research and inventions in the '50s and 60s'. However, actual inventor of VR is Ivan Sutherland who created the first Head Mounted Display (HMD). It was attached to a computer system and closely resembled a portable television and could not be comfortably worn by a person.

Both AR & VR are finding more and more practical applications in the enterprise and have a huge disruptive potential in the business processes. Their impact is already being felt across consumer technologies as dozens of new products enter the market. AR and VR are introducing new opportunities to transform the enterprise, particularly in the areas of Gaming, Media & Entertainment, training & simulation in education, defence, real estate, financial services, health and retail sector and reinvention of employee and customer experiences.

2. What are AR & VR Technologies:



AR and VR are two sides of the same coin. While AR stimulates artificial objects in the real environment, the VR creates an artificial environment to inhabit.

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AR is a direct or indirect live view of a physical, real world environment whose elements are augmented by computer - generated perceptual information, ideally across multiple sensory modalities including Visual, Auditory, Haptic, Somatosensory and Olfactory. In laymen terms it refers to a simple combination of real and virtual (computer generated) worlds. Mixed reality (MR) is a subset of Augmented Reality, which overlays 3D holographs into the real environment.



VR is the use of computer technology to create a simulated environment. Unlike the traditional user interfaces, VR places the user inside an experience. Instead of viewing a screen in front of them, users are immersed and able to interact with 3D worlds. Neuro Reality (NR) is a subset of VR which involves technologies that interface directly with the human brain to create a deeper sensory experience. However, it is in a very nascent stage of development.



AR & VR have one big thing in common. They both have the remarkable ability to alter our perception of the world. Where they differ is the perception of our presence. Putting a VR headset over your eyes will leave you blind to the current world, but will expand your senses with experiences within. Augmented reality however, takes our current reality and adds something to it. It does not move us elsewhere. It simply 'augments' our current state of presence after with clear visors. In VR You can swim with sharks while with AR you can watch a shark pop out of your business card. While VR is more immersive, AR provides more freedom for the user and more possibilities for marketers because it does not need to be a head mounted display.

3. Key Components of AR / VR System

Key Components of AR System

Hardware



Key components of any AR device are processor, display, input devices and sensors. Today's Smartphone fulfil all these hardware requirements of AR. Besides above, Microsoft Holo lens is a head-mounted display and focusses on MR. Google's AR headmounted device known as 'Google Glass 2.0' is being used by enterprises with a focus on workforce productivity.



Software

Special 3D Augmented reality programmes are used in AR based applications. Virtual images used for overlapping over the real live image, can be generated using 3D software. Software can be Auto Cad 3D, Cinema 4D. To experience AR, end user has to download a software application.



Remote Server

Apart from the hardware and software, a web cloud server plays an important role in storing the database of virtual images.



Major Players in VR system

In the VR space major player is oculus VR brought by the makers of the Oculus Rift headsets. It is VR head mounted display and hand controllers focussed on Gaming.



HTC vive is VR head-mounted display and hand controllers.



Many other companies are developing virtual reality headsets and other peripherals. To name a few are Sony's Morphens, Samsung Gear VR, Google Cardboard and Magic leap. Neura link is an early stage of brain machine interface to connect humans to computers.

4. Working Principles of AR/VR

Augmented Reality (AR)



It is growing as one of the most sought after technology today. AR Technology brings Virtual objects into the surrounding environments. AR based applications work on the basis of two types of approaches viz. Marker based and location based. The Key difference between the two approaches is that Marker based AR Application generally know about the object that they see, whereas location based do not, they work by locating the object being seen.

Marker based



2D bar codes is the simplest type of AR markers. When a Smart phone having marker based AR application scans a pattern such as a bar code or a symbol through the camera of it, the software recognizes it and super imposes a digital image on the screen. 3D or animated digital image is used for a better experience. The Marker-based approach is also called as Recognition based Augmented Reality.

Location based



As opposed to recognition based AR, location based AR relies on a GPS, digital compass, Velocity Meter and accelerometer to provide data about the location. When a camera of a smartphone having location based AR application is pointed towards a real scene, inbuilt GPS software recognises the action of the device in the world. Based on this location the application offers relevant data which is then super imposed to the real scene visible with device camera. Location based approach is the most widely implemented AR application e.g., mapping directions, finding nearby services. Augmented Reality turns the environment around you into a digital interface by placing virtual objects in the real world. 3 main categories of AR tools are:

Augmented Reality 3D Viewers



It allows the users to place life-size 3D models in your environment with or without the use of trackers. Trackers are simple images that 3D models can be attached to in AR. It powers image tracking and depth sensing.



Augmented Reality browsers

It enriches your camera display with relevant information e.g., you can display your camera to a building and get the information regarding its history or approximate value.



AR Gaming utilizes your actual surroundings.

The biggest use of AR Gaming to-date is Pokemon Go, allowing users to catch Virtual Pokemon who are hidden throughout a map of the real world.

Virtual Reality (VR)

VR technology immerses users in a completely virtual environment that is generated by a computer. The most advanced VR experiences even provide freedom of movementusers can move in a digital environment and hear sounds. Moreover, special hand controllers can be used to enhance VR experiences. VR is normally achieved by wearing a headset like Facebook's Oculus equipped with technology and is used in 2 difference ways.

To create and enhance an imaginary reality for gaming, entertainment and plays e.g., Video and Computer games, 3D movies.

To enhance training for real life environments by creating a simulation of reality where people can practice before hand e.g., Flight Simulators.

Virtual reality is possible through a coding language called Virtual Reality Modelling Language (VRML) which can be used to create a series of images required for interaction.



Augmented Reality vs Virtual Reality

AR and VR are inverse reflections of one in another. Augmented reality delivers Virtual elements as an overlay to the real world whereas VR offers a digital recreation of a real life setting.





Milgram's Reality- Virtuality Continuum

Similarity

Both AR & VR serve to the user with an enhanced or enriched experience. Both are being widely used for entertainment purposes and changing the landscape of the medical fields by making things such as remote surgeries a real possibility. These are already being used to treat and heal psychological conditions such as Post Traumatic Stress Disorder (PTSD).

Difference

AR enhances experiences by adding Virtual components such as digital images, graphics or sensations as a new layer of interaction with the real world. On the contrast VR creates its own reality that is completely computer generated and driven.

VR is usually delivered to the User through a head mounted display or hand held controller whereas AR is being generally used in mobiles, laptops, Smartphones and Tablets.

AR & VR do not always operate independent of one another. They are often blended together to generate an even more immersing experience. Alone or blended together, they are undoubtedly opening up world's both real and Virtual alike.

5. Evolution of AR & VR Technologies

Initially all interactions with interfaces were through intermediate devices such as mouse or key board. Then screens manipulated based on environment facilitated direct physical or spoken interactions with displays. Now Devices respond to ambient cues and intentional movements such as Gesture, Mood and Gaze.

SHORTENED CHAINS OF COMMAND

Augmented and virtual reality help accelerate the coalescence of users with their device-powered experience of the world, improving the fidelity of intention, increasing efficiency, and driving innovation.



6. AR & VR application in different Sectors

Disruptive impact of AR & VR is already being felt across consumer technologies as dozens of new products enter the market. Continuous decline in the cost of device and affordability of new interface and interactions had a great impact on business process.

AR and VR technologies are finding their ways in many sectors. Here are some examples



<u>**Training and Simulations:**</u> AR and VR can be very useful in retooling high-cost training and simulation environments e.g. Health, Education and Aviation Sector. VR flight simulator, VR tours are good examples.



Health: AR can enhance real time medical procedures to a surgeon. VR can be used as a form of therapy e.g. simulating an icy environment for burn patients to help soothe pain.



<u>Retail:</u> Marketing Managers are already using AR to view retail shelf inventory and sales data, demonstration of products. Engineering teams are deploying VR to collaborate in real time to test and refine a single design. Other examples are test driving car via simulation, customising of any product. In clothing stores it allows consumers to try the dress without the need to physically changing the clothes.



<u>Media, Entertainment & Games:</u> AR & VR technologies enhance the experience of a viewer while watching movies, concerts or sports. Use of both AR/VR technologies in games is the first and most popular application.

Defence: AR can be used for "heads up display" for soldiers and technicians. While VR is being used for combat simulation and manoeuvers.



Insurance Sector: Growth of AR and VR technologies is likely to create new risks for individuals and businesses in some sectors and it will present a new growth opportunity for insurance sector e.g. the recently successful AR game, Pokemon Go has been associated with many Instances of accident while playing game. Insurers can seize the opportunity by understanding the emerging risks of these technologies by way of market intelligence and developing a strategy and tactics thereby improving the effectiveness and efficiency of businesses.

7. How can business engage AR & VR technologies?

Although, AR & VR technologies are still nascent but day by day they are finding more and more practical applications in the enterprise and the technology's disruptive potential is already being felt in some sectors. The transition from client-server and web based technologies to mobile has been transformative because it has made it possible to deploy solutions at the actual point where business takes place and decisions are made. According to some surveys the market for these technologies is forecasted to more than \$100 billion globally by 2021, with AR taking 80% share. Clearly there is a first mover advantage. Redefining the customer experience, transforming ways of working, enhancing products and services and the creation of new revenue streams are all possible. For organization looking to build awareness of the technology available, the first step would be to build a business case for further level of investment in some selective departments or role where the technology could improve the productivity and likely to enhance the customers engagement.

Collaboration with the right external partner for developing the technology would be logically the next step. It will see how AR & VR could support your long term growth and competitiveness in a tech driver future. Finally, it is the marketing and distribution campaign on social media and existing channels that would enhance customer engagement and improve the productivity.

8. Way Forward:

PS3G has undertaken some work in developing AR / VR experience in education, healthcare and entertainment. PS3G has recently partnered with upcoming healthcare start-up to design and develop virtual reality applications for the hospitalized kids undergoing long term treatments. The VR application would help the kids with exposure to play and learn that would not only reduce their pain but also the healing process would be quick. Further it will deviate their mind from illness and they won't feel lonely and isolated and able to enjoy the world.

In education sector also PS3G has recently developed AR application for the kids for learning through which they can pick-up the blocks and arrange it at the right place. If you are looking to explore new realities for business, contact PS3G Inc.



LEADERSHIP TEAM



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