

Augmented Reality: Practices and Future Perspectives

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Abstract

Augmented Reality is a technique that empowers users to associate with their physical environment through the overlay of digital data. Augmented Reality has become popular in last few years. Virtual Reality has taken ages to come into use but augmented reality has risen as fast as a virus into the real world. People are using these applications regularly without noticing it. Virtual reality takes a person to a whole new world but augmented reality allows a person to bring their fantasy world into reality. This paper will show how augmented reality has emerged which changed the thinking of the people and its applications that made them realize how they can live their fantasy world in real life.

Keywords: Augmented Reality, Virtual Reality, IAR, intraoperative surgery.

1. Introduction

Welcome to the age of new realities, virtual and augmented. The world is progressing quicker than it has ever previously and it is hard to keep over the day to day technology advancement. So, at any given time there are a plethora of new technologies to keep an eye on. We are surely spanning most of our time looking at the screens be it the laptop, television or mobile. They have become a big part of our lives and VR and AR are the two technologies that are changing the way we use screens. Creating new and assigning experiences both in a different way.

Augmented Reality superimposes user interface with computer-generated images into a real-world environment. Earlier AR systems were mostly focused on maintenance and repair. Nowadays AR has switched from laboratories to applications like advertising, defense, smart cities, driver assistance, etc. It enhances the viewer's perspicacity of reality. AR resolves the limitations endured by VR i.e. in augmented reality the virtual reality is wholly virtual and is detached from the physical world. It provides a bridge between the virtual and the real world.

AR was first noticeable in the launch of Google Glass in 2013. Following Pokémon Go was released by Niantic and Nintendo in July 2016. Later in June 2016, Tencent organized a virtual

torch relay like Olympics on smartphones. In 2017, Snapchat released World Lenses and Facial-up app by Mietu. These are some applications that attracted millions of users worldwide.

2. Virtual Reality

Rising yourself into an entirely unexpected world that is the virtual world it is the entire idea of the Virtual Reality technology. The use of computer technology to create simulated environment of which you become a part and can live that experience.

One of the earliest virtual reality systems was “Sensorama”, which was a immersive multi-sensory technology introduced by Morton Heilig in 1962. Sensorama simulated the experience of a spectator sitting on a motorbike riding through New York. It had screens, you could have smells, you can experience the wind blowing through your hair and much more. Edward Sutherland is an American computer researcher and web pioneer well known as the father of computer graphics.

“The Sword of Damocles” is considered as the fourth virtual reality head-mounted display which is the HMD system. It came into picture in 1968 by Ivan Sutherland, he started working towards what he termed the ultimate display. Virtual Reality uses head technology, where we move our head to look around what is happening[4].

Although virtual reality made a lot of promises back until late 80’s and 90’s it did not evolve much apart from gaming and arcade. Sega introduce the concept of VR headset in the market but it was actually Nintendo which released the infamous “Virtual Boy”. It was infamous because it was such a disaster. The display was only 244 pixels wide and there was only a single color used that is red. Moreover, it was uncomfortable and expensive for an average gamer to buy that headset. There was a lot of hype in the 90’s but the technology wasn’t right and ready to deliver that hype. Today we have the right technology where we can create high definition 3D content and create impulsive experience that are very close to real life. Although its mostly used for gaming, it was supposed to give us an experience of travel without travelling and experience a whole new world.

It is now being used in research and therapy too which is also used for people having acrophobia which is the phobia of height. Now a day’s virtual reality content is useful for PTSD and

cognitive therapy patient. Surgeons are using VR to practice highly technical surgeries before operating. Businesses are using them to give a virtual tour.

3. Augmented Reality

On one hand virtual reality takes us to whole other world, Augmented Reality add things to the existing world. It does not cut out the real world but rather it's an improvement of this present reality where we mix the real world with virtual objects and that creates beauty. That's why it is sometimes referred to a mixed reality. At the point when an individual's real environment is enhanced or expanded with the computer-created virtual pictures it is known as Augmented Reality.

"Magically", was one of the first company to introduce Augmented Reality to the world. It's secured around 15 million dollars investment in 2014 and released the most famous magically one. Recently, Google invested 2.3 billion dollars to this company. We can think of it as the Oculus Rift of AR technology. They have been making great advancement in content usage and the high definition wide-angle view. There is also an idea of "smart lenses". It is similar to a lens but helps in creating content and that too without using external devices but just your eye. With Augmented Reality you can interact with stuff right in front of you as if it was an object in the room. You cannot manipulate it and it completely creates a new environment around you.

The wisely famous "Pokémon Go", more than 380 million users were playing it at one single point i.e. one out of every 20 people on the earth.

If you have used "Snapchat" then you have already used AR. There are various face filters which are all AR based. What Snapchat does is that it presents a layer of reality over the reality in which we are already in[3]. AR users can connect with the virtual content in the real world and can differentiate between the two. If we look at the usage of the AR technology apart gaming, if implemented right business can use it correctly to work customers through the fixes more efficiently.

The best suited example for this one is the "Volkswagen Mota". It is an app which provides the real time augmented reality implementation of how to repair your car.

Other examples include the “Google Translate”, then the “Google Glass” and we have the most famous “Hololens” by Microsoft. It was Microsoft who first coined the term mixed reality[1].

Augmented reality is widely being used in various applications like medical, entertainment, military, navigation, security, maintenance, shopping, advertising, social networking, driver assistance systems, education, manufacturing and many more. The users have liked the technology worldwide and are very happy with the new upgrades going on the technology.

Imagine you are in your own cozy room and you can work through your emails and other works by using your bare hands just like Tony Stark in Iron Man 2. Alike Tony Stark, imagine yourself manipulating the 3D graphics which floats in the air with your hands. The day is not far away when this science fiction will become reality. And of course, it is becoming reality. I would like to portray some of the applications of augmented reality that really hit the ground and made people realize that augmented reality is the next step to virtual reality.

A. Pokémon Go

Pokémon Go is an augmented reality mobile game released on July 6, 2016. It was developed by Niantic and was a result of a joint effort of Niantic, The Pokémon Company and Nintendo[3].

The game uses augmented reality to display the small virtual creatures named as Pokémon. It has features to capture and train their Pokémon and have a battle with the other users. It uses GPS to locate other user and augmented reality to show the virtual creature. The Pokémon appears as it is in the player’s real world. It was one of the most used and most profitable apps in 2016. It has been downloaded more than 500 million times worldwide.

The game was praised a lot, not only by the critics and kids but also by the parents. The parents were overjoyed and stated that they were delighted to see their kids to move outside and make friends instead sticking to the video game inside a room. They were happy to see their kids active.

B. QQ-AR

Following the lead of Pokémon Go, China’s social media giant ‘Tencent’ launched ‘Pass the Olympic Torch’ as QQ- AR in August,2016[3]. QQ is a messenger app in China greatly influenced by the people there. QQ launched visually interactive geo-localized feature in the app.

The application depended on QQ big data, some portion of users who have more prominent social effect had the option to get fire and become torchbearers through brushing highlight. They could likewise light the torch through "QQ-AR scanning", after which the 3D QQ Penguin would light the torch. The users participated in the relay and earned points with which they could unlock the next city's AR animation. More than 100 million users participated in it in 26 days.

Chasing the succession to this, they created 'AR Red Envelopes', in which over 258 million users participated in 5 days. The feature was added in January 20, 2017. It enabled users to gather virtual red envelopes during Spring Festival. These two features highlight national exercises after their launch.

C. Anomaly

Anomaly was first published in 2012 in part by Brian Haberlin, which was the first ever application of AR technology to a printed document. Anomaly is impressive AR graphic novel which demonstrates the way AR is revolutionizing the printed documents with the digital [6]. It was a time when there existed pop-up books and cards. Now the era has come where people can virtually view the contents of the novel in the real world. You can simply point your tablet or smartphone at the pages in the book and watch the characters come to life in the real world. In 2012, there were 50 AR pages in the 370 pages of Anomaly and now they have increased it to 60 AR pages. The 3D interactive virtual pop-ups also include audio. It also contains touch features which enables the user to get a more detailed written information about the selected object. After this getting published, Marvel comics have also used AR in their Marvel Wow! titles.

D. Medical AR

AR solutions has also developed in context of minimal invasive surgery. It enables the client to connect with the virtual activities which assists the surgeons and the surgeons to be. It provides a great benefit of the visualization of the preoperative planning before going for the actual operation. It could assume a significant job in the accomplishment of the medical procedure. The 'Intraoperative functional imaging' assists the surgeon in the port placement. The port placement is a very crucial part of a surgery which defines the access point and environment of the surgery. This application can superimpose the virtual CT information onto the patient's life systems [7].

The 'EVI' system or the Easy Visualization In-situ system enables CT image visualization of a body part[7]. The 'PhobiAR' is a treatment application for the patients who have spider phobia. The setup enables users to view spiders crawling on their hand in the real world. They can also pick the spiders with their hands. Also, Japan uses AR applications to reduce Acrophobia (phobia of heights) [5].

E. Industrial AR Systems

IAR systems was analyzed by Navantia, one of the world's largest shipbuilders. IAR is used to support an industrial process[2]. Many companies are looking forward to the AR technologies to improve their efficiency of the processes in the shipyard. It provides powerful tools which supports the operators which help in the operations going on in the shipyard such as assembly task, maintenance application, material management, quality control and many more. IAR can help advance the applications like precision agriculture, transportation, industrial systems, home automation etc.

4. Literature Review

Haibin Ling [2017] reviewed the augmentations of academia with the Augmented Reality's breakthrough algorithms. He illustrated a few important algorithms like – 2D recognition & tracking, Visual simultaneous localization and mapping, Efficient computer vision algorithm and Deep learning for semantic understanding. He also mentioned the tech giants like Microsoft, Google, Facebook and Apple who are actively working on Augmented Reality technologies. He heeded the masterstroke trends by industry to up front the software and hardware development. Some of the trends included Virtual-Real fusion, 3D Environment perception, Semantic perception and Human-Computer interaction. He also stated the opportunities for start-ups and asserted the use of To-Business (2B) Model[3].

Paula Fraga-Lamas et al [2018] proposed Industrial Augmented Reality architecture that fuses Cloudlets and Fog Computing that reduces latency response and stimulate rendering tasks. The authors studied Industrial Augmented Reality system for the Industry 4.0 shipyard. They started with the basics of the Industrial Augmented Reality and proceeded to the latest Industrial Augmented Reality systems. They also compared the hardware and software solutions of the systems. They discussed the necessity of Cloudlets[2].

Nassir Navab et al [2007] has discussed the issues related AR solutions to the encroaching surgery. The authors mainly focused on four major issues -Monitoring and Recovery of surgical workflow, integrating preoperative & intraoperative anatomic & functional data, improving visual perception in a mixed environment and Developing new user interaction paradigms for taking full advantage of the virtual data. They analyzed various methods for synchronizing multiple surgeries into one kind of virtual average surgery. Finally, the outcome was that the in-situ visualization could build-up new peerless solutions[7].

Mark Billinghurst et al [2014] explored the physical, symbolic and metaphorical gestures for manipulation. They discussed the free-hand gestures on desktops with the paradigm of PhobiAR which is a treatment to spider phobia. Also, the author explained the 3D interaction for mobile AR. They conducted a study with 20 people to contemplate their gestures. The result was that the symbolic and metaphorical gestures play a larger role than the physical gestures for the direct manipulation[5].

Bruce H. Thomas et al [2009] have explored the wearable AR. The authors have explained what AR is about. The authors have explained what Augmented Reality is about. They have elaborated the benefits of wearable AR, also mentioning the HMD. The applications of the wearable AR are thoroughly discussed by the authors, also mentioning games like AR-Quake and Sky-Invaders[4].

Fridolin Wild [2016] elaborated the Augmented Reality Learning Experience Models. He justified the effectiveness of Augmented Reality onto a worker's learning and performance at job. The author paraphrased the ARLEM applications like XML workplace model, Computer-Aided designs for engineers, Smart glasses etc. He also explained the ARLEM scripts and concluded that ARLEM will be a boon to new jobs[6].

5. Conclusion and Future Scope

This paper was able to integrate the concept behind the computer-generated imagery. It explains the various applications related to Augmented Reality. The explanations of various applications like shipyard, PhobiAR, Pokemon Go, HMD, ARLEM, IAR etc. The future aspects of augmented reality will be explained and how AR is emerging day by day. The AR systems will

bring a massive change in the life of the daily working people if it is used widely among commoners. We would be able to advance a lot technically if more applications come in handy.

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