International Journal of Latest Research in Engineering and Management" (IJLREM)
ISSN: 2456-0766
www.ijlrem.org Volume 3 Issue 11 ǁ November 2019 ǁ PP 11-14

An Empirical Study on Augmented Reality

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Abstract: The technology that joins visual perception of real world environments to the things with virtual, computer-generated content. Augmented reality systems achieve this combination of the real and virtual using computers, displays, specialized devices for geospatial and graphic alignment, wired and wireless networks and software.Research in augmented reality draws on development from a number of other fields including virtual reality, wearable and ubiquitous computing, and human-computer interaction. Whereas virtual reality and virtual worlds immerse the subject in computer-simulated environment, augmented reality augments and annotates the natural environment with virtual components. Augmented reality brings virtual reality into the real world and in the process enhances what we can do in real-world scenarios.This history of augmented reality can be traced to work done at MIT in the late 1960s. In the ensuing decades, a growing cadre of researchers in university, medical, industrial and military settings built upon the early breakthroughs. Distinct applications of augmented reality followed, and today we are witnessing a dazzling array of change in across a wide range of industries and disciplines.
Keywords: Virtual Reality, Wireless network, Augments, Tracking, Digital image, Real time.

Introduction

What is Augmented Reality?

"The process of overlying digitally delivered images onto our real-world surroundings, giving a sense of an illusion or virtual reality."

The research literature defines augmented reality as systems that have the following three characteristics which are1.combine real and virtual content, 2.thses are interactive in real time 3.these are registered in 3-D. Augmented reality systems achieve this combination of the real and virtual using computers, displays, specialized devices for geospatial and graphic alignment, wired and wireless networks and software. Research in augmented reality draws on development from a number of other fields including virtual reality, wearable and ubiquitous computing, and human computer interaction. Augmented reality is related to virtual reality and virtual worlds in its use of virtual content however it does not fully immerse the user in a virtual environment. Whereas virtual reality and virtual worlds immerse the subject in a computer-simulated environment, augmented reality augments and annotates the natural environment with virtual components. Augmented reality brings virtual reality into the real world and, in the process, enhances what we can do in real-world scenarios. This technology will absolutely change the way we view the world. With augmented-reality displays, which will eventually look much like a normal pair of glasses, informative graphics will appear in your field of view, and audio will coincide with whatever you see. These improvements will be refreshed continually to reflect the movements of your head.

Figure: Components Needed to make an Augmented-Reality System Work.

There are mainly three components which needed to make an augmented-reality system work are as follows:

- Display.
- Tracking system.
- Mobile computing power.

Implementation on Augmented Reality

The technology behind augmented reality draws from a number of disciplines and exhibits a wide array of approaches to the problem of combining virtual and real-world objects and scenes. Display technology solutions range from head-mounted, hand-held, projected, and screen-based to what many consider the future of augmented reality – retinal displays. Augmented reality applications can be stationary and tethered (wired to local networks), mobile and wireless (using broadband wireless networks) or some mixture of the two. Few technologies have explored as many different approaches to their problem space as augmented reality.

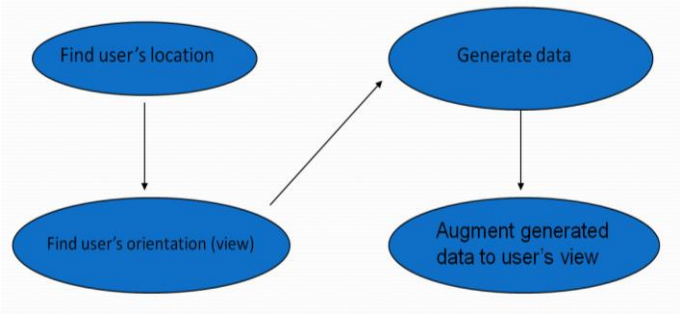

Figure: Concept for Augmented Reality

Using a mobile application, a mobile phone's camera identifies and interprets a marker, often a black and white barcode image. These software analyses that marker and build a virtual model spread on the mobile screen, tied to the position of the camera. The app works with the camera in that software to decode the angles and distance the mobile phone is away from the marker. Due to the number of calculations and prediction a phone must do to deliver the model over the marker, often only smart phones are capable of supporting augmented reality with any success.

Applications

With little fanfare, augmented reality systems have been used in a wide variety of fields over the past two decades. While many of the applications described here are purely research prototypes.

- Medical
- Military
- Industrial / Manufacturing
- Mobile
- Entertainment
- Education

1. Medical Applications

In real-world medical scenarios thers is presence of Augmented Reality applications. The capability to look within a body without cutting it open has long been a goal of medical technology research. Augmented reality systems are realizing this goal with displays that mix real-world views of patients with virtual internal views facilitated by real-time ultrasound, magnetic resonance imaging (MRI), computed tomography (CT) scan, and laparoscopic data.

2. Military Applications

The US military, in conjunction with major defense contractors and aerospace companies, has been researching and experimenting with augmented reality systems for the better part of two decades. Their stated goal is to improve situational awareness for pilots and soldiers and to facilitate enhanced communication with their peers and the chain of command. Heads-up displays (transparent displays of data mounted in the pilot's line of sight) have long been a reality for fighter jet pilots, and recent developments make use of advanced eye-tracking to allow pilots to acquire targets and fire upon them simply by looking at them.

3. Industrial and Manufacturing Applications

Many modern manufacturing systems have largely abandoned the "one size fits all" approach in favor of methodologies that allow highly customized, one-off versions of a product line as customer demands become increasing specialized. Workers must consult multiple versions of assembly guides, templates, parts lists and other related documents in order to fulfill customer orders. Problems of registration and tracking within busy, noisy factory environments remain however these stumbling blocks are sure to be overcome in the pursuit of the competitive advantages afforded by augmented reality and related technologies.

4. Mobile Applications

Mobile augmented reality combines augmented reality technology with mobile devices, including wearable computers, PDAs and mobile phones. Geospatial positioning and registration is accomplished with built-in digital compasses, GPS units, and, in the case of the iPhone, a technology known as locationservice. Location service uses a combination of wifi, cellular tower location, and GPS to determine the geospatial location of the iPhone user.

5. Entertainment Applications

The entertainment industry is a fertile ground for augmented reality applications. The promise of combining virtual imagery with real-world scenes, particularly for live-action entertainment categories such as sporting events and concerts, opens up a world of new possibilities.

6. Education Applications

Augmented reality has been associated with educational institutions since its beginnings. Much of the research and many of the breakthroughs have been accomplished by teams in colleges and universities. Augmented reality applications are beginning to find their way into elementary and secondary schools, made possible by inexpensive yet powerful hand-held devices and personal computers and widely available authoring systems like AR Toolkit.

Challenges on Augmented Reality

There are many challenges to the widespread, everyday acceptance and use of augmented reality applications. Alignment of virtual content with real-world environments is a complex and vexing challenge. For mobile augmented reality applications wireless networks are incompatible and often lack sufficient bandwidth for refined applications. Head-mounted displays, although improving constantly with advances in miniaturization of optical and display technology, can be uncomfortable and socially awkward.

Conclusion

Augmented reality is another step further into the digital age as we will soon see our environments change dynamically either through a Smartphone, glasses, car windshields and even windows in the near future to display enhanced content and media right in front of us. This has amazing applications that can very well allow us to live our lives more productively, more safely, and more informatively.

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