

# Importance of Augmented Reality in Today's World

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**Abstract:-** This work describes the more basic aspects present in Augmented Reality(AR). It also describes the fields in which it is mainly used, the important factors of the AR devices and the basic characteristics of Augmented Reality. By the implementation of augmented reality a revolution in computer interfaces has also been evolved and has completely changed the way we think of the computers. Instead of using the keyboard for typing and watching the television monitor augmented reality makes it more flexible and accessible to people in an easy way. The AR also provides a link to many computer networks it can also be used by doctors by simply viewing the superimposed Medical image. It can even be used by the construction engineers by making use of ordinary paper engineering drawings to communicate with their colleagues who are at different places. The goal of the augmented reality is to augment the objects in the physical world by enhancing it with a digital Information and communication capabilities rather than immersing them in to an artificially created virtual world.

**Keywords:** Augmented Reality(AR), Scientific Visualization, Virtual Reality.

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## I. INTRODUCTION

Augmented reality (AR) is a live direct or indirect view of a physical, real-world environment whose elements are "augmented" by computer-generated or extracted real-world sensory input such as sound, video, graphics or GPS data. Augmented reality enhances one's current perception of reality, whereas in contrast, virtual reality replaces the real world with a simulated one. Augmented Reality (AR) is a new technology that involves the overlay of computer graphics on the real world (Fig 1). One of the best overviews of the technology is [4], that defined the field, described many problems, and summarized the developments up to that point. That paper provides a starting point for anyone interested in researching or using Augmented Reality. AR is within a more general context termed Mixed Reality (MR) [20], which refers to a multi-axis spectrum of areas that cover Virtual Reality (VR), AR, telepresence, and other related technologies. The most innovative aspect of augmented reality is not the technology: it is the objective. Instead of replacing physical objects with a computer, we create systems that allow people to interact with the real world in natural ways and at the same time, benefit from enhanced capabilities from the computer. The future we envision is not a strange world in which we are immersed in "virtual reality". Instead, we see our familiar world, enhanced in numerous, often invisible ways. However, the development of a robust outdoor wireless AR system is a complex process that involves a large number different technologies and devices to assemble and tune. The goal of this paper is to investigate the current status of the outdoor wireless systems, in order to estimate the operational level and identify urgent topics for investigation. It focuses on approaches, technologies, devices and systems that can be used to provide mobile users with advanced information, which are in the form of text, video, sound and graphics.

## II. COMPONENTS OF AUGMENTED REALITY

### 1. Optical See-Through HMD

Optical See-Through AR uses a transparent Head Mounted Display to show the virtual environment directly over the real world (Fig 2 and 3). It works by placing optical combiners in front of the user's eyes. These combiners are partially transmissive, so that the user can look directly through them to see the real world. The combiners are also partially reflective, so that the user sees virtual images bounced off the combiners from head-mounted monitors. Recent Optical See-Through HMD's are being built for well-known companies like Sony and Olympus and have support for occlusion, varying accommodation (process of focusing the eyes on objects at a particular distance). There are very small prototypes that can be attached to conventional eyeglasses (Fig2).



Fig 1: Optical see through HMD

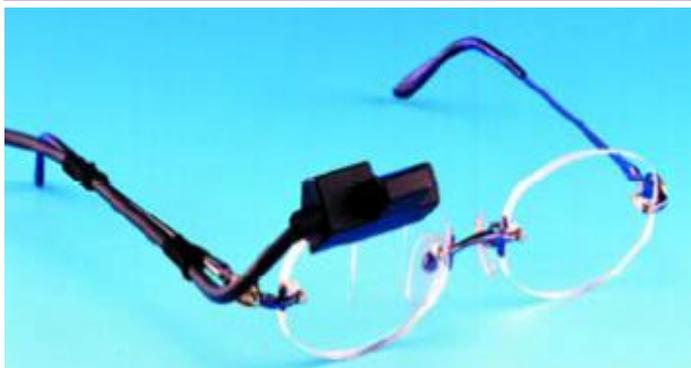


Fig 2: Eyeglass display with Holographic element.

## 2. Scene Generator

The scene generator is the device or software responsible for rendering the scene. Rendering is not currently one of the major problems in AR, because a few virtual objects need to be drawn, and they often do not necessarily have to be realistically rendered in order to serve the purposes of the application [4].

## 3. Tracking System

The tracking system is one of the most important problems on AR systems mostly because of the registration problem [3]. The objects in the real and virtual worlds must be properly aligned with respect to each other, or the illusion that the two worlds coexist will be compromised. For the industry, many applications demand accurate registration, especially on medical systems [4].

## 4. Display

The technology for AR is still in development and solutions depend on design decisions. Most of the Displays devices for AR are HMD (Head Mounted Display), but other solutions can be found. When combining the real and virtual world two basic choices are available: optical and video technology. Each of them has some tradeoffs depending on factors like resolution, flexibility, field-of-view, registration strategies, among others [4]. Display technology continues to be a limiting factor in the development of AR systems. There are still no see-through displays that have sufficient brightness, resolution, field of view, and contrast to seamlessly blend a wide range of real and virtual imagery. Furthermore, many technologies that begin to approach these goals are not yet sufficiently small, lightweight, and low-cost. Nevertheless, the past few years have seen a number of advances in see-through display technology, as we shall see next.

## 5. THE HEAD-MOUNTED DISPLAY

- The head-mounted display used in augmented reality systems will enable the user to view superimposed graphics and text created by the system.
- There are two basic head mount design concepts that are being researched for augmented reality systems and these are the video see-through systems and optical see-through systems.
- The video see-through systems block out the user's view of the outside environment and play the image real time through a camera mounted on the head gear.

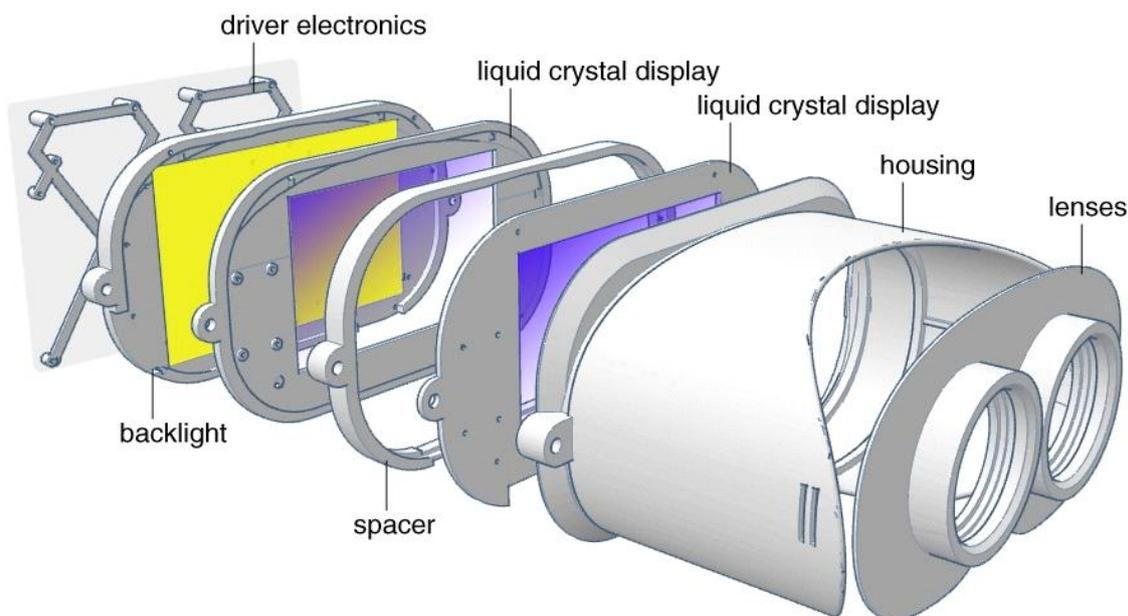


Fig 3: A schematic of NVIDIA's VR HMD

- Optical see-through systems, on the other hand, make use of technology that "paints" the images

directly onto the user's retina through rapid movement of the light source.

- With current VR head mounted displays (HMD) set to have the user focus on a display; NVIDIA's approach is to have the user to focus on the image.

## 6. TRACKING AND ORIENTATION

Another component of an augmented reality system is its tracking and orientation system. This system pinpoints the user's location in reference to his surroundings and additionally tracks the user's eye and head movements.

## 7. PORTABLE COMPUTER

Augmented reality systems will need highly mobile computers. As of now, available mobile computers that can be used for this new technology are still not sufficiently powerful to create the needed stereo 3-D graphics.

## III. REALITY-VIRTUALITY CONTINUUM

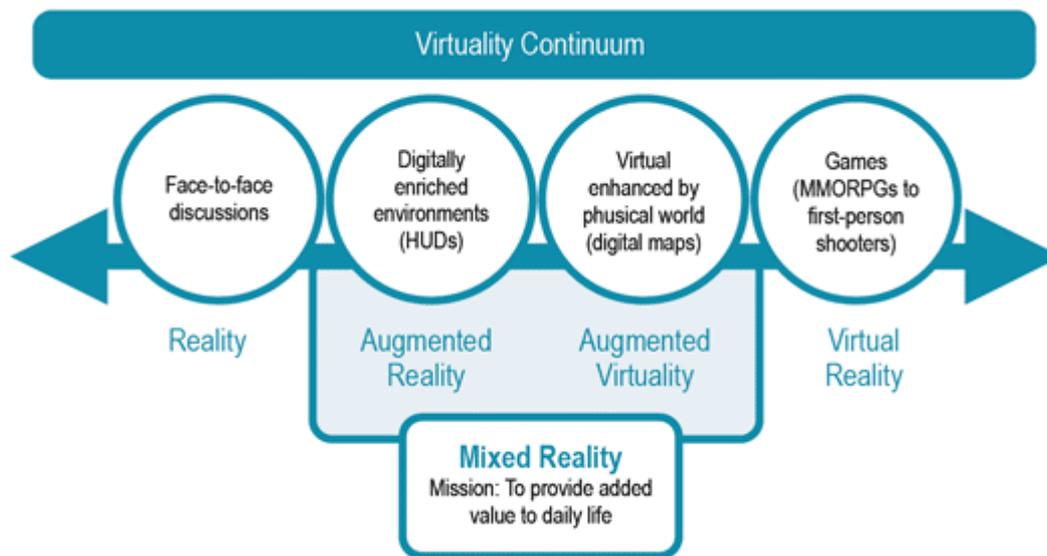


Fig 4: Reality-Virtuality Continuum

- The concept was first introduced by **PAUL MILGRAM**.
- The virtuality continuum is a continuous scale ranging between the completely virtual, virtuality, and the completely real, reality.
- The reality-virtuality continuum therefore encompasses all possible variations and compositions of real and virtual objects. It has been described as a concept in new media and computer science, but in fact it could be considered a matter of anthropology.
- The area between the two extremes, where both the real and the virtual are mixed, is called mixed reality. This in turn is said to consist of both augmented reality, where the virtual augments the "real" and augmented virtuality, where the real augments the "virtual".

## IV. APPLICATIONS

The number of applications utilizing augmented reality is increasing continuously and the outcomes are clear in many

domains e.g. health care, business, education and amusement.

- Education
- Medical
- Architecture
- Flight training
- Military
- Tourism and Sight-seeing
- Music
- Work place
- Video games

## V. CONCLUSIONS AND FUTURE WORK

Despite of the many recent advances in AR, much work remains to be done. Application developments can be helped by using the available Libraries. One of them is AR Toolkit [5], which provides computer vision techniques to calculate a camera's position and orientation relative to marked cards so that virtual 3D objects can be overlaid precisely on the

markers. Here are some areas requiring further research if AR is to become commonly deployed.

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