

International Journal of Advance Research in Computer Science and Management Studies

Research Article / Survey Paper / Case Study

Available online at: www.ijarcsms.com

Augmented Reality

Mayur Agrawal¹

MCA Department,

Vivekananda Education Society's Institute of Technology,
Chembur - 400074, Mumbai , India

Adwait Kulkarni²

MCA Department,

Vivekananda Education Society's Institute of Technology,
Chembur - 400074, Mumbai , India

Sneha Joshi³

MCA Department,

Vivekananda Education Society's Institute of Technology,
Chembur - 400074, Mumbai , India

Nishi Tiku⁴

MCA Department,

Vivekananda Education Society's Institute of Technology,
Chembur - 400074, Mumbai , India

Abstract: *This paper presents an overview of Augmented Reality (AR) and the main concepts of this technology. It describes how to use of AR, the main fields in which AR is being applied nowadays and the working of Augmented Reality. Some characteristics of Augmented Reality systems will be discussed and this paper will provide an overview of them. Future scope and applications are also discussed.*

Keywords: *Augmented Reality, Virtual Reality, Head mounted devices, browsers, smartphones, GPS - Global Positioning System, GPU - Graphics Processing Unit.*

I. INTRODUCTION

The massive technological advancements around the world have created significant challenging competition among companies where each of the companies tries to attract the customers using different techniques. One of the recent techniques is Augmented Reality (AR). The AR is a new technology which is capable of presenting possibilities that are difficult for other technologies to offer and meet. In this research paper we will give a brief description of what is Augmented Reality and how will it change the way we see the world

II. WHAT IS AUGMENTED REALITY ?

Augmented reality abbreviated as AR is a new technology that blurs the line between what's real and what is computer generated by enhancing what we see, smell, hear and feel. It is said to change the way we see the world around us. It basically adds a layer of graphics and other sensory enhancements on the natural world as it exists in real time. Researchers are pulling graphic out of the computer screen and integrating them into the real world pushing the barriers of photorealism. **Augmented reality is said to be a type of virtual reality.**

What does virtual reality mean?

As the name suggests virtual reality is a combination of both **virtual** and **reality**. In technical terms it can be defined as three-dimensional and computer generated environment which can be interacted with by a person .In simple terms it means "near reality".

The difference between Virtual Reality and Augmented Reality:

It is always said than AR is closely related to the concept of Virtual reality but there are certain key differences between the two which can be very well explained as follows:

VIRTUAL REALITY**75% VIRTUAL + 25% REAL = VIRTUAL REALITY**

This can be thought of as a container for example. If the container is virtual in which real objects are placed it leads to achieve virtual reality.

AUGMENTED REALITY**75% REAL+25%VIRTUAL=AUGMENTED REALITY**

This can be understood if we consider that container is the real world in which virtual objects have been placed, this leads us to achieve augmented reality.

A simple description of how augmented reality can be helpful:

Picture an augmented reality induced device which looks like a normal pair of glasses and in your field of vision will appear informatics graphics which are enhancements that are applied to the surrounding your present in and these enhancements can be viewed through these glasses. It also includes information about weather, GPS updates that can be clearly viewed right in front of the user's eye through the glasses worn.

Depiction what the user might experience is shown as follows:**III. WHAT ARE FEATURES THAT ARE A MUST IN AN AR APPLICATION ?**

- » **IMAGES:** The ability to allow a person to view three-dimensional images and the image appear life sized to the person.
- » **OBJECT RECOGNITION:** This allows you to look around your surroundings and scan anything and everything that comes under your sight.
- » **LOCATION:** Location based feature allows user to find location of service centers, dealers, stores etc near the current location of the user. Users just need to point and rotate around their surroundings to find real time information about their point of interests. The current location of the user is found out using the mobile phones GPS system and based on users' current location all the information is shown in list view. User can select a particular place and access all the detailed information about it like name, image gallery, address, mobile no, email id etc. User can also view that location on Google maps and find the route from his current location to the selected location.
- » **CHANGE IN PERCEPTION:** AR requires the person to be in real environment which means the person will move around in this environment. To achieve desired results there should be a seamless join between the person's head, eye, and hand movements depending on the device.
- » **ZERO LATENCY:** As the person explores the environment there should be no or minimum delay between the person's action and the system's response .the aim is for natural free-flowing experience.

IV. HOW 'AR' WORK ?

In order to integrate real and virtual world certain components are used by AR devices such as

- » Head mounted display
- » Tracking and orientation
- » Mobile Computing power

The aim is to incorporate these components in one device.

Head Mounted Display (HMD):

The graphics, text generated by the augmented reality devices is displayed on HMD. It works similar to a computer monitor.

It normally has a camera attached to the device which captures the images and graphics are superimposed on the captured image.

The making of a HMD specifically for AR is under process.

A close replica of how HMD might look is shown as follows:



Tracking and Orientation:

The most important task is to achieve the user's movements and track the eye ball movement to impose the graphics at the right time when the user is seeing at any given moment. Tracking accuracy can be increased using GPS signals, antenna, optical sensors, infrared Light emitting diodes (LED).

Mobile Computing Power:

For a wearable augmented reality system, there is still not enough computing power to create stereo 3-D graphics. So researchers are using whatever they can get out of laptops and personal computers, for now. Laptops are just now starting to be equipped with graphics processing units (GPUs).

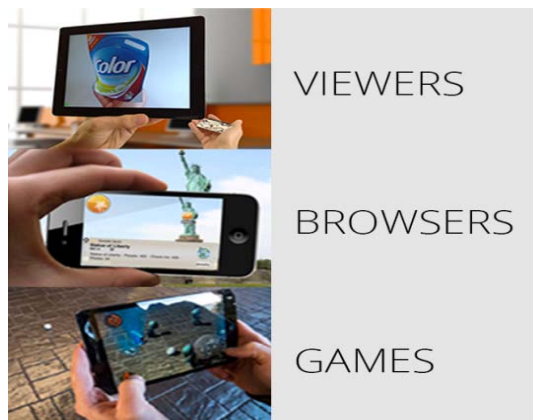
V. WHAT ARE THE DEVICES IN WHICH AR CAN BE USED ?

The various devices on which augmented reality can be used

- » **On smart phones and tablets**, Augmented Reality feels like a magic window. Hundreds of Augmented Reality apps are available on iPhone, iPad and Android.
- » **On PC and connected TV**, Augmented Reality works with a webcam, which can be quite cumbersome when you have to manipulate a tracker in front of your screen.
- » **On connected glasses and lenses.**

VI. HOW AUGMENTED REALITY CAN BE USED ?

To give an overview of the ways AR devices can be useful are shown as follows:



- » **VIEWERS:** augmented reality helps viewers to place life size 3D models in their environment.
- » **BROWSERS:** AR devices just require placing your device camera on the object you want to gain information about. As soon as the camera captures and reads the picture information a layer of information is displayed on the screen as shown above.
- » **GAMES:** AR creates immersive game experiences where user can have gaming experience in his or her own surrounding.
- » Example: Shooting games can be played in one's bedroom as shown above.
- » **OTHER:** Moreover it also provides location information, weather updates on your device. This can be shown as follows:



Fig. 4 Information provided using AR device.

VII. HOW IS AUGMENTED REALITY CURRENTLY USED ?

There are various applications which use AR and are being used by people on a large scale. Such applications can be explained as follows:

ALIVE

Alive app is one of the leading Augmented Reality applications that has empowered more than 200 brands and publications including the very popular **TOI** to enrich their print content with new & innovative Augmented Reality experiences.

It enables users to connect and engage with your print content by scanning, interacting and sharing their digital experiences which includes watching videos, buying products, viewing 3D animations, photo gallery and much more. Alive is available on all platforms viz. iOS, Android, Windows, Blackberry, Symbian & Java. With more than 1 million downloads, Alive is the one of the most accessed augmented reality application.



Fig. 5 Alive application

It provides features like:

- » Object recognition
- » Social Connect
- » Discover your location
- » QR Code recognition

GOOGLE SKY

Google sky is another very popular application being used which turns your Android-powered mobile phone into a window on the night sky. Figure out what you're looking at: Point your phone at the sky, and Sky Map will show the stars, planets, constellations, and more to help you identify the celestial objects in view.



Fig. 6 Google sky.

AREAL

This is an AR app which brings the power of visual search and augmented reality together in your hands. It is cloud based which means it has unlimited recognition capability. This application makes it easier to do the following:

- » Bring things to Life.
- » A one-touch access to virtual-real world.

» An augmented joy within your own reach.

A handy way to socialize with friends and family.



VIII. APPLICATIONS WHERE AR CAN CAUSE WONDERS ?

Augmented Reality can be of great contribution for the especially able. Voice base announcement of things which are location based is one very good example.

The current development in this is of an application called the vOICe for Android which adds a sonic augmented reality overlay to the live camera view in real-time, thereby giving even totally blind people live and detailed information about their visual environment that they would otherwise not perceive. It may also serve as an interactive mobile learning app for teaching visual concepts to blind children. The vOICe for Android is a universal translator for mapping images to sounds. This app can be incorporated with Google Glass which can capture the surrounding information and give a detailed description to the visually impaired with the help of speakers, headphones etc.

HOW WILL IT WORK?

Once started, the application will continuously grab sounds and snapshots from the camera. Each camera snapshot is sounded via a polyphonic left-to-right scan through the snapshot while associating height with pitch and brightness with loudness. For example, a bright rising line on a dark background sounds as a rising pitch sweep, and a small bright spot sounds as a short beep. This approach allows for sounding arbitrary images while largely preserving the image content as needed in sensory substitution for the blind.

The following gives an idea of how it will be helpful for the blind.



Fig. 8 Application for the blind people.

AUGMENTED LEARNING

When learning becomes a game, it is not a chore any more. AR encourages deeper and insightful learning by stimulating the natural curiosity of the learner.



Fig. 9 Life without AR and with AR

Following possibilities can take place in an augmented reality enhanced learning:

- » Digital Objects & Multimedia embedding (i.e., text, audio, graphics). One can overlay the educational environment with interactive multimedia objects.
- » YouTube and other Videos can be used to add your augmented reality describing the scenes with interesting graphics leading to interactive learning.
- » Role Based Learning: Assign learners responsible for a set of related information.

They do their research and share the knowledge using different means like videos, images through their AR application.

An example of how Augmented learning can take place is explained below:

Imagine if you are a Botany teacher, you visit an overseas horticulture wonder. You want to capture the details of ferns and firs in your phone. You want to share all images in your next course. Capture as many and collect data on each specimen. Now back home, use your images to create an augmentation application. Ask your students to download the app before they leave for the upcoming botanical garden field trip. Using the screen of their smart phones, your students can scan the garden. Any specimen you need them to know will be elaborated in the form of supporting information: history, morphology and characteristics and your audio narration.

IX. APPLICATIONS OF AR ?

MEDICAL:

Doctors could use Augmented Reality as a visualization and training aid for surgery. It may be possible to collect 3-D datasets of a patient in real time, using non-invasive sensors like Magnetic Resonance Imaging (MRI), Computed Tomography scans (CT), or ultrasound imaging. These datasets could then be rendered and combined in real time with a view of the real patient. In effect, this would give a doctor "X-ray vision" inside a patient. This would be very useful during minimally-invasive surgery, which reduces the trauma of an operation by using small incisions or no incisions at all. A problem with minimally-invasive techniques is that they reduce the doctor's ability to see inside the patient, making surgery more difficult. AR technology could provide an internal view without the need for larger incisions. AR might also be helpful for general medical visualization tasks in the surgical room. Surgeons can detect some features with the naked eye that they cannot see in MRI or CT scans, and vice-versa. AR would give surgeons access to both types of data simultaneously. This might also guide precision tasks, such as displaying where to drill a hole into the skull for brain surgery or where to perform a needle biopsy of a tiny tumor. The information from the non-invasive sensors would be directly displayed on the patient, showing exactly where to perform the operation.

ARCHITECTURE:

AR helps architects visualize their products in virtual world before bringing them to reality.

AR makes it easier to grasp by layman so architects can use it as tool of presentation and creation of projects. AR allows 2-D and 3-D rendering which help the architects to make any changes easily and quickly.

ART:

Art is a major field where AR is considered a stepping stone. AR is a boon to physically disabled individuals as they can use their potential to create something with just movement of their eyes.

COMMERCE:

Commerce industry works on their sales policies and that's where AR steps in. AR is very important tool in enhancing product reviews which allows customer to visualize the product virtually without actually buying it or handling it. AR help in reducing the work of the customer as he can just point a device to catalog and get full description about the product. AR is being used by certain well know American e-commerce websites to sell their products online.

CONSTRUCTION:

AR can help the engineers who are working on certain projects to have a virtual walk around of their design. AR is currently being used by many high ranking firms for designing and demonstration of their future products.

X. WHAT ARE THE BENEFITS OF AR ?

- » AR takes a user mobile experience to a whole new level by eliminating the mobile search, all you have to do is point the camera.
- » AR help in making visual alerts and reminder s for example visual reminders can be used to check whether a car driver is feeling fatigue or not and sounding alarm accordingly.
- » AR has proven to be an effective tool in gestural interfaces .In other word the AR is considered a multimodal i.e. it can respond to gestures, voice, taps or head movements.
- » AR equipped devices such as Google glasses weight around 1.28 ounces which allows user to have environment awareness with hands free.

XI. WHAT ARE THE DRAWBACKS OF AR ?

- » The hardware performance which is required by this technology is not easily available but coming future it will be feasible to general public.
- » AR might obscure the user by feeding him with unneeded data for e.g. while searching for a certain restaurant the AR might give you the nearby historic places triggered by your GPS.
- » AR is considered a vital threat to the privacy .As it can trigger by individuals images and photos which allows two strangers to have complete knowledge about each other.

XII. WHAT IS THE FUTURE OF AR ?

- » People may not want to rely on their cell phones, which have small screens on which to superimpose information. For that reason, wearable devices like Sixth Sense or augmented-reality capable contact lenses and glasses will provide users with more convenient, expansive views of the world around them. Screen real estate will no longer be an issue.
- » Imagine the possibilities you may learn things about the city you've lived in for years just by pointing your AR-enabled phone at a nearby park or building. If you work in construction, you can save on materials by using virtual markers to designate where a beam should go or which structural support to inspect, artists could produce virtual graffiti and doctors could overlay a digital image of a patient's X-rays onto a mannequin for added realism. In the near future, you may be able to play a real-time strategy game on your computer, or you can invite a friend over, put on your AR

glasses or AR lenses, and play on the table top in front of you. The future of augmented reality is clearly bright, even as it already has found its way into our cell phones and video game systems.

- » As the technology develops, you will see augmented reality mini apps more and more often in day to day life. Real time data will be streamed to us about everything we see, smell, hear and touch. We will be able to interact with this data in order to make more informed decisions. Heads up displays will show us detailed history on cars and homes for sale as we pass them on the streets lines.

XIII. CONCLUSION

Hence we can conclude that AR will be a great achievement in the field of technology which will change the way we see and interact with our surrounding.

References

1. **A survey on augmented reality** <http://www.cs.unc.edu/~azuma/ARpresence.pdf>
2. **Quora-Augmented Reality** www.quora.com/Augmented-Reality
3. **Alive AR app by TOI:** www.alivear.com
4. **Research paper on recent advances in AR:** <http://www.cc.gatech.edu/~blair/papers/ARsurveyCGA.pdf>