

# Virtual and Augmented Reality: An Overview

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## ABSTRACT

Augmented reality is an innovation which allows a user to the computer-simulated environment, regardless of whether that condition is a reproduction of this present reality or a conjured up universe. It is the way to encountering, feeling and contacting the past, present and what's to come. It is the medium of making our very own reality, our own customized reality. It could go from making a computer game to having a virtual walk around the universe, from strolling through our very own fantasy house to encountering a stroll on an outsider planet. With computer-generated reality, we can encounter the scariest and exhausting circumstances by playing safe and with a learning point of view. Not many individuals, be that as it may, truly realize what VR is, the thing that it is fundamental standards and its open issues are. In this paper a chronicled outline of computer generated reality is displayed, essential wording and classes of VR frameworks are recorded. A savvy investigation of normal VR frameworks is done and finds the difficulties of Virtual Reality. Augmented reality, in which virtual substance is reliably planned with grandstands of genuine scenes, is a creating zone of natural arrangement. With the climb of individual cellphones prepared for making charming augmented reality conditions, the tremendous ability of AR has begun to be examined. This paper audits the present forefront in expanded reality. It delineates work performed in different application territories and clears up the leaving issues experienced when building extended reality applications considering the ergonomic besides, specialized confinements of cell phones.

**KEYWORDS:** Virtual Reality, Augmented Reality, Robotics, Smart Technology

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## 1. INTRODUCTION

A blend of a genuine scene seen by a client and a virtual scene created by a PC that expands the scene with extra data. It includes virtual PC produced articles, sound and other sense improvements to a true situation progressively. AR is a live immediate or aberrant perspective on a physical, true condition whose components are increased by PC created tangible information sources. It is identified with a progressively broad idea called intervened reality, in which a perspective on the truth is adjusted by a PC. Therefore, the innovation capacities by improving one's present view of the real world.

On the other hand, computer generated reality replaces this present reality with a re-enacted one. Enlargement is routinely continuously and in semantic setting with ecological components, for example, sports scores on TV amid a match. With the assistance of cutting edge AR innovation (eg: including PC vision and item acknowledgment) the data about the encompassing genuine universe of the client winds up intelligent and carefully manipulable. Data about nature and its articles is overlaid on this present reality. This data can be virtual or genuine, eg seeing other genuine detected or measure data, for example, electromagnetic radio waves overlaid in precise arrangement with where they really are in space. Increased reality draws out the parts of the computerized world into an individual's apparent genuine world.

Enlarged reality (AR) is a live immediate or circuitous perspective on a physical, genuine condition whose components are increased (or enhanced) by PC created tangible info, for example, sound, video, designs or GPS information. It is identified with a progressively broad idea called interceded reality, in which a perspective on the truth is altered (perhaps even reduced as opposed to Augmented) by a computer generated environment.



Figure 1: Augmented Reality

Thus, the innovation capacities by upgrading one's present impression of the real world. By differentiation computer generated reality replaces this present reality with a

reproduced one. Growth is traditionally progressively and in semantic setting with natural components, for example, sports scores on TV amid a match. With the assistance of cutting edge AR innovation (for example including PC vision and article acknowledgment) the data about the encompassing genuine universe of the client ends up intuitive and carefully manipulable. Data about the earth and its articles is overlaid on this present reality. This data can be virtual or genuine, for example seeing other genuine detected or estimated data, for example, electromagnetic radio waves overlaid in precise arrangement with where they really are in space.

## 2. Virtual reality and augmented reality

Virtual reality (VR) is an artificial, computer-generated simulation or recreation of a real life environment or situation. It immerses the user by making them feel like they are experiencing the simulated reality firsthand, primarily by stimulating their vision and hearing. VR is typically achieved by wearing a headset like Facebook's Oculus equipped with the technology, and is used prominently in two different ways:

- To create and enhance an imaginary reality for gaming, entertainment, and play (Such as video and computer games, or 3D movies, head mounted display).
- To enhance training for real life environments by creating a simulation of reality where people can practice beforehand (Such as flight simulators for pilots).

Virtual reality is possible through a coding language known as VRML (Virtual Reality Modelling Language) which can be used to create a series of images, and specify what types of interactions are possible for them.

Augmented reality (AR) is a technology that layers computer-generated enhancements atop an existing reality in order to make it more meaningful through the ability to interact with it. AR is developed into apps and used on mobile devices to blend digital components into the real world in such a way that they enhance one another, but can also be told apart easily. AR technology is quickly coming into the mainstream. It is used to display score overlays on telecasted sports games and pop out 3D emails, photos or text messages on mobile devices. Leaders of the tech industry are also using AR to do amazing and revolutionary things with holograms and motion activated commands. Augmented reality and virtual reality are inverse reflections of one in another with what each technology seeks to accomplish and deliver for the user. Virtual reality offers a digital recreation of a real life setting, while augmented reality delivers virtual elements as an overlay to the real world.



Figure 2: Milgram's Reality-Virtuality Continuum

### 2.1 HOW ARE VIRTUAL REALITY AND AUGMENTED REALITY SIMILAR?

#### Technology:

Augmented and computer generated realities both influence a portion of similar kinds of innovation, and they each exist

to serve the client with an upgraded or advanced understanding.

#### Entertainment:

Both advancements empower encounters that are winding up more regularly expected and looked for after for excitement purposes. While in the past they appeared to be only a fantasy of a sci-fi creative energy, new counterfeit universes become animated under the client's control, and more profound layers of communication with this present reality are additionally feasible. Driving tech big shots are contributing and growing new adjustments, upgrades, and discharging an ever increasing number of items and applications that help these innovations for the undeniably sharp clients.

#### Science and Medicine:

Additionally, both virtual and enlarged substances have incredible potential in changing the scene of the restorative field by making things, for example, remote medical procedures a genuine plausibility. These innovations been as of now been utilized to treat and mend mental conditions, for example, Post Traumatic Stress Disorder (PTSD).

### 2.2 How do Augmented and Virtual Realities Differ? Purpose:

Augmented reality upgrades encounters by including virtual segments, for example, advanced pictures, illustrations, or sensations as another layer of communication with this present reality. Contrastingly, augmented reality makes its own world that is totally PC produced and driven.

#### Delivery Method:

Virtual Reality is normally conveyed to the client through a head-mounted, or hand-held controller. This gear associates individuals to the computer generated experience, and enables them to control and explore their activities in a situation intended to recreate the genuine world. Augmented the truth is being utilized increasingly more in cell phones, for example, workstations, advanced mobile phones, and tablets to change how this present reality and computerized pictures, illustrations converge and cooperate

## 3. APPLICATIONS

### 3.1. Education:

Augmented reality applications can supplement a standard educational modules. Content, illustrations, video and sound can be superimposed into an understudy's constant condition. Course readings, cheat sheets and other instructive perusing material can contain implanted "markers" that, when filtered by an AR gadget, produce valuable data to the understudy rendered in mixed media group. Understudies can partake intuitively with PC produced re-enactments of verifiable occasions, investigating and learning.

### 3.2. Military:

In battle, AR can fill in as an arranged correspondence framework that renders valuable front line information onto a fighter's goggles continuously. From the warrior's perspective, individuals and different items can be set apart with exceptional markers to caution of potential risks. Virtual maps and 360° view camera imaging can likewise be rendered to help an officer's route and combat zone point of view, and this can be transmitted to military pioneers at a remote war room.

### 3.3. Video Games:

Augmented reality permits computer game players to encounter computerized diversion play in a genuine situation. Organizations and stages like Niantic and Eyeshot rose as expanded reality gaming craters. In any case, however the well-known press overpowering calls Pokémon Go an increased reality diversion, most specialists in AR and specialists in amusement improvement concur that it is best portrayed as an area based amusement.

### 3.4. Visual art:

AR innovation has helped impaired people make visual workmanship by utilizing eye following to interpret a client's eye developments into illustrations on a screen. A thing, for example, a dedicatory coin can be structured with the goal that when examined by an AR-empowered gadget it shows extra items and layers of data that were not noticeable in a certifiable perspective on it. In 2013, L'Oréal utilized Crowd Optic innovation to make an enlarged reality at the seventh yearly Luminato Festival in Toronto, Canada.

### 3.5. Sports and entertainment:

AR has turned out to be regular in games broadcasting. Sports and entertainment settings are given transparent and overlay expansion through followed camera bolsters for upgraded seeing by the group of onlookers. Precedents incorporate the yellow "first down" line found in transmissions of American football match-ups demonstrating the line the hostile group must cross to get a first down.

AR is additionally utilized in relationship with football and other games to indicate business ads overlaid onto the perspective on the playing region.

## 4. ADVANTAGES AND DISADVANTAGES

### 4.1. Disadvantages

- A. Current execution levels (speed) on the present [2009] iPhone or comparative touch gadgets like the Google G1 will take a couple of ages to make Augmented Reality plausible as a general interface method open to the overall population.
- B. Content may dark or thin a client's interests or tastes. For instance, realizing where McDonald's or Starbucks is in Paris or Rome probably won't intrigue clients as much as "off the beaten track data" that you may search out in movement encounters.
- C. Privacy control will turn into a greater issue than with the present data immersion levels. Walking up to an outsider or a gathering of individuals may uncover status, considerations (Tweets), or other data that generally accompanies a presentation, may cause unjustifiable breaks of security.

### 4.2. Advantages

- A. Augmented Reality is set to upset the portable client experience as did motion and contact (multi-modular collaboration) in cell phones. This will rethink the versatile client experience for the cutting edge making mobile seek undetectable and diminish scan exertion for clients.
- B. Augmented Reality, as multi-modular cooperation (gestural interfaces) has a long history of ease of use research, investigation and experimentation and subsequently has a solid history as an interface procedure.

- C. Augmented Reality improves versatile ease of use by going about as the interface itself, requiring little communication (this Interaction Design method is known as Direct Manipulation). Envision turning on your telephone or squeezing a catch where the space, individuals, questions around you are "detected" by your cell phone giving you area put together or setting touchy data with respect to the fly.

## 5. RELATED WORKS

The Augmented Reality technology can work using one of the following three approaches:

### A. SLAM:

SLAM (Simultaneous Localization and Mapping) is the best method to render virtual pictures over true items. Hammer at the same time restricts sensors regarding their environment, while in the meantime mapping the structure of the environment.

SLAM is a way to deal with tackle complex AR recreation issues and isn't a particular calculation or programming. The SLAM framework is, truth be told, a lot of calculations went for taking care of synchronous restriction and mapping issue. This should be possible in numerous ways and now every expanded reality advancement pack has it's upon to giving SLAM usefulness.

### B. Recognition based:

Recognition (or marker) is the best method to render virtual pictures over genuine items. Slam at the same time confines sensors concerning their environment, while in the meantime mapping the structure of the environment. SLAM is a way to deal with take care of complex AR reenactment issues and isn't a particular calculation or programming. The SLAM framework is, truth be told, a lot of calculations went for tackling concurrent limitation and mapping issue. This should be possible in different ways and now every enlarged reality improvement pack has it's upon to giving SLAM usefulness.

### C. Location Based:

As opposed to recognition based, area put together AR depends with respect to a GPS, advanced compass, speed meter, or accelerometer to give information about the area and the augmented reality representations are initiated dependent on these data sources. It is otherwise called marker less augmented reality. The area location includes in cell phones make it simple to use this kind of augmented reality innovation, making it very famous. Some basic employments of area based AR incorporate mapping bearings, finding close-by administrations, and other location centric mobile applications

### 5.1. Ways to Support Augmented Reality Technology: How AR Works on Different Devices?

#### Mobile Phones:

In case of **mobile devices** like smartphones and tablets, augmented reality technology can be used either through location services or camera or a combination of both. The viewer can see the input from the camera being modified on the screen. There are many location-based apps available for Android and iOS platform.

#### PC and Smart TVs:

**PC and connected TV players** support Augmented Reality by relaying the virtual objects over the input from a webcam.



Since it a hectic process to manipulate a tracker in front of your screen there aren't many applications of AR on PCs or smart TVs.

### Smart Glasses:

**Head-mounted displays, glasses, and lenses** also support the Augmented Reality technology by making it an integral part of your entire field of view. This gives a more life-like AR experience giving a much broader scope of applications.

For instance, there is an AR helmet that can give you life-like augmented reality experience while driving. This means you can get information about directions, speed, etc. without the need to look at the speedometer or mobile phone.

With the dispatch of AR Kit by Apple and AR Core by Google in 2017 (this year) the confusions engaged with structure enlarged reality applications have fundamentally decreased. In the meantime, the conceivable number of uses of AR and the client base has expanded since Android and Apple consolidated, spread practically all the cell phone clients on the planet. Since the potential market measure and backend innovation has advanced, existing organizations, just as new companies both, have abundant open doors here. It relies upon you that whether you influence its first or let your rivals take an advantage.



Figure 3: Applications of AR

### 6. limitations

- AR still has some challenges to overcome. eg: GPS is only accurate to within 30 feet and doesn't work as well indoors
- Improved image recognition technology is a must for more fluid AR experience.
- Data should be rendered across the wearer's full scope of vision, not partially. The technology should also be equipped with a better understanding of natural body movements, ensuring that the displays get lighter and thinner. Internet connectivity is still a problem since there are so many places where no connection is available.
- Battery life of such a device, which should be extended to allow users make the most from the technology in daily use.
- A serious concern about the technology is related to the issue of privacy. Image-recognition s/w together with AR will allow users to access information about strangers imported from their online profiles.

Finally, At long last, there's the contention of data over-burden which is regularly connected to innovation all in all.

Numerous individuals contend that we live in an always exchanged on society and such all day, every day innovation on interest will fundamentally change the manner in which we see and consider reality. They frequently refer to the threat of investing an excessive amount of energy in the virtual world and passing up minutes that are going on in reality

### 7. challenges

#### 7.1. Technological limitations

Although there is much progress in the basic enabling technologies, they still primarily prevent the deployment of many AR applications. Displays, trackers, and AR systems in general need to become more accurate, lighter, cheaper, and less power consuming. Since the user must wear the PC, sensors, display, batteries, and everything else required, the end result is a heavy backpack. Laptops today have only one CPU, limiting the amount of visual and hybrid tracking that we can do.

#### 7.2. User interface limitation

We need a better understanding of how to display data to a user and how the user should interact with the data. AR introduces many high-level tasks, such as the need to identify what information should be provided, what's the appropriate representation for that data, and how the user should make queries and reports. Recent work suggests that the creation and presentation of narrative performances and structures may lead to more realistic and richer AR experience.

#### 7.3. Social acceptance

The final challenge is social acceptance. Given a system with ideal hardware and an intuitive interface, how AR can become an accepted part of a user's everyday life, just like a mobile phone or a personal digital assistant. Through films and television, many people are familiar with images of simulated AR. However, persuading a user to wear a system means addressing a number of issues. These range from fashion to privacy concerns. To date, little attention has been placed on these fundamental issues. However, these must be addressed before AR becomes widely accepted.

### 8. 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.

Perhaps later on, we will see our surroundings become expanded to show data dependent on our own advantages through inherent RFID labels and increases being executed through holographic projections encompassing the situations without a utilization of an empowering innovation. It is unimaginable to never again wonder where to eat, where to go, or what to do; our condition will encourage our communications consistently. We will never again have the capacity to recognize what is genuine and what is virtual, our reality will turn into an assembly of computerized and physical media.

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