

Augmented Reality: A new dimension in an immersive real world experience

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Abstract— Although ‘Augmented Reality’ was theorized many decades ago, its actual potential is far from being realized and harnessed. This technology has the promise to be a game changer and revolutionize the existing primitive technologies. This paper analyses the current developments in Augmented Reality and its applications in the real world. Its uses in healthcare are scrutinized. This paper also attempts to comprehend the mass perception of the people towards the aforementioned technology via a survey based on an appropriately formulated questionnaire. To conclude, the potential future of Augmented Reality is discussed.

Index Terms— Augmented Reality, Marker-based, Marker-less, Applications, Uses, Gaming, Pokémon Go, Healthcare, and Medicine..

1 INTRODUCTION

AUGMENTED reality (AR) can be defined as a direct/indirect view of a physical and real-world surroundings whose components are augmented i.e. supplemented via computer-generated inputs to various sensors such as audio, images, video, graphics or Global Positioning System (GPS) data.^{[1][3]}

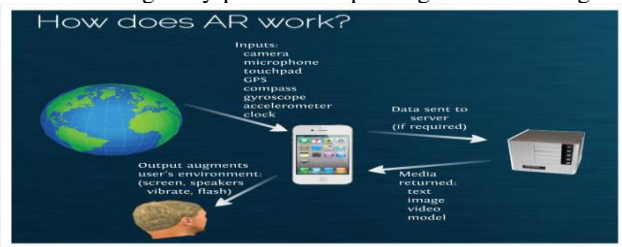
It is also the combination of pseudo (digital) information with actual video or the user's surroundings in real time. AR takes an existing picture and adds new content in it. The first commercial use of this technology is the addition of stats, graphs, and data in televised sport games.^{[2][3]}

The origin of augmented reality can be traced back to 1990 and research done by Professor Tom Caudell for a neural systems project at Boeing. The emphasis was to find new ways and means to assist the company's engineering process by involving the use of virtual reality.^[2]

Augmented reality can be experienced by using various Hardware components like: processor, display, input devices and sensors. New mobiles and computing devices like Smartphone's, tablet computers, etc. have these elements which include a camera and MEMS (Micro electromechanical systems) sensors such as accelerometer, GPS, gyroscope, and solid state compass, making them suitable AR platforms.^[3]

2 WORKING

Augmented reality is technology that combines virtual reality with the real world. The current realm of augmented reality deals with live video images which are digitally enhanced with computer generated graphics. For example, a user might wear translucent goggles or view the screen of a camera equipped mobile device where they can see the real world as well as strategically placed computer generated images. [4]



AR technology can be generally being split into two broad

categories: Marker-based and Markerless.^[5]

2.1 Marker-based

It makes use of physical- real world- symbols as a reference point for other digital graphics to be added. E.g.: a 2D printed marker is kept in front of a webcam. The computer then understands the symbol to add an on-screen graphic making it look as if it were directly on top of the marker in the actual world.^[6]

2.2 Marker-less

It makes use of the ‘mobile augmented reality’, whereby the technology is used with devices such as Smartphone's and tablets. It uses a combination of the sensors an electronic device such as accelerometer, compass and location data (GPS) to calculate the position in the real world, its orientation, its heading and its axis.^[6]

3 APPLICATIONS AND USES

AR has many real world applications in various domains such as:^{[7][8]}

- Construction and Architecture
- Medical
- Military
- Navigation
- Sports and entertainment
- Task support
- Television
- Tourism and sightseeing
- Video games

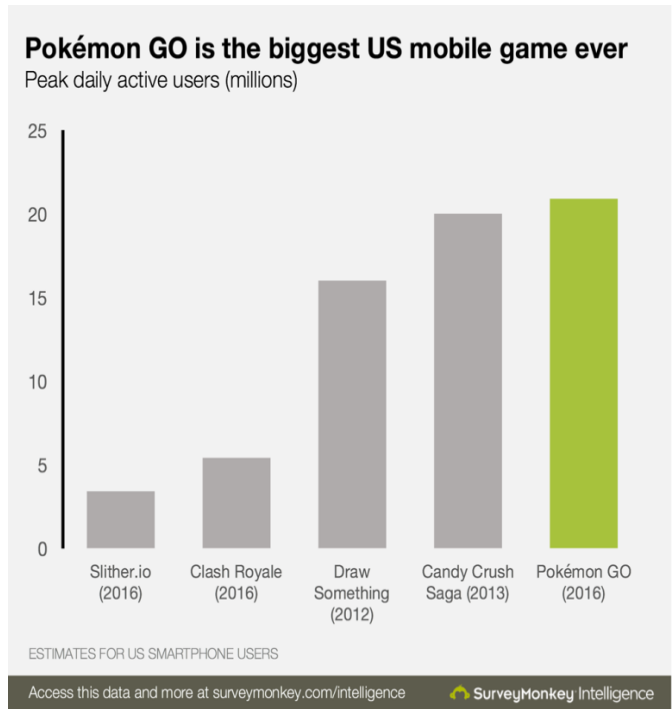
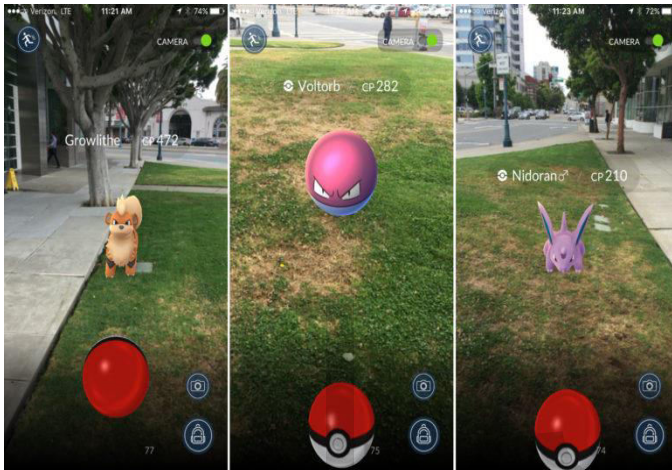
3.1 Gaming

The technology of Augmented Reality and Virtual Reality is used in games to warp players' perception of reality by a combination of storylines, images, music, graphics, and the latest hardware. In 2015, Virtual Reality devices from the likes of Oculus, Microsoft, and Sony, have pioneered in immersive experiences. These new devices, then, rely on content creators to use the capabilities of headsets and motion controls to the maximum. This growing device-content combination has resulted in some standout experiences. Some of the top 5 AR/ VR games show the extreme diversity of experiences that

can be achieved with combined game design and AR/ VR systems. The following games have used AR to enhance the user experience:

- Ingress
- Pokémon Go
- Drakerz-Confrontation
- Zombies Run!
- Endgame

E.g. Pokémon Go: Pokémon Go is an augmented reality and location based game developed by Niantic Labs. It is for android and iOS devices. It was released in July 2016 with the use of augmented reality; the creators were able to give an immersive experience to their user which is the main reason for the success of the game.^{[9][10]}



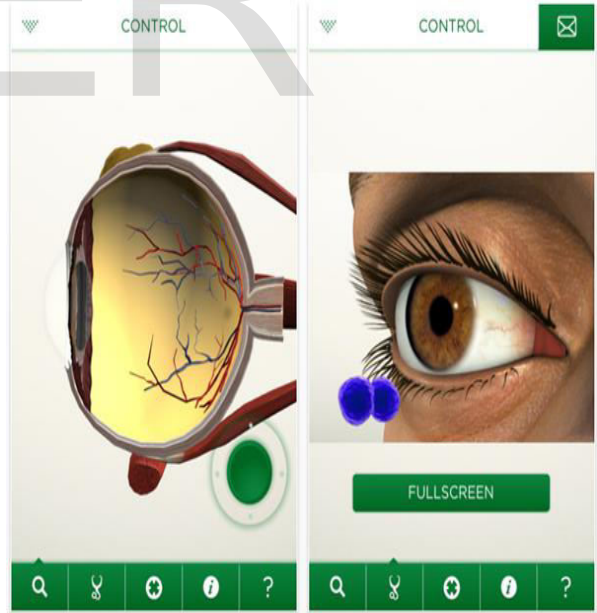
3.2 Healthcare and medicine

Augmented is different from virtual reality (VR) since the lat-

ter creates a 3D world completely detaching the user from reality. There are 2 ways in which AR is unique: users do not lose touch with reality and it puts information into eyesight as fast as possible. These distinctive features enable AR to become a driving force in the future of medicine.^[11]

1) Augmented reality can save lives through showing defibrillators nearby: AED4EU an application, developed by Lucien Engelen. Its users can add places where automated external defibrillators or AEDs are located and this database can be accessed through this new application. Also, the Layar browser enables you to project the exact location of the nearest AEDs on the screen of your phone and it would take a minute to find them and help those in need. Thus augmented reality brings crucial pieces of information to those in need or danger^[12]

2) Patients can describe their symptoms better through augmented reality: Patients face problems when they are told to describe their illness symptoms to their doctors. In few cases, people find themselves over stating a medical situation or on the other hand, belittle the problem. In ophthalmology, augmented reality might help for education of patients. Eye Decide is a medical app that makes use of the camera display for simulation of the impact of few conditions on a people’s vision. Using this, doctors can show simulation of the vision of a patient suffering from a disorder. The app can demonstrate the impact of Cataract and help patients understand their symptoms and their actual medical state.^{[12][13]}

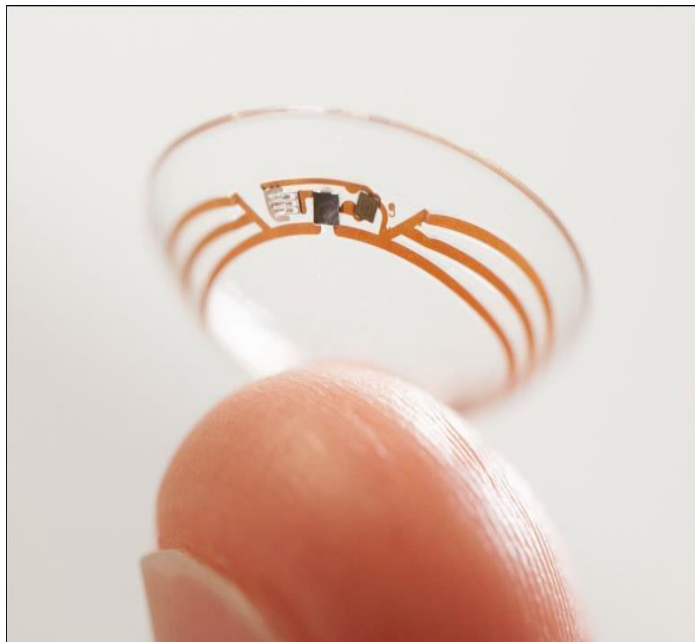


3) Pharmaceutical companies can provide more accurate drug information: If you get curious and interested in discovering how a particular pills and tablet works, it is boring and undecipherable to read the drug description. Augmented reality can help to change it. With the help of AR, patients could see how the drug works in 3D before their eyes rather than just reading the long descriptions on the label. Pharmacists could monitor their experiments with AR equipment^[12]



4) Augmented reality can assist surgeons in the OR: Doctors and even patients know of the fact that during surgery, precision is the priority. Now, AR can assist surgeons and enable them to become more efficient at surgeries. Whether it's a minimally invasive procedure or location of a tumor in liver, AR healthcare apps can help save lives and treat patients with ease. ^[12]

5) Google's digital contact lens can transform how we look at the world: Digital contact lenses and retinal implants have great potential in changing healthcare. Retinal implants might be able give vision back to those who lost it. Digital contact lenses could change how we look at the world while also revolutionizing diabetes care. Google aims to produce digital, multi-sensor contact lens which will be able to measure blood sugar levels. ^{[12][13]}



4 SURVEY

Augmented Reality (AR)

Augmented reality (AR) is a live direct or indirect view of a physical, real-world environment whose elements are augmented (or supplemented) by computer-generated sensory input such as sound, video, graphics or GPS data.

* Required

Are you aware of Augmented Reality? *

- Yes
- No

Is Virtual Reality same as Augmented Reality? *

- Yes
- No
- Not Sure

Have you used any augmented reality apps/devices? (Ex: Pokémon GO) *

- Yes
- No

How was your experience after using the AR apps/devices? *

- Good
- Average
- Poor
- Did not use them

Did you have a better, immersive and interactive experience (with videos, games, etc.) using AR tech as compared to the primitive technologies? *

- Yes
- No
- Did not use them

Do you think Augmented Reality will replace the existing primitive technologies? *

- Yes
- No
- Can't say

Will you ever use AR technology in the future? *

- Yes
- No

What will you use AR most extensively for? *

- Watching videos
- Playing games
- Interacting with people
- Others

Will you recommend using AR tech to others?

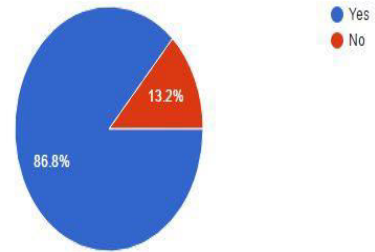
- Yes
- No
- Maybe

SUBMIT

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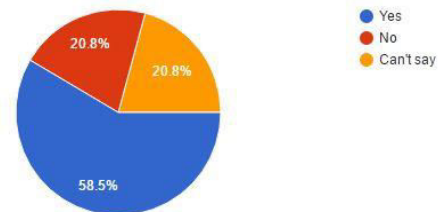
Have you used any augmented reality apps/devices? (Ex: Pokémon GO)

(53 responses)

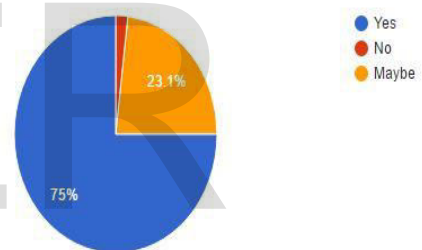


Do you think Augmented Reality will replace the existing primitive technologies?

(53 responses)

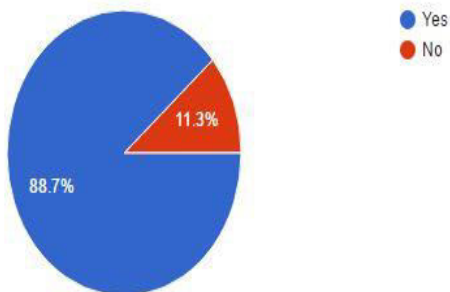


Will you recommend using AR tech to others? (52 responses)

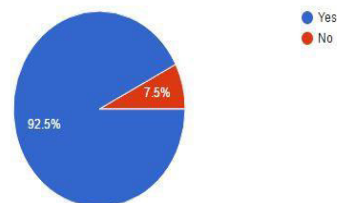


5 ANALYSIS OF SURVEY

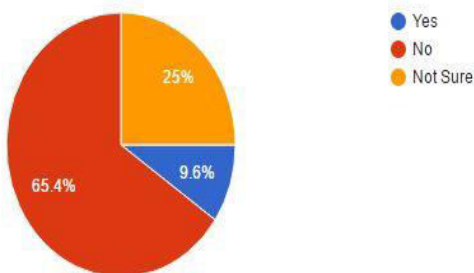
Are you aware of Augmented Reality? (53 responses)



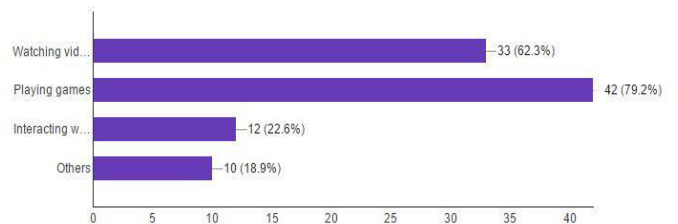
Will you ever use AR technology in the future? (53 responses)



Is Virtual Reality same as Augmented Reality? (52 responses)



What will you use AR most extensively for? (53 responses)



6 CONCLUSION

- With the data obtained from the survey, 88% of the people are aware of Augmented Reality. We can infer that a few people are still in the dark about this technology.
- Also 86% of the respondents have used one or more AR apps/ devices. 81% of those people had a better experience using AR as compared to the primitive technologies
- 58.5% of the respondents thought that AR would replace the existing primitive technologies and 20.8% of the people were against this opinion. 20.8% of the people abstained from agreeing/ disagreeing with the opinion.
- 75% people would surely recommend AR to others, while 23.1% would maybe recommend them.
- 92.5% of the respondents agreed to use AR tech some-time in the future, while 7.5% declined to the same.
- 79.2% of the respondents want to use AR for Playing games, 62.3% for watching videos, and 22.6% for interacting with people and 18.9% for other purposes.
- Thus we can conclude that even though Augmented Reality has not been currently used so widely, it will be used a lot in the future. However, it has a long way to go before it can disrupt and replace the current existing primitive technologies.

FUTURE ENHANCEMENT

- Augmented Reality has a wide future with a lot of progressive research continuing in the field. People could extensively use applications based on Augmented Reality for Newspapers, Books and Magazines.^{[14][15]}
- Snap chat has incorporated a Facial sticker feature that also uses a marker less Augmented Reality. This could give rise to the use of AR extensively in social media and similar applications.^[16]
- Google sky map, Blipparetc, etc. are several AR based apps that are of great use in bringing the physical world to life through smart phones and wearable's.^[17]
- In future we will see applications that are going to be Mark less (not needing image or any reference) that would be capable of performing tasks like real time weather forecast and enquiry, product descriptions, etc. Companies like Magic leap and Microsoft are developing 'mounted on human vision' based AR experiences.^[18]
- The future of augmented reality is beyond the realms of the human mind. This technology can achieve everything we have ever thought.^[15]
- The applications are unrivalled -effortless lifestyle, home-automation, filling in the gap between the normal and differently abled as many interfaces allow vision impaired users or handicapped users to operate it seamlessly.^[19]
- Technically the devices that we use with our hands and eyes could soon be using the principles of au-

mented reality to enable us to control them and perform operations just by brain waves or gestures.^[19]

- The human mind cannot fathom the intensity of its power. It's going to revolutionize the way we perceive technology as whole. It's the NEXT BIG THING!

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