

Augmented Reality: Current And Future

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Abstract- *The gigantic innovative progressions around the globe have made critical testing rivalry among organizations where every one of the organizations tries to pull in the clients utilizing distinctive procedures. One of the current procedures is Augmented Reality (AR). The AR is another innovation which is fit for introducing conceivable outcomes that are troublesome for different advances to offer and meet. These days, various expanded reality applications have been utilized in the business of various types and scattered everywhere throughout the world. AR will truly modify the way people see the world. The AR is yet in its underlying periods of innovative work at various schools and cutting-edge establishments. All through the most recent years, AR applications wound up transportable and for the most part accessible on different gadgets. Additionally, AR starts to possess its place in our varying media and to be utilized as a part of different fields throughout our life in unmistakable and energizing courses, for example, news, brandishes and is utilized as a part of numerous areas throughout our life, for example, electronic trade, advancement, plan, and business. Also, AR is utilized to encourage the learning while it empowers understudies to get to area particular data given through different sources. Such development and spread of AR applications pushes associations to contend each other, and each one of them applies its best to pick up the clients. This paper gives an extensive investigation of AR including its history, engineering, applications, current difficulties and future patterns.*

Keywords- Augmented Reality, Augmented Reality Browser, Mobile Augmented Reality, Virtual Reality.

I. INTRODUCTION

The innovative advances directly affect our life and on our behavioural way. The Augmented reality moves from the modern specialties to mass innovation [1]. It can be characterized as a new type of training, through which this present reality is enhanced through PC produced content that is associated with specific places and additionally occasions. As it were, AR allows the advanced substance to be easily superimposed and intermixed into our bits of knowledge and origination of the genuine world [2]. Expanded reality can be depicted as one of the advances that can build up a "people to

come, reality based interface" [3]. Additionally, it is recognized by advancement from simply being in test revolves far and wide to being utilized as a part of various fields and purchaser markets. These days with the development and dispersion of the savvy telephones and AR programs, we start to acknowledge this unique also, energizing kind of human-PC correspondence [3]. Despite the way that AR has increased substantially more research intrigue and consideration as of late, different implications are connected to the term AR by specialists. Additionally, AR could be created through utilizing and including unique creative advances (for example, body-borne PCs, cell phones, and immersive advances) [4]. Amid the most recent years, the AR applications have turned out to be transportable and comprehensively available on versatile telephones. Likewise, the AR has turned out to be one of our varying media (for example, news, methods for amusement and sports). What's more, it is being utilized as of late in numerous fields, for example, electronic trade, tourism and advancement. Additionally, it has swung to be an extremely noteworthy some portion of the Virtual Reality (VR) space. The AR appreciates clear points of interest in contrast with the conventional VR. One of the key points of interest picked up by AR is having a superior sense and connection of reality while it lays accentuation on the natural incorporation of virtual condition what's more, this present reality [1]. In this article we exhibit a study of the cutting edge in AR. Our point is to give a superior comprehension of the present and future application zones in this developing field. The rest of this paper is sorted out as takes after: Area 2 displays an outline of AR, Section 3 audits AR all through history, Section 4 portrays the design of AR framework, Section 5 talks about distinctive uses of AR, Section 6 compresses the current difficulties of AR, Section 7 talks about what's to come patterns of AR, lastly Section 8 closes the paper.

II. AUGMENTED REALITY: AN OVERVIEW

Expanded reality (AR) can be characterized as ready to bargain with the new data promptly immediate or roundabout along these lines impact the physical true condition has been upgraded/increased were by including virtual PC produced data to it [5,6]. Likewise, the AR is characterized by Azuma in 1997 [7]. He demonstrates that the

AR isn't just limited to the specialized equipment though it brings the genuine and virtual things together in a genuine situation. Moreover, it records the genuine and virtual protests together and after that runs mutually in continuous in three measurements. Milgram and Kishino [2] characterized the continuum of reality-virtuality where AR is viewed as a segment of the general branch of knowledge of blended reality. Both virtual conditions also, enlarged virtuality where the genuine things are sub-joined to the virtual ones can substitute the nearby condition by a virtual one. In actuality, the nearby virtuality is submitter by the enlarged reality. As appeared in Figure 1. The objective of the AR is to make the life of the client simpler through giving the virtual data to his adjoining condition and also to any roundabout perspective of the true condition like the live-video stream. Another objective of AR is to form the client's understanding into and interchanges with this present reality. The virtual reality or then again, the virtual condition as named by Milgram locks in clients absolutely in a fake world without seeing the genuine one. Then again, the enlarged reality helps the feeling of reality through laying virtual things over the genuine world continuously. AR not just includes things in genuine word yet additionally speaks to helpful computerized data in genuine world [5,6].

III. AUGMENTED REALITY THROUGHOUT HISTORY

The term enlarged reality shows up without precedent for 1950s

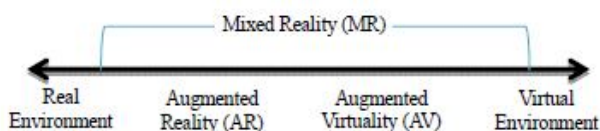


Figure 1. Reality-virtuality consecutive

when Morton Heilig, a film cameraman, trusted that silver screen as a workmanship ought to be fit for drawing the watcher into the on-screen movement. In 1962, Heilig built up a model of his thought, that he named in 1955 as "The Cinema of the Future", known as Sen-sorama, which exist before computerized figuring [5]. At that point, Ivan Sutherland formulated the head mounted in 1966 [2,5]. While in 1968, he built up a working model of the main AR framework [2]. After that Myron Krueger in 1975 set up a counterfeit reality lab called video put. It is a territory which empowers clients to effortlessly manage the virtual components out of the blue [5,6]. Toward the start of 1990s, AR turned into a field of study. In 1997, Ronald Azuma directed the principal overview in AR though he presented a comprehensively acknowledged

meaning of AR. He characterized it as gathering genuine and virtual environment together while them two is being recorded in 3D and intelligent continuously [5,7]. In 2000, Bruce Thomas imagined the primary portable AR amusement and dis-played it amid the International Symposium on Wear-capable Computers [5,6]. In 2007 new therapeutic applications were created. From that point forward, more AR applications are composed especially with portable applications e.g. Wikitude AR Travel Guide was made in 2008 [5]. In 2008, Gartner Inc. expected that AR would be among the initial 10 troublemaking advances in the period from 2008 to 2012 [2]. What's more, plainly the quantity of AR open applications has been increased all of a sudden and expanded to incorporate the area based pursuit applications as well as person to person communication, recreations, informational, way of life and individual social insurance applications [7]. Figure 2 demonstrates the advancement of increased reality all through the history.

III. ARCHITECTURE OF THE AUGMENTED REALITY SYSTEM

The four tasks carried out by the AR system are: scene capture; scene identification for choosing the accurate in- formation for boosting it; scene processing and visualization of the augmented scene [8,9]. These tasks are de- scribed in details as follows:

1. Scene Capture

Generally, the devices used in scene capture are physical components which recognize the reality which should be boosted. There are two types of scene capture devices:

Video-through devices: Such devices capture the reality in a different way than the other devices used for visualizing the augmented reality (for instance, video cameras, and smart phones) [9].

See-through devices: Such devices capture reality and give a picture of it with the augmented information (for instance, head mounted displays) [9].

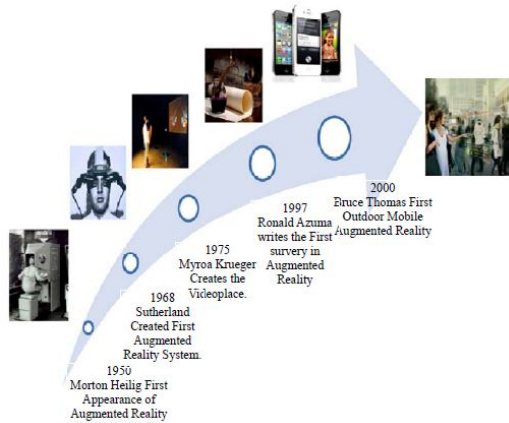


Figure 2. Augmented reality throughout history.

2. Scene Identification Techniques.

Scene identification classifies the scenarios. Also, it is considered one of the main actions taken in reality augmentation. There are two basic types of scene identification techniques which are discussed as follows:

- **Marker-based:** The marker-based approach uses the markers which are in the form of visual tags contained within the real scene which is perceived by the AR system [9]. **Figure 3** shows the example of marker.
- **Non-marker-based:** AR systems which do not utilize markers make use of devices for scene identification. Such as AR browser uses tags in order to help users envisage and surf digital data in real world environment. For instance, you may go around the town searching for your preferred restaurant. Through the video feature that exists in your AR browser, you can easily find the restaurant you search for instead of having a look on a map. In addition, as long as you move around, the browser can easily give information concerning your place, e.g. the specific point location you are interested in, clinics, restaurants, etc.

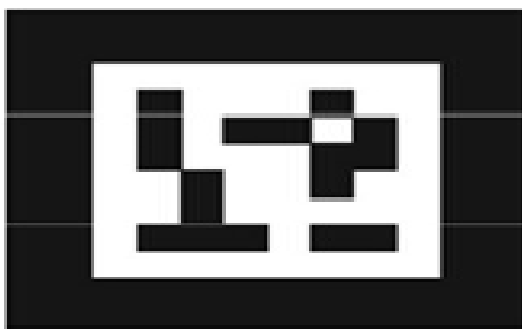


Figure 3. Example of marker [10].

3. Scene Processing.

After calculating the spot of a specific marker in real space according to inner and outer parameters of the camera, the system looks for the corresponding virtual model to each marker in the 3D.

4. Visualization Scene.

Toward the end, the framework delivers the picture of the anticipated 3D question and genuine space and passes on the scene picture that blends reality and virtuality on the off chance that utilizing marker and present advanced data when utilized non- deface kern scene of distinguishing proof strategies [8].



Figure 4. Example of non-marker

V. APPLICATIONS OF AUGMENTED REALITY

The quantity of utilizations using expanded the truth is expanding constantly and the results are clear in numerous spaces e.g. social insurance, business, training and entertainment. This area worries with condensing the earlier looks into that endeavour the expanded reality applications.

1. Medical

1.1. Medical Learning

It is well known that AR has presented new ways of submitting information. The health care world would be re-organized to be represented in a mobile AR way. Such health-related information can be submitted by AR in its extreme visual. The AR became widespread by virtue of the smartphones that are supplied with sensors and cam-era. Such sensors permit the provision of precise context information to the environment aware situations, the matter that permits doctors to gather information, illustrate and identify the measures and procedures. Also, doctors can easily have

control over the sick persons needing constant intensive care, e.g. measuring the temperature and heartbeats, etc. This information can be submitted through the AR. As indicated in **Figure 5** of apps utilizing AR in medical school [12].

1.2. Medical Training

AR has had great implications for the medical industry; however, its more innovative apps come about because of the popular usage of mobile technology. AR is considered very beneficial in the field of healthcare training. For example, the healthcare provider can easily install a program or an application on his mobile. Such program or application may contain the main list of medical measures for the healthcare providers to select from. Once the healthcare provider chooses one of the measures from the list, the first screen will display where the tracking patterns should be situated in the sick person’s body. After applying the patterns, the training model will begin.

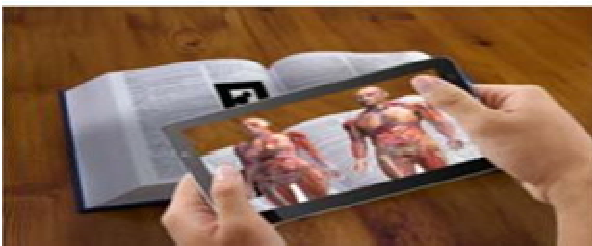


Figure 5. Example of augmented reality medical school practical books from student view on phone display.

The training program will show an animated simulation in 3D, indicating precisely when, where, and in what the various manoeuvres should be performed. Also, the user can alter the point of view of the simulation through moving the mobile phone, either forwards or backwards, via the animation. In addition, he can display extra notices in the course of particular points of the measures.

2. Education

2.1. E-book

This application depicts a physical interface (augmented book) relying on augmented reality technology for learning standard mechanical components. Such book has been contained in the course of an engineering graphics subject in a mechanical engineering degree of a Spanish university [14].

Figure 7 depicts the augmented book.

2.2 Children Education

- **FETCH! Lunch Rush** is defined as an AR application

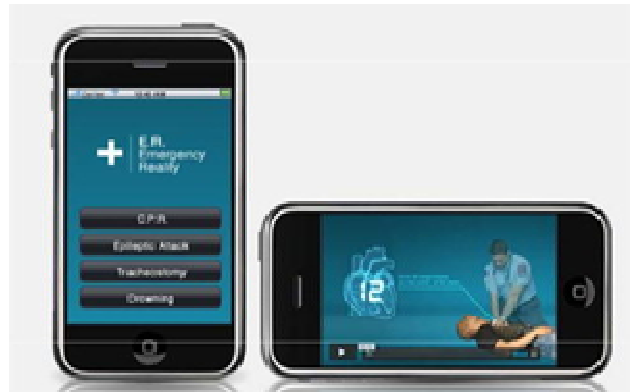
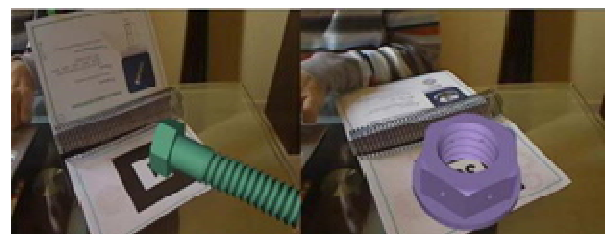


Figure 6. Example of augmented reality training.



(a)



(b)

(c)

Figure 7. (a) Augmented book; (b) Examples of hex-head screw; (c) Examples hex-nut perforated.

that is concerned with teaching mathematical proficiencies to primary pupils via making use of visualization. Designed in 3-D, the application utilizes in smartphone camera to place photos on your camera over real-world surroundings. After that, the application instructs primary pupils to add and subtract through utilizing real-world situations that p that is concerned with teaching mathematical proficiencies to primary pupils via making use of visualization. Designed in 3-D, the application utilizes in smartphone camera to place photos on your camera over real-world surroundings. After that, the application instructs primary pupils to add and subtract through utilizing real-world

situations that permits visualization at the time of solving mathematical problems [15]. Figure 8 depicts the FETCH Lunch Rush application emits visualization at the time of solving mathematical problems [15]. Figure 8 depicts the FETCH Lunch Rush application.

- Matching Objects and Words: Nowadays, digital games have been designed not only for amusement but also to boost the learning process. Matching Objects and Words (MOW) application is an AR game that is designed and developed to help learning words in various languages [16]. Figure 9 illustrates an example of how it works.

III. COMMERCE

3.1. Mobile Coupons

Nowadays, mobile coupons have become a tendency



Figure 8. FETCH lunch rush application [15].

(c) Game 1 being played with Portuguese (left image) and English (right image) words among customers. For customers, it was impractical dream to go to the retail store and to have all the coupon deals forwarded directly to your mobile device. Hence, the mobile coupon becomes an important instrument. With the development of AR technology, users became capable of getting good local deals around their particular places [10] as shown in Figure 10.

3.2. Clothing Shopping

Online business is considered as a standout amongst the most gainful uses of the AR applications. Particularly online dress shopping because of the clients can't anticipate whether the garments will fit them or not. Subsequently, people begin to associate AR with electronic shopping, e.g. attire shop-ping. This progression gets defeat a greatest deterrent client look in pick attire and in the meantime, enhance the quality level and aggressiveness of this business higher than ever [17].

3.3. Products Shopping

AR applications furnish clients with profitable substance. This substance may handle the item attributes and advantages or may give data that helps clients to make a correlation between the different types of items and henceforth take the best shopping choices [18]. For instance, when the purchaser who experiences medical issues needs to purchase grains however there are numerous brands to look over, he can without much of a stretch tap an AR application to know every one of the items pertinent in this data and accordingly can undoubtedly think about between the diverse brands and pick the best one for him [18].

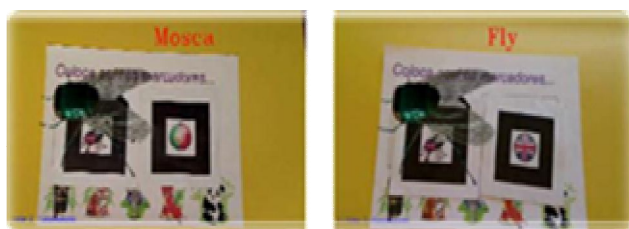
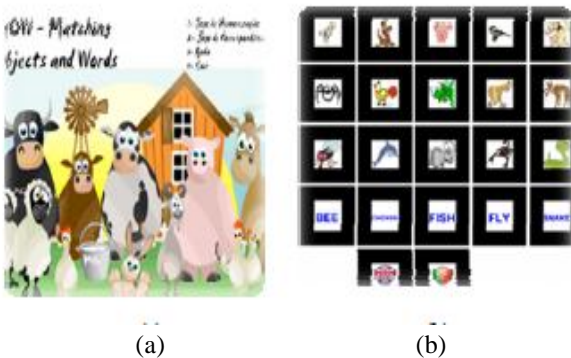


Figure 9. (a) MOW start menu; (b) Examples of template markers used in MOW;



Figure 10. Mobile coupons application classifieds offer [10].

3.4. Shopper Browsing through Different Reviewers

Purchasers depend extraordinarily on electronic social substance, e.g. item audits, before purchasing any items. The most recent overviews led on the Retail Industry assert the importance of the social substance where as it is viewed as the principal component depended on before taking the buy decision. These days, this online substance distribution center is just reachable by PCs that are far expelled from the place of shopping knowledge itself. A versatile AR application outspreads this social substance from the computer show to this present reality by means of cell phones, sup-employing clients with items related data that causes them to understand the reasonable time for taking the buy choice.

IV. Advertising

4.1. Image Space Application

Since the smart phones are provided with multimedia de-vices, e.g. many sensors, they are considered the perfect enablers for AR whereas they enable users to catch sight of the real world via a magic lens. The “Image Space”



Figure 12. Mobile trends for products shopping [18].

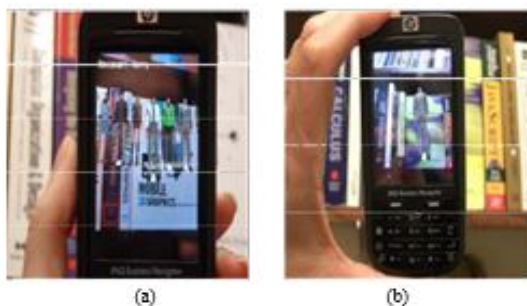


Figure 13. (a) Shopper browsing through different reviewers; (b) Shopper focusing on one reviewer while browsing through books on a shelf [19].

application indicates the manner through which users and small companies can present their content, advertising to AR view, without exerting great efforts, therefore, this content can be accessed immediately by any user who installed the Image Space mobile client on his mobile. As presented in the screen capture of our mobile client as indicated in *Figure 14*,

the live camera feed displays the real world when on the other hand the digital banner is overlapped on the upper part, making it appears as “standing” in front the store, even though the user switches the device [20].

4.2. Advertisers Print Media Campaigns

Battles All through the latest year, a couple of brands have utilized AR to progress and market their things, e.g. LEGO, JC Penny, Adidas, et cetera. In spite of the application compose, e.g. on the web, or versatile applications, they all have been sketched out with the end goal that incorporates the customer in a more helpful way rather than the standard publicizing. Nowadays, adaptable extended reality (known as MAR) makes it workable for merchants and promoters to upgrade their print sees in their plan of media outline systems. Starting late, various associations, for instance, Coca Cola in Germany and Absolut Vodka in Spain, influence customer of MAR to incorporate extra estimation and get-up-and-go their canine rent printed promotions [21] as showed up in *Figure 15*.

V. ENTERTAINMENT

5.1. Tangible Cubes

This application offers an AR diversion which goes for finding out about creatures in risk of annihilation in entertaining way. This application relies upon using substantial 3D squares



Figure 14. (a) Placing the banner on a map; (b) Example of a coffee store banner in the augmented reality client. as the user interface as indicated in *Figure 16*. Through this app, children know much information about the animal’s characteristics and habits and reasons of probable extinction [22].



Figure 15. Advertisers print using augmented reality.

5.2. Sightseeing Guidance

Through this application, customers can without a lot of an extend convey and offer visiting information through making use of mobile phones. Subsequently, this application will help customers to enhance visiting information. Also, the suggested application system utilizes AR which bolsters the honest to goodness condition with PC - made items. Subsequently, the application structure can be utilized as a visiting bearing system that overlays clarifications on a certifiable. Particularly, the proposed application system submits virtual visit guides with a particular true objective to help their visit [23] as appeared in Figures 17-19.

5.3. Design

5.3.1. Machinery Systems Design

The apparatus frameworks configuration is one of the AR applications which are worried about improving item outline and advancement. This application centers around an alternate designing instrument. Consequently, plan and its related issues are submitted limitedly. It is probable toutilize the AR technology in design, with the desire that in sometime in the future it may become a complementary part of a standard design process of more dependable and resilient machinery systems. The basic aim of the applied application was to help designers of machinery system to design more dependable mobile robots. Know-ledge embodied in a procedural form should be utilized during the design process in order to remove causes of incompetence in the upcoming products. Such knowledge is stored in a knowledge database which is gained from experts [25] as indicated in *Figure 20*.

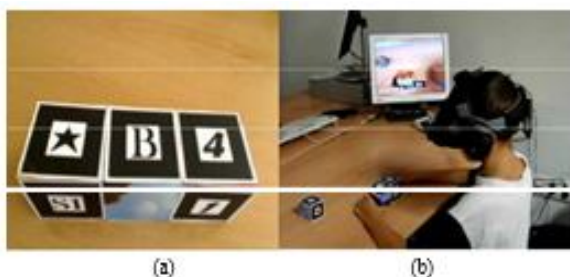


Figure 16. (a) The three cubes used in the game; (b) A boy is trying to find the Orinoco crocodile in game [22].

5.3.2. Furniture Design

Having a good application will enable you to reorganize the chamber while sitting down on your sofa. With the AR application, you can easily see the general view of the new furniture in the sitting room or you can know the suitable color for the office. AR is considered an amazing notion which can easily deliver virtual furniture into our houses. Also, this application can arrange the new furniture in your house on screen in real time. In addition, it can easily alter the color, size, and location of every piece for full customization [26] as indicated in Figure 21.



Figure 19. Map [24].



Figure 20. (a) & (b) Previewing data from a database; (c) Viewing instructions or procedures concerning design process [25]

VI. CURRENT CHALLENGES OF AUGMENTED REALITY

In this section, the current challenges facing augmented reality are described. They are classified as follows:

1. Environment

There are some perceptual issues related with the earth itself. Such issues can realize extra ace issues through the joint effort between the earth and the developments [27]. The most basic difficulties standing up to the earth are according to the accompanying:

Lighting and climate conditions shockingly, it is demonstrated that in outside situations, a significant number of the highlights existing in common pictures are not associated with genuine physical highlights. Shadows caused by light being hindered by objects in the scene help corners and lines to happen and to move as lighting or atmosphere conditions change. Thus, an extensive number of outliners and divergences impact restriction quality, paying little mind to choosing comparing calculation [28]. The shading plan and decent variety of a domain can hamper precise discernment all in all and result in real issues while representing it. What's more, the shading plan of a situation would cause real issues in the light conditions variety. Finally, surfaces with high shading fluctuations would impact the brilliance of anticipated pictures in projector-camera frameworks [27].

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Figure 21. Home design interior space using augmented reality [26].

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3. Content Management

A lot of the current handheld AR systems are divided in travel of associating the new substance to them. In general, such structures are controlled by couple of master territories. The authority to incorporate new substance is simply given to application specialists, and this is benefit skilled through the backend of the application as a result of the need of programming aptitudes to impact an association between puppy to rent systems and data sources. The typical customers, visitors and in addition authorities, in flexible AR structures, should have the capacity to incorporate their own particular substance without spending marvellous specific undertakings. Furthermore, there is a customer made component in these systems, which is showing a way that is straightforward for all customers to pulverize up the substance they have al-arranged produced using distinctive sources into an indistinct handheld AR see [29].

4. User

There are also some user concerns which could be a challenge for AR. The Location of the users is considered a central element of any AR system [28].

VII. FUTURE TRENDS OF AUGMENTED REALITY

AR is still in its underlying stages; thus, it's up and coming potential applications are ceaseless. Propelled re-see in AR assesses proposes for a period where the association amongst people and data is done in a straight line without requiring the usage of any most of the way gadget. As appeared in Figure 22, MIT Media Lab venture "Intuition" is the best model of AR re-pursuit and Parviz's contact focal point venture proposition discover condition where data must be seen by the client [5].

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In addition, enlarged reality gives a chance to supplant and cure the missing faculties for some impeded people, i.e. AR could be used as a sense interchange instrument. Hearing-disabled people could be given visual signs managing them to get missed aural signs and blind people could be given aural signs directing them to obscure visual occasions [6]. An extra in future some AR applications are not a long way from challenges social acknowledgment issues, security concerns, and moral concern emerging [6].

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Figure 22. Example of futuristic augmented reality [5].

Alternatively, a small number of related studies have been prepared for the approval and the usability of AR systems and innovations in manufacturing instructions and training that require additional investigations and research in future. Nonetheless, since many experts and researchers positively declared the potential likelihood of AR in industrial and commercial fields in their studies, AR in manufacturing venues has an opportunity for the growth of its extent into other business fields such as manufacturing, services, government-related sections, and other industrial settings. Along with such sections, appears a good opportunity of AR to be experienced in occupational safety and health (OSH)

sectors. AR could be assumed into safety check up in power plants, chemical plants, and oil refineries, OSH training for executives and members of staff with computer-generated 3D set-tings, as well as AR games and simulations about dangerous resources management [2].

An additional app provided by application developer Crowd Optic may head for a new development in augmented reality apps. This new technology of Crowd Op-tic put fans gathering like shows or sports events in focus [30].

In the future augmented reality will provide opportunities for businesses and dealers to spend their money and efforts in new fields of AR. The researchers expected all augmented reality applications returns will come up to \$5155.92 million by 2016 [31]. Also, as shown in Figure 23, the total mobile AR revenues from 2012 to 2017 will be come up to \$5.2 billion on mobile devices split by different categories of application [32].

VIII. CONCLUSION

Increased the truth is viewed as an ability that has been around for quite a long time. Expanded the truth is still in its underlying stages8. Conclusion

Increased the truth is viewed as an ability that has been around for quite a long time. Expanded the truth is still in its underlying stages; and along these lines the up and coming conceivable applications are unending. A considerable measure of AR items has been displayed in a few sorts and spread the world over. The layering of data more than 3D space makes totally new encounters of the world, and backings the more extensive progress of registering from the work area to the cell phones, and in the meantime raising new standpoint concerning achieving data and new possibilities for learning and along these lines the up and coming conceivable applications are unending. A considerable measure of AR items has been displayed in a few sorts and spread the world over. The layering of data more than 3D space makes totally new encounters of the world, and backings the more extensive progress of registering from the work area to the cell phones, and in the meantime raising new standpoint concerning achieving data and new possibilities for learning.

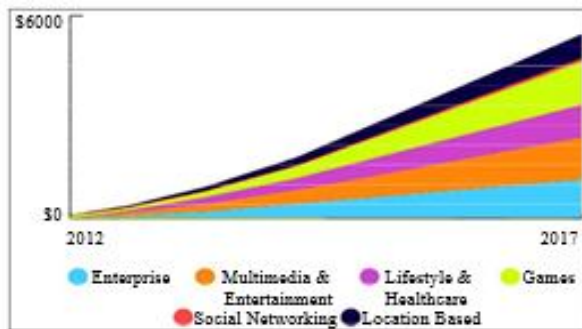


Figure 23. Revenues of augmented reality mobile application from 2012 to 2017 [32].

Despite the way that AR is used extensively in the client's segment, for instance it is utilized as a part of social engagement, excitement and advertising, new types of utilization seem each day. It can be effortlessly used as an instrument for growing new applications. Also, AR will be more open in the as of late future and it will be an integral part in our lives.

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