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Augmented Reality Application

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Abstract: Augmented Reality is a way newer technology to bring in field for the development of new applications so that it can be able to enhance the digital market in the upcoming years. This research paper is to have a knowledge of about how to implement this technology to bring the revolution all over the world, its benefits in using various fields and how augmented reality application would be easier in accessing the complicated virtual things in just one click.
Keywords: Augmented Reality, Android, Unity, Vuforia, ARCore, Android Studio

I. INTRODUCTION

A. Augmented Reality

Augmented Reality (AR) is one of the biggest technology trends right now as it brings virtual information and digital information into the physical space. It is a result of superimposing the information such as sound, image, text, video, graphic or any other content on the world we see with the help of technology.

It is a new technology that can be used on mobile devices such as smartphones, tablets, gaming consoles and Head-Up Display (HUD). It is going to be bigger trend in the upcoming time as the smartphones being introduced in the market these days are AR ready, therefore resulting in a massive use of the technology. There are vast applications of Augmented Reality in various fields like navigation, military, medical, gaming, advertising and entertainment and various other fields.

1) Marker Based: The different types of the markers are nothing but the images that can be detected with the help of the camera. Simple augmented reality markers uses one of the simple shapes such as black squares with a white background. More advanced markers can be created with the help of the images that can be read by the cameras and they can even take the form of the tattoos. Recognition is one of the type of marker based augmented reality that is based on the recognition of the real world items such as shapes, faces and so on which provides the supplementary virtual information to the user in real time. Some of the handheld devices such as the mobile phones or the smart phones with the proper software can use the recognition to read the bar codes and can even be used to provide the information related to it.

2) Marker Less: In the marker less augmented reality the internet is used to gather the images which is then displayed on any specific location. The applications based on the marker less augmented reality does not require the marker to display the content. It is more interactive as compared to the marker based augmented reality. Projection is amongst the most common form of marker less augmented reality. It basically transforms what we see live. It uses the virtual imagery to augment something that we see live. There are few mobile phones that are able to track movements and sounds with the help of the camera and then they respond accordingly. Some of the examples of augmented reality devices that uses the interactive projection includes virtual or projection keyboards that one can project onto any flat surface or use.

B. Android

Android is an operating system for smartphones and tablets and various smart devices. It is basically a modified version of the Linux kernel and other open source software. The default user interface is based on the direct manipulation which is done through the touch inputs. The response to these user inputs are immediate which provides haptic feedbacks to the user. The internal hardware includes accelerometers, gyroscopes and proximity sensors which are used by certain applications to provide additional response to the users.

Almost all Android devices comes with preinstalled google applications such as Gmail, YouTube, google chrome, google maps, google play and many more. Applications that are used to extend or enhance the functionality of the devices are written using the Android software development kit which includes java combined with C or C++ along with a non-default runtime which supports C++. The main hardware platform for Android is ARM architectures with x86 and x86-64 supported in the latest versions. The minimum amount of RAM which is required by the devices running Android 7.1 ranges from 2GB for the best hardware to 1GB for the common screen and down to 512 MB for the lowest specification 32 bit smartphone. For the Android 4.4 minimum 512 MB of RAM is required.

II. REVOLUTION DUE TO AUGMENTED REALITY

Augmented Reality came into the picture in late 1960s when a head mounted AR display was invented , but it was hidden behind the concepts of virtual reality and in that time , both augmented and virtual reality were not distinct . Later on, both the concepts separated and researchers started concentrating on augmented reality as a separate technology.
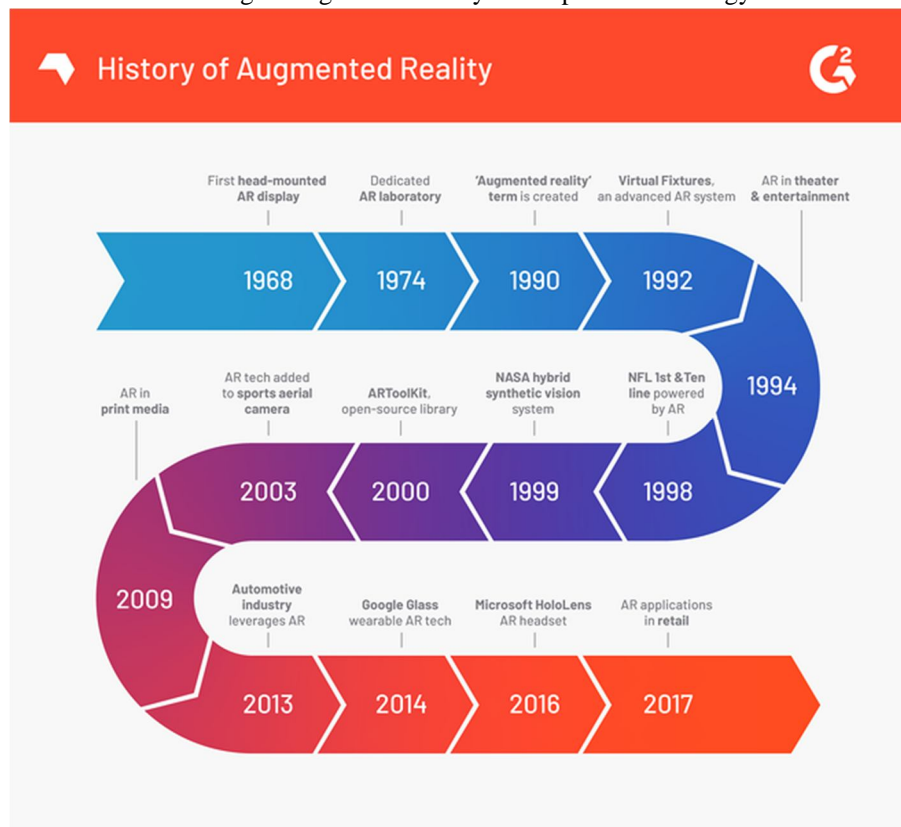

Fig. 1 History of AR

In early 1990s, Researcher Tom Caudell named this technology of interacting to real world with virtual things as 'Augmented Reality'. Also in 1990s, Augmented Reality was started using in entertainment and theatres. Virtual fixtures were created, gave an advanced Augmented Reality system. In this period, physical and virtual objects interacted with each other. This interaction has paved the way to mixed reality which is a big technology to relying different fields and concepts using both AR and VR.

From 2000s till now, Augmented Reality has made revolution in many industrial fields and sectors. ARToolkit and other open source libraries were invented and started using to create more enhanced and new Augmented Reality application. Augmented Reality started including more and more sectors like sports in 2003 and print media also but it had not been proved as much helpful as on that time, there were not much enhanced tools to build an AR application that would be suitable in almost every device. Still today, there is not any fine tool kit available that can help in building an AR application that can run in every mobile devices and desktops. [1] One of a very big example of augmented reality is Pokémon go app, released in 2016 and is a gaming app based on augmented reality interacting real world with digital world by catching Pokémon which do not exist in real. This was the first gaming app based entirely on augmented reality and it made companies believe that augmented reality can do much more in other fields also rather than just using this technology in entertainment sectors.

Lenskart-an ecommerce website for purchasing lens and frames also started using this technology for increasing their customers and proved it as a very strong technology to attract customers as it allows the customer to try their glasses virtually so that they can have the idea of how it looks on them.

Snapchat is a social media app using this simpler Augmented Reality lenses for fun and entertainment. But today there are millions of users connected with this app who are actually loving this AR technology. These few trials of basic AR technology has opened the way for many businesses to give it a try. Many companies and websites are also thinking to include Augmented Reality as a new feature to enhance their profit growth and to achieve goals.

Augmented Reality is now in growth stage, but in upcoming years, there may be millions of websites that will come with AR as an additional feature. Just like in home decorators' application, enabling the users to decide what kind of furniture and wall colours should be placed and imposed to make their homes really elegant and as according to their choice. And in media sector, by introducing Augmented newspaper for those who does not have much time to go through all headings of any newspaper. As people are now switching from paper media towards digital media , so newspaper should also get converted into more advanced form so that , only relevant content and videos related to that heading will be displayed and there will be no need to go through the entire newspaper.

Our google lens and maps also working on Augmented Reality to be included in their apps so that it will show us details and description of a place where you are standing. Facebook is also working on augmented Reality glasses as announced by Mark Zuckerberg. Also in these growth years, we would also be able to see the revolution in shopping apps where, there will be more than one technology like Augmented Reality, machine learning, big data working together and giving the customers highly advanced power to compare deals, receiving recommendations, virtual trials, extra information along with full description of the product and its quality on putting the camera upon it, all in one single application.

Google has already launched an Augmented Reality app ARCore for Android, so that by using this application, one can build augmented reality app for android. So, this Augmented Reality will going to impact the digital system for sure in the upcoming years and will prove itself as one of the most powerful technology in almost every sector.[2]

III.   BENEFITS OF USING AUGMENTED REALITY IN NEW APPLICATIONS

Augmented Reality is now imposing as a new technology which is changing the values of the applications of any organisation in an entirely new way and adding more values on their product details. The key benefit that this technology providing us is to superimpose the virtual object images, videos or any relevant description or information onto the physical object or place. This can make our life way much easier and comfortable with respect of how we can use this technology in different fields or sectors.

The other benefits that we can get by using this Augmented Reality are-

1) Augmented Reality has now focusing more on mobile and smart devices. So, this will increase the market of smartphones and devices sooner or later.
2) This technology can provide access to the detailed analytics of anything that can help in understanding the audience also.
3) It provides us more innovative features and functionalities.
4) With Augmented Reality, one can easily visualize the things that cannot be seen in real. For example- in medical, Human anatomy can be seen using the augmented reality by the students to study it in more detail.
5) Augmented Reality can be used by operating it as freehand gestures and thus can be easier to implement.
6) Three dimensional perception of any object can also be done using augmented reality.
7) With Augmented Reality, people can interact with more possible ways and it is decreasing the gap between real and virtual world.

All these key benefits making this technology more like a dream come true.[3]

There are various fields where we can use these benefits and implement the augmented reality in an application. Few of them are-

A. Automobiles

In automobiles, the augmented reality applications can be installed in it so that it can provide visualizations of the roadmaps, virtual instructors and many other additional features like giving suggestions for driving and many other important information like changing oil, required maintenance etc. all in one AR display.

Fig. 2 AR used in maps present in automobiles

B. Retailers/Consumers

In this field, augmented reality can be used to provide virtual demos of any products like the one which Lenskart is using. So, it can be used to increase the product sales and attract more and more users. By using augmented reality in product sales, one can be made available more detailed brand content (like videos, description, quality) which can be analysed in just one touch.

Fig. 3 AR being used to gather info about goods

C. Education

It can play a very important role in the field of education by augmenting various historical and cultural locations, by helping in deep study of human body by a three dimensional image, by using the other detailed description of objects to know more about it.
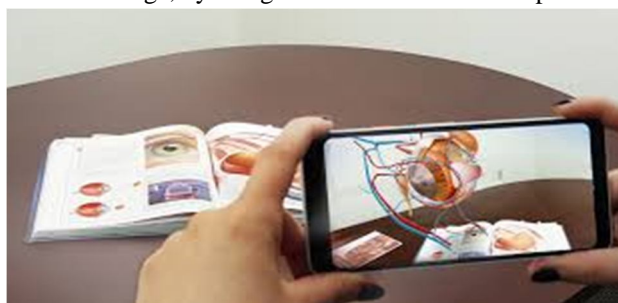

Fig. 4 AR useful in education

D. Media/Press Media

It will be used as an augmented media like augmented newspaper which will superimposed the relevant videos on the newspaper containing thumbnails or headings. This feature can be helpful in changing the old way of reading the newspapers and spending lot of time to search the relevant contents inside the newspaper.

Fig. 5 News contents with the help of AR

E. Tourism

Tourism can also become a centre of attraction by using augmented reality to provide virtual tours and other three dimensional images for the historical monuments that will itself give the brief history of that place and many other functionalities also.[4]

Fig. 6 AR simplifying tourism

IV. HOW TO IMPLEMENT

Implementation or building of an augmented reality application for mobile is not a cake walk as it may seem on YouTube videos because there are many platforms available online which provide drag and drop features but not every idea can be implemented in this way. There are various factors which need to be considered for choosing the best suited option. These factor vary from developer to developer and idea to idea. Here are few factors which we are considering in our application:

1) Since our application is marker based application i.e. it uses predefined marker that trigger the display of AR overlaying on top of the image.
2) The next important thing is choosing a platform for which application is to be designed, here it means android or iOS or both.
3) Next we need to decide the budget as because not everything is unlimited and free. If we go by facilities like cloud storage etc. then certainly we will have to pay.

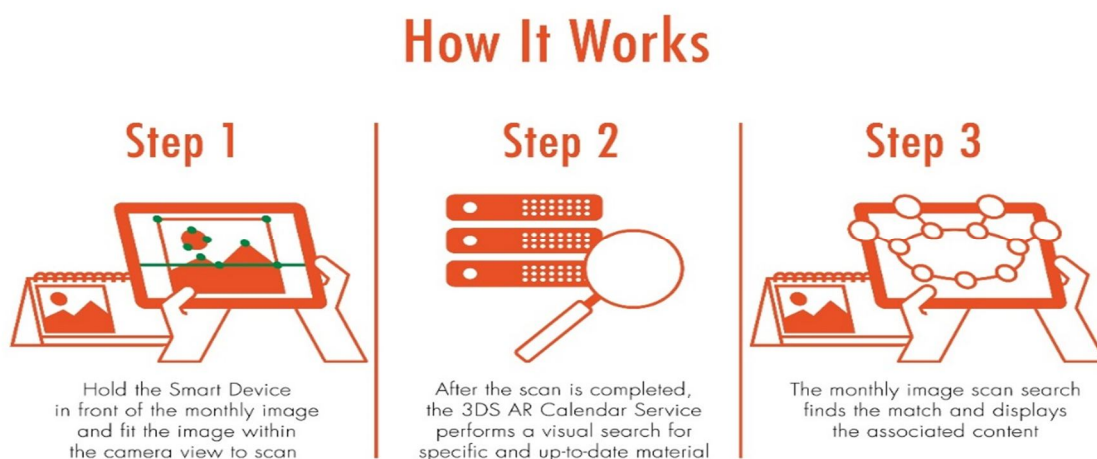Combining all the factors we will filter out the tools needed for it.

Fig. 7 Illustration of how to work

A. *Available options our choice with reason*

Our motive is to develop this app for android and that too at no cost. With that we had many options but we selected few of the well-known trustworthy names and decided to go with any one of them.

1) *Android Studio and Unity:* For all android application development, Android Studio is considered as the best option and it seems obvious as well because no other IDE is as convenient as it is. Unity is also a great platform but it is generally used for game development as it is the most powerful tool for it for the reason that it supports nearly every best available tool which assists game development.
2) *ARCore and Vuforia:* ARCore is the augmented reality SDK developed by google and it is one of the best in the market for development of AR apps and it supports all platforms as well. It has its own features which include its pros and cons as well. Vuforia on the other hand is the market leader for augmented reality application development. This SDK was introduced as AR app development framework by renowned Qualcomm – a company which had the history of specialization in the research and development of the wireless means of communication as well as SoC electronic microchips.We chose unity as the IDE because it has upper hand over android studio when it comes to augmented reality apps development because it had upper hand at few places in comparison to android studio. We chose Vuforia over ARCore because of many reasons although it can be implemented with unity as well but it had its drawbacks like ARCore only support devices which support android 7.0+ etc. Targets in Vuforia are, nearly, real world objects, scanning which, your application can portray virtual objects in the needed locations and corresponding proportionate dimensions. Vuforia has Extended Tracking i.e. The object remains captured even after camera leaves the frame, which results for implementing apps with augmented reality that factually surrounds the user. Also, Vuforia is free for students and it is compatible with all versions of android.

V. CONCLUSION

This paper is to give a detailed description of about all the applications that can be available in future containing augmented reality and how this augmented reality will bring the revolution in our digital world. The paper also discussed about what benefits this newer technology provided in the e-commerce market already and how it will benefit other fields also. Then we have discussed some points on the history of augmented reality and how it got separated from virtual reality. Further, there is a brief description of some tools and how to implement this technology using these tools in an easier way. At last, this paper helped in understanding this technology as a whole and how it will affect us in the upcoming years.

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