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Overview of Virtual and Augmented Reality

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Abstract: **- Graphics has changed the way we consume data. Earlier, most of the data used to be in the form of text or audio, but today the data is close to the real world and computer graphics has played a major role in it. Applications of computer graphics has led to tectonic swing in the current times. Among them are augmented and virtual realities. Augmented and Virtual Reality offer many options that allow the user to make use of them in almost all the fields. The intention behind this review paper is to summarize the applications of Augmented and Virtual Reality in various fields.**

Keywords**: Applications, Augmented Reality, Computer, Graphics, Virtual Reality, Virtualization.**

I. INTRODUCTION

In today's world computer graphics is used in almost all aspects of our lives. Graphics have made designing lot easier by providing tools those are much faster and innovative in style. Among such applications are Augmented Reality and Virtual Reality. Virtual reality being in essence of something yet not being physically present. Augmented Reality though, is a step ahead in superimposing objects and senses and in creating in a whole new experience which is very near to the real world.

II. VIRTUAL REALITY

A. History

The era of virtualization began with the boom of microprocessors. Even though virtualization started in early 1950s, it rose to popularity in 1980-1990s. Computer scientist Jaron Lanier introduced the world back in 1987, which led to improvements in the 1990s [3]. The majority of virtualization include visual and acoustic enhancements. SA multi-sensory simulation device called Sensorama was developed by Morton Heilig [1] wherein the environment of a natural ecosystem was created, but it lacked user interaction. In the year 1968, Ivan Sutherland introduced the first ever Head Mount Display system(HMD). HMD had a head orientation option and stereo system [1] [14]. VPL manufactured first commercial VR equipment's in 1980s. By the end of 1990s there were many advances in the virtualization workspace. [1] Gaming is the best example where we can see the drastic applications of virtualization. It is the present trend.

B. Present

1. Virtual Reality in Military

Virtual reality is used in military training programs. Scenarios such as war need special training and using Virtual Reality, a combat environment can be created and soldiers can be trained under various assumed circumstances with none getting hurt. Some commonly used situations are flight training, boot camps, vehicle simulation. In flight training cockpit simulation is the most trained aspect as it needs high skill and accuracy in order to make better decisions while flying. [4]

Fig: II.1.1 Military training using headgear

2. Virtual Reality in Medicine

Healthcare is one among the most applied area of virtualization. Virtual reality is used to train surgeons on new technology while keeping in mind the safety and privacy of patients. It is also used to detect complex issues in scan reports and x-rays. Nowadays, surgeries are carried out using virtual reality wherein an environment similar to human body is created for better accuracy and to avoid any kind of complexity. [6]

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Fig II.2.1: VR headgear in medicine

3. Virtual Reality in Media and Entertainment

Gaming is the biggest and most successful testimony to applications of Computer Graphics. Various interactive platforms are built using this technique. The haptic systems and data gloves are instrumental in involving spectators to an extent [7]. Unlike earlier, the method of reaching out to crowd is different. Audio books, abstract art involving 3D shapes are all allowed using virtual reality. [8]

Fig II.3.1: VFX used in movies [23]

4. Virtual Reality in Educaion

Images are used while teaching, that makes learning a fun experience. Virtual Reality gave a new dimension to teaching and learning process. Several courses are taught and learnt using the applications, that helps the content to reach a wider audience. [9]

Fig II.4.1: Headgear used in education [24]

5. Virtual Reality in Construction

Virtual Reality offers various design patterns and options for construction of buildings. Blueprints of buildings and bridges can be developed using various tools. Simulation of constructions allow the builders to make amendments to the building based on the analysis. By doing this money and safety can be ensured. Also, various situations can be created to test the durability of the building while guaranteeing wellbeing. [10]

Fig II.5.1: VR headgear in construction and design

6. Virtual Reality in Sports

Using this performance of an athlete can be improved by providing necessary analysis and tips. It is also used to design equipment's where they can satisfy the high requirements. [11]

Fig II.6.1: VR in sports training

C. Future

The future of virtualization is very promising, according to [13] it is going to be a billion -dollar economy by the end of 2020. There are many applications that are being developed, in another decade virtual reality is going to be a frontrunner.

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III. AUGMENTED REALITY

It can be defined as enhancement of virtual objects with reality. It adds most of the senses into an object. It is most popular in gaming and entertainment world. The augmented reality is highly user interactive and is in real time.

A. History

The concept of combing the senses and the objects began in 1950s, when [15] started to conceptualize cinema along with the sensory features. Again, in the year 1966 [2] devised the first head mount device that allowed the creation of an environment closer to the reality. Ronald Azuma s survey in 1997 confirmed the acceptance of this term. He introduced 3D imagery and made it a real-time interactive system. [16]

B. Present

In today's market, augmented reality is becoming very popular and hence there are various applications that use this technology. Some of them are described below.

1. Medical

In this, the augmented reality is used to study as well as illustrate concepts. There is an application developed by Oracle called "Oracle Health's EyeDecide". This application lets ophthalmologists can simulate the vision of patients. [17]

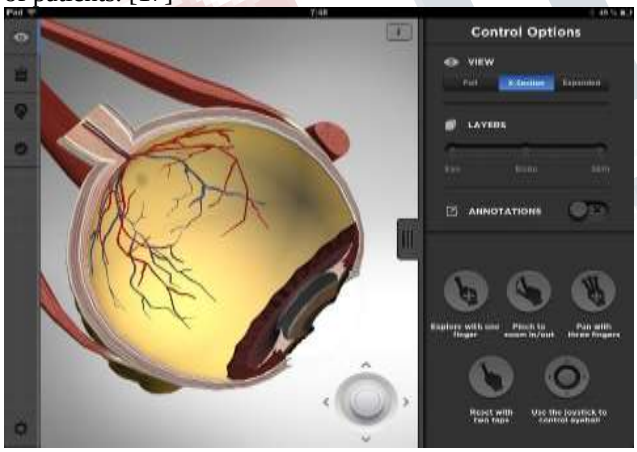

Fig III.1.1: Analysis of eye by EyeDecide application

Another application called AccuVein is used to spot the accurate vein location, as the chances of missing the vein is high. This done by projecting the device onto the patient's wrist to check the locus of veins. [17]

Fig III.1.2: AccuVein

2. Education

The idea of showing the concept is widely accepted, hence there are numerous applications where augmented reality is used to enhance the learning. A Montessori application called "AR Flashcards" are used to teach toddlers and playschool kids. Another application called "Anatomy 4D" provides a better understanding of complex human body. [18]

Fig III.2.1: AR Flashcard

3. Mobile Applications

Most i-phones have augmented reality applications developed. Applications like "Wikitude" which is used to find out details about a location without having to search for it. "Yelp" is another application where, a component called "Monocle" enables augmented experience. It is used to rate and review restaurants. [19]

Fig III.3.1: Wikitude

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Another application called "Roar" is used for fashion advices. It also allows user to review and rate products. [20]

For all the cosmology enthusiasts there exist an application called "SkyView". The user has to point the device upwards the sky and all the information related is directly available on the phone screens. [20].

Fig III.3.2: Skyview

4. Military

In training an application called "Super Cockpit" is used to train pilots on flying and air travelling. The speciality of this application is that, the horizon was visible through the cockpit. Another training called "Forward Observer Training" uses augmented reality, wherein the fire team and the forwarder are given headgear and the instructor is given a screen to test the accuracy of the fire team. The environment is created virtually. [21]

Fig III.4.1: Cockpit Simulation

5. Gaming

Earlier games were played on systems and arcades, but now they are in the mobile phones because of the augmented reality technology. The game called "Pokemon Go" is the best example wherein, smartphones are used to identify, capture and release these pokemons. This is the field where augmented reality most widely applied. [22]

Fig III.5.1: PokemonGo

C. Future

The future of augmented reality is very interesting. The consumer requirements for augmented reality is increasing and the reach is growing too. As the barrier is fading we can expect augmented reality to rule the industry in a decade.

IV. CONCLUSION

Virtual and Augmented realities are most cherished and advanced technologies in the market today. These technologies are changing the way we consume and forward data. After looking at the various applications in almost all the major aspects of living, it is clear that Virtual and Augmented Reality are here to stay and the acceptance is happening at a higher rate too. In the coming decade, we can expect this arena to create havoc and to make the technology much easier and interactive to the consumer. As far as impact is concerned, this is a billion-dollar market and the disruptions are here to stay.

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