Augmented Reality Based Book Visualization Using Marker Based Technique

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Abstract: *Augmented reality (AR) belongs to computer displays which provide additional virtual information to a user's sensory perceptions. AR usually focuses on see-through devices, which are worn on the head that overlay graphics and text on the user's view of environment. In layman's term it overlays graphics over a real world environment in real time. Procuring the right information at the right time and at the right place is the key in such applications. What makes augmented reality different is how the information is presented that is, not on a separate display but along with the user's perceptions. An AR system adds the real world with virtual (computer generated) objects that appear to coexist in the same space as the real world. In this project, we were entrusted with exploring modern innovations and industry practices in the area of Augmented Reality. This consciousness was used to create an interactive AR Book using AR application. This study aimed to implement Augmented Reality on images or diagrams of photosynthesis, water cycle and pollution by recognizing the images as marker and to add their 3-D view on top of the images in the device upon recognition. This way, a person develops more interest towards his/her studies. The person also has an option to study from a video to make the understanding of the subject easier.*

1. Introduction

Augmented reality (AR) is an image rendering technology by which virtual objects are superimposed onto images of real objects captured in real time by a tracking camera. It is a live, direct or indirect, view of a physical; real-world environment whose elements are augmented by a computer generated sensory input such as sound, video, graphics or GPS data. The superimposed sensory data can be constructive (adding to the surroundings) or destructive (masking of the surroundings) which is seamlessly knitted with the environment such that it is witnessed as an aspect of the real world. This is rather unrelated to VR, which has computer rendered environments for you to interact with, and be engrossed in whereas AR complements to the reality you would ordinarily see rather than replacing it.

It is a technology that can enhance visual perception through rendered information generated by a computer. Many applications using AR have been rapidly developed in scientific and commercial fields in recent years by superimposing computer-generated virtual objects on the captured images of real world objects. AR systems can naturally provide users a wealth of useful information.

We were entrusted with exploring modern innovations and industry practices in the area of Augmented Reality. This consciousness was used to create an interactive children's book using an AR application. This study aimed to implement Augmented Reality on images of a book by recognizing the images in the book as marker and to add 3-D model on top of the image in the device upon recognition.
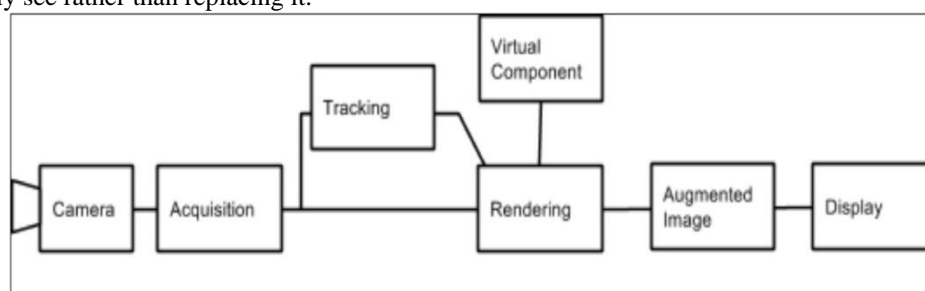

Figure 1: Block Diagram of working of Augmented Reality

It is a combination of the physical world viewed by the user and a virtual scene developed by the computer that adds to the scene with the additional information. In all those applications the AR presented to the user improvises that person's performance in and perception of the outside world. The conclusive goal is to create a machine or a system that renders the real world such that the user cannot tell the difference between the real world and the virtual augmentation of it. It depicts the combination and correct registration of data from a pre-operative imaging study onto the patient's head, providing this, to a doctor in the operation theatre would enhance their performance and to a pilot during training would increase his/her flight skills and also increase the cost effectiveness of the training for the government.

Between the extremes of Virtual Reality and Augmented Reality lies Mixed Reality, in which views of the real world are combined in some fraction with views of a virtual environment .Users can interact with virtual objects in the real world we observe with our senses, generally with the use of a headset with transparent lenses e.g. Microsoft's HoloLense. Augmented Reality describes that class of displays which consists primarily of a real world environment, with graphic enhancement or superimpositions. In Augmented Virtuality, real world objects are added to a digital environment. An AR system

complements the real world with virtual objects that appear to co-exist in the same space as the physical world.
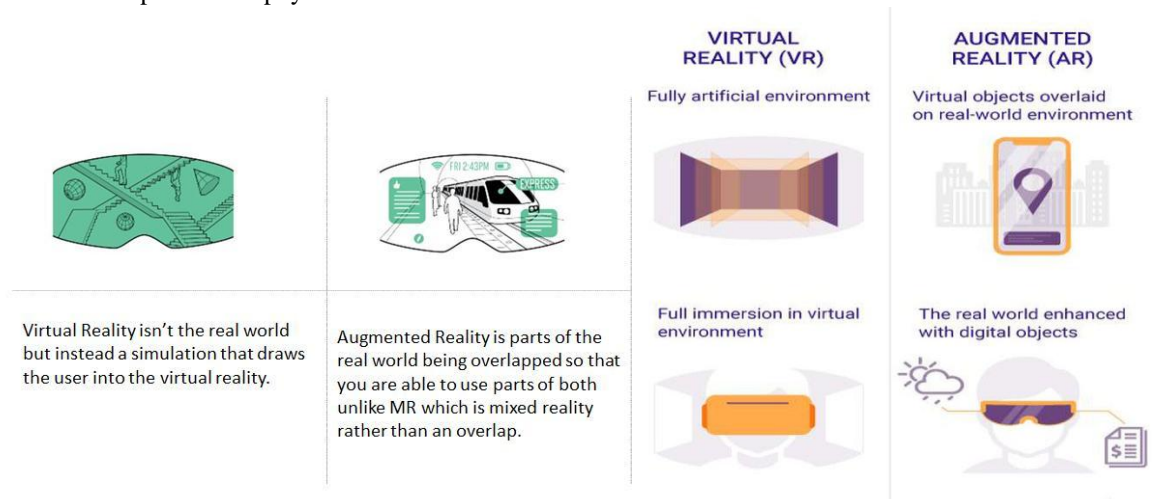

Figure 3: An overview of the comparison between AR and VR

2. Problem Identification

The technological revolutions having occurred in almost every area also had an impact on books, with the emergence of electronic books. However many problems have risen in the availability of such books, and users have started to come back to printed books that are palpable, with pages which they can physically turn over. AR books have brought a revolutionary change in which a person feels or sees a book and enhances these books by introducing collective and hypnotic properties into the frivolous and interaction-free characteristics of printed books. Albeit AR books have the advantages and traditionalism of hard books, they bring out an innovative twist on books with a static structure by adding various sensorial interactions, to have a few books that contain the elements of AR that supplement the text is a wonderful way to target those readers who are obsessed and as well as those who don't enjoy reading. It will increase kid's curiosity, will increase their knowledge as well and the kid will learn new things. And no one can deny the fact that how addictive kids have become towards smartphones or tablets but with the help of AR this could be something very productive which would benefit both children and parents.

3. Objective of the Study

Augmented Reality (AR) is a trailblazing technology which improves the real world by adding digital objects to create a new MR environment. A typical AR system consist of an output device displaying the digital information, a tracking system for calculating position and orientation of the user, a computer to process the data and input devices for navigation and interaction. It is a way with which one can get an ambiguous view of a real world scenario or environment in an augmented way by use of technology.

Sometimes it becomes difficult for people to visualize things or understand a particular concept and as AR/VR gives a very realistic experience to a person our goal is to develop an AR/VR application for students especially of the younger age. Our application will help these students to understand some basic concepts of science and make the subject more understandable. It has strong possibility to provide both powerful circumstantial, in learning experiences and fortuitous exploration and discovery of the nature of data in the physical world.

4. Scope of the Study

We will develop an application where one can rather than visualizing 3-D objects would actually be able to see them. In terms of education it will make teaching easy and more efficient, for gaming the user experience will be far more improved and realistic, for medical and science one can before surgeries can see a 3-D structure of the patient in real time and decide about the surgery, for military one can learn how to fly or shoot without using a real jet or gun. When visuals or regular computer displays are brought into the physical world which gives a delusion of its presence to the surroundings, such technology is known as augmented reality (AR). Today AR has spread its wings not just into gaming but has also influenced the mobile industry and becoming an integral part of our day to day life. One can enjoy special effects and advanced technology on hands itself.

5. Conclusion

By analyzing the project, we have come to the conclusion that this project should prove quite beneficial in the real world as it will make books more interactive and attractive to students. It will be used in schools, college's libraries and in book selling stores. This project will make it easier for people to decide which books to read and which to skip. Also the AR 3D models book can make learning fun and more efficient for children.

It was a incredible and informative experience for me while working on this project. This project took me through the diverse aspects of project advancement and gave me the absolute comprehension into the world of AR. The joy of working and the fun involved while overcoming the various problems and obstacles gave me an insight of developers industry.

6. Future Scope

Technology is endlessly expanding, and the emergence of brand new devices sometimes acts as an appearance of a completely new technological archetype which with other technologies thrusting up all over flashing what may very well be the stepping-up of Augmented Reality (AR). Today AR has spread its wings not just into gaming but also into our day to day life, from health sector to forces of a country. AR has shown its proficiency and demonstrates its future scopes to all of us.

The forthcoming of augmented reality seems really sparkling and imminent. An area that might be reformed by AR is the retail sector, where the technology will aid the gap between online and real world shops, contributing to a better experience and illustrated promotions delivered right to the user. Console or computers games are certainly another important aspect of advancement of AR. The smartphone industry is also a budding retail for the future of AR from phones accessing GPS to technologies which are wearable ranging from Moto 360 to Apple Watch. Some other possible future uses of AR are in the market of medicine, military, fine art, industry and teaching. And similar to other growing technologies, AR also faces some hindrances which are no expulsion. Even though smartphones have many uses in their current form, there are several challenges that should be brought up before the technology becomes fully market ready and goes dominant. Data should be concluded across the wearer's full scope of vision. The technology should also be armed with a better perception of natural body movements, assuring that the displays get better. Internet connectivity is still a hindrance as still there are many places where internet connection isn't available. Another concerning issue is the battery life of such devices, which should be increased to allow users make the most from the technology, so it can be put to everyday use. Challenges lie in hardware too; smartphones are not powerful enough to process stacks of real-time data even if some are the price of such devices should be reduced for mainstream use. Let's hope with time, all the technical challenges will be dealt with and AR will certainly showcase something that would bridge the gaps amid social and ethical issues.

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