

Application of Augmented Reality for Science AR Lab

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Abstract:

An application of augmented reality (AR) for virtual labs is implemented. The emphasis is to demonstrate the use of different buttons and knobs of a Cathode Ray Oscilloscope (CRO) using an application Unity 3D which will make it easier for the students to get a better understanding of the CRO and its working. Using Vuforia engine, which is used to create AR applications in Unity 3D, an application is created which takes the picture of a CRO and superimposes the description of different knobs and buttons present on it. The AR camera does this by detecting specific features of the image. Realizing the impact of a stable and flexible AR virtual lab on the present education system, a more relevant application has been introduced in this-paper.

I. INTRODUCTION

Augmented Reality (AR) is a technology which overlay the graphics on the real world. When an AR technology enabled device or application capture's the object image, sharing it with the computer vision program which then processes that image to gather all the relatable and relevant details from its prestored database. It holds the promise of creating direct link between the physical world and electronic information. AR is often mistaken as Virtual Reality (VR). The key

difference between the two is that while Virtual reality replaces the entire real world whereas AR incorporates the real world with physical information overlay. Also, in case of VR, user need not to be present for experiencing the imaginary world whereas user's presence is required in case of Augmented Reality.

II. APPLICATIONS OF AUGMENTED REALITY

AR has great application in many of the fields, for example:

- 1) AR is now used in the field of medical and it's application is not limited to MRI but it also has application during operation where it can help reduce the need for more traditional invasive cameras and probes.
- 2) One of the most common use of AR in everyday effectively explain the students the various aspects of lives is during shopping and home buying process. the topic with more ease with this smart phone.
- 3) AR is being massively used in the gaming industry so as to provide the consumer with better and more immersive gaming experience.

4) It also finds important application in military as it can be used in detecting malicious things and for practice purpose too.



III. LITERATURE SURVEY

A. Advancements of Augmented Reality in past few years for real time applications

This Research paper investigates on how augmented reality improves the interactivity of the users with the actual world by appending practical object and it is easy, natural and convenient method to interact to the cyber world. The research contains a study of synchronal applications and frequently required technology [1]. Apart from this, the paper also highlights about the upcoming uses of AR in different areas of man-made intelligence. In early stages the Augmented Reality basically focused mainly upon gaming field but now advancement in AR helped in shifting their focus onto different areas such as defense, medical, teaching, production industry, robotics and also in entertainment industry. The requirement and the importance of AR allows us to use it in our day to day life. However, there are certain points which leads to various challenges in future of augmented reality. Some of these challenges are public acceptance, poor quality of content, possibility of

physical harm, technical challenges and unsatisfactory experience overall.

B. Smart learning about augmented reality with reference to android platform and its applications

The augmented reality is a correct mixture of both hardware and software applications[2]. To ease the traditional teaching style followed by the teachers using black board, chalk, white board and marker this research has been made Software has been implemented for the android platform where a student or a teacher can study an image in great depths. The 2D image of the picture to be studied can be captured with the software and the 3D view of the same will be displayed on the screen which can be viewed from all dimensions and directions. The teachers can more the shape and changing the dimensions of the objects for calculation.

C. An Augmented Reality App For Educational Purpose

The introduction of augmented reality in the world of educational sector has brought about a major change in the traditional teaching methodologies[3] which were followed before. Since then the technology has been advancing at a fast pace. This research gave a new dimension to the learning world. It related the subject of study to various other things associated with it. This created a visual learning in the students which is better than audio learning. The students could visually see and study the topic and also relate to it by understanding it even better. It brought life to the lifeless books that the students had to study before and thus received more attention from the students. The only difficulty faced in this study was to display the contents in a 3D manner which can be worked upon in later researches.

D. The use of Augmented Reality for 3D Disparity inspection in Industrial Applications

This research paper discusses about the discrepancy check that is used in industrial applications[4]. Real-time 3D disparity inspection is generally used in various industrial applications namely modelling, constructing and assembly control. With the help of AR we can verify whether the 3D configuration of an object corresponds accurately with the reference 3D model. Other researches includes a semi- automatic method for quickly aligning the reference model with the recreation with a new and quick method to detect disparities of the whole reconstruction due to which a more accurate geometry capturing was possible. Through augmented reality such difficult work can be made less complex which gives it an advantage over other methods and as a result it'll become more sought after approach in the future.

E. A Tool for Learning Geometry Using Augmented Reality:

In the following research paper it is discussed how augmented reality can be used to detect and register the different practical objects[5] in real time. Using this approach a teacher can use this method to help its students understand and calculate angle of the objects using protractor. For this coloured cards are being used example red, blue, green and yellow. All these coloured cards serve some different purpose. One of them is used as a pivot point, while the other two are used are used for the targeting point and the last one is used to display the size of the angle. The measurement of the angle can be calculated by using the camera to detect the object. As soon as the camera detects the objects all the different cards do their specific tasks and displays the intersect lines that can be calculated by the students to get the angle of the object and for checking the accuracy of the calculation the correct angle is displayed on the screen. The issue which occurred in this research was that the teachers used

different 3D structures such as cubes, spheres and other shapes, to help the students to visualize the structure in a 3D space. But there was a drawback in this approach as it was difficult for the teacher to carry all these objects around which also made it difficult to perform certain functions such as slicing through the shape and changing the dimensions of the objects for calculation.

IV. CONCEPT

The concept behind our project is to use the power of Augmented reality to implement an application which will make it convenient for students to understand the working of the Cathode Ray Oscilloscope. This application is developed using the powerful game-developing software Unity 3-D and Vuforia Augmented Reality Software Development Kit. Our purpose is to overlay the workings of different knobs and switches namely, the Amplitude, Time Knob, Channel Select, Invert and X-Y position buttons of the CRO on the screen of the device of the user when looked through the camera of our AR application.

V. CONCLUSION

This AR based application created using Unity 3D and Vuforia can be successfully used to learn the working of different knobs and switches of a Cathode Ray Oscilloscope, thereby, making it convenient for students to perform experiments involving a CRO in the virtual labs. Given that the application will be available for various mobile devices, it will be accessible to a large student population. Organising virtual labs has always been a tedious task for teachers and as well as students, however, our application will move us a step closer to create an environment where teachers find it easier to teach practical concepts and students to grasp them easily.

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