

Education using Virtual Reality and Augmented Reality

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Abstract: To tackle the increasing challenges of educational systems, their complexity needs to be better understood. This can happen by the means of modern digital technologies that influence the educational system. The analysis of these technologies would enable us to extract value from the education systems and help in creating a more efficient education system. The objective of our paper is to develop an application on Virtual Reality implemented Education and employ the recent research in this field in order to reduce complexity in the current education system. This idea is still in early stages of development and is yet to be accepted globally as a standard for education.

Index Terms: Component, formatting, style, styling, insert

I. INTRODUCTION

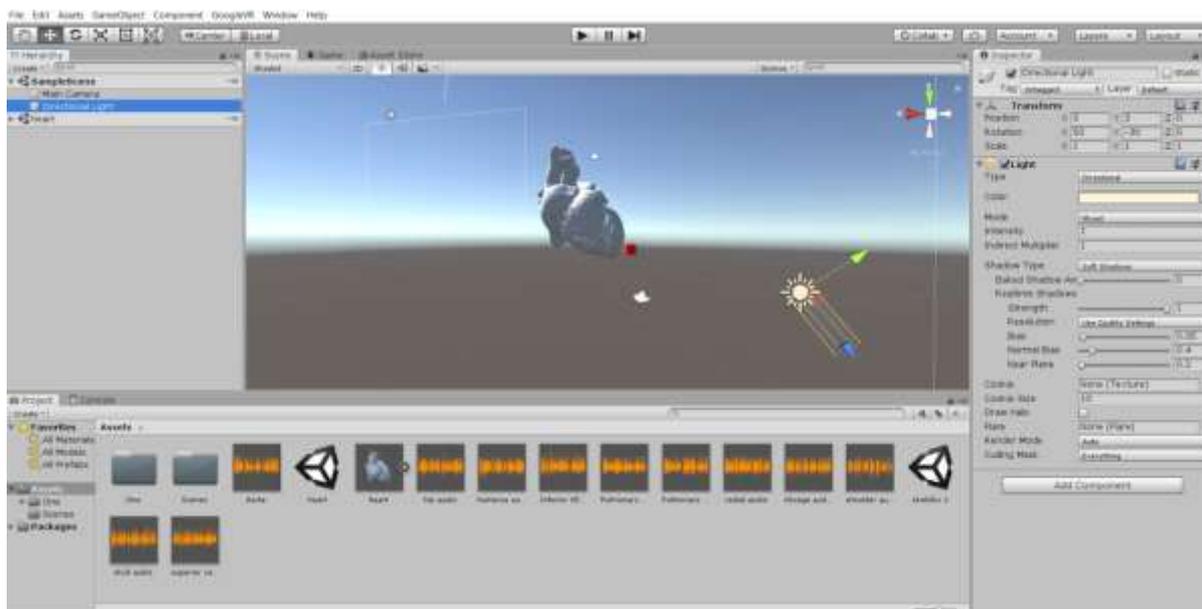
Virtual reality (VR) means experiencing things through our computers that don't really exist. Today the Virtual reality (VR) technology is applied to advance fields of medicine, engineering, education, design, training, and entertainment. VR is a computer interfaces which tries to mimic real world beyond the flat monitor to give an immersive 3D (Three Dimension) visual experiences. Often it is hard to reconstruct the scales and distances between objects in static 2D images. Thus the third dimension helps bringing depth to objects. On the other hand Augmented Reality (AR) is improving the way of visualizing objects in the real world. Augmented Reality (AR) is used for blending the interactive digital elements like visual overlays, haptic feedbacks and other sensory projections into our real world. AR is a technology that finds uses in matters like business to warfare to medicine. In the warfare world AR is used to create digitally enhanced modules for different types of trainings. The possibility of AR and VR tech are limitless because of virtual environments and virtual objects.

II. MOTIVATION

Motivation plays a very important, and possibly the most important part in the learning process. Educators know that if we are able to connect learners with ideas and concepts, and motivate them to discover more, that successful outcomes have a very high probability of being realized. VR can provide the learner with opportunities for autonomous learning. There are the certain applications which are readily available for the learning as well as entertainment purpose with respect to VR and AR. The project developed by Castrol Edge named as Virtual Drifting with VR helmet. The helmet has used different visualization techniques and artificial intelligence algorithms to demonstrate the real and virtual environment context. The Castrol edge has used the VR helmet having its inbuilt NVidia 980 graphics card supported to it. The drawback of that helmet was it was using too much power supply. Another application was developed by classVR to educate students was consists of local network where multiple modules are stored on local database. The drawback of that system was only limited number of students were able to access the VR device headsets.

III. METHODOLOGY

In the virtualization world there are multiple options available to design interface such as Unreal Engine 4, Unity etc. Unity is open source software used to develop the 2D as well as 3D games across multiple platforms such as Android, Windows, Mac, Linux, Blackberry etc. Unity standalone doesn't support the virtual reality and augmented reality.



To implement the Virtual reality application Google VR (GVR) SDK is used. Google VR SDK is open source and can be integrated over different applications. GVR SDK provide support for head movement, cardboard input, daydream input. Steps to develop an android app are given below

1. Download Google VR SDK
2. Import GVR in Unity
3. Configure GVR Reticle Pointer
4. Develop a UI Level and Module Level
5. Build the project and generate APK

As per the requirements of project 2 modules were implemented in unity:

1. Biological Module: Biological module consists of 2 modules of human body parts such as Skeleton and Heart. While designing the 3D modules the main issue was mobile devices does have limited storage space as well as processing power. By keeping that in mind the modules have been developed using low poly assets.
2. Puzzle module: The main aim to develop this module was to increase problem solving skills, cognitive skills, hand eye co-ordination. The module was developed in such that it allows user to move virtual environment with the help of controller and VR Box. In this module we have implemented multiple levels of puzzles in which we have to grab the multiple objects and place them on a specific location by following certain track. The track was designed in a way to improve decision making skill.

To implement the Augmented Reality application unity requires the support of Vuforia Augmented Reality components. Augmented Reality makes the use of real time objects to tag the virtual objects. Vuforia makes the use of machine learning algorithms to detect the object reference points. Steps to develop Augmented Reality app in Unity:

1. Download Vuforia AR Component for Unity
2. Import assets of Vuforia AR in Unity Project
3. Delete the Main Camera and Replace it with AR camera.
4. Open Vuforia Development Website
5. Create Database by uploading 2D image or 3D object
6. Download Database having reference points
7. Import Database in Unity
8. Add image component from Vuforia in unity
9. Import 3D module to take place on 2D image or 3D Object
10. Configure 3D module over image component
11. Build the project and generate the APK

As per the requirement of project an Android app based on AR is developed containing 3D modules of insects and Biological parts.

Results:

1. VR App:

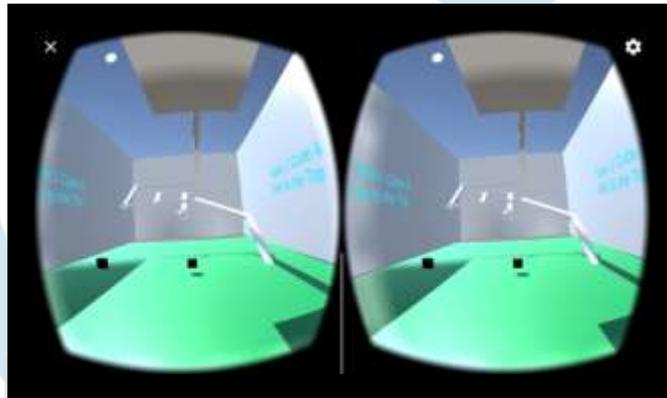
To make the interaction more immersive it colliders is added at multiple points of organs. To interact with colliders GVR reticle pointer is used. For more immersive experience narrations are added over colliders. When we interact with colliders gets activated. Triggers invoke the canvas panel as well as narrations.

a. Biological Module:

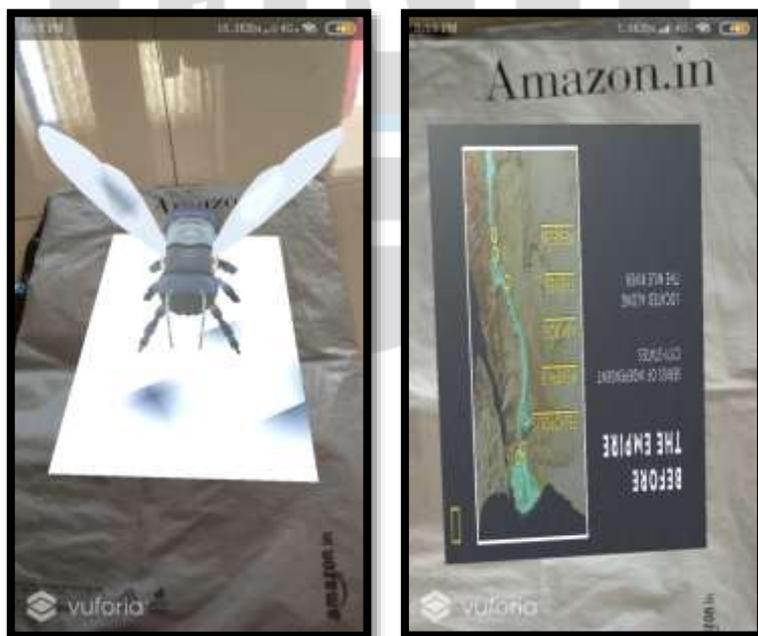


Fig.: Biological VR Module

b. Puzzle Module:



2. AR app: The results of AR app were quite a different than previous app. The AR app did use the mobile camera based on that image identification took place.



IV. CONCLUSION

The conclusion of this paper is we that we have successfully implemented the Virtual Reality and Augmented Reality concepts and turned it into an educational application with the tools available to our disposal. The main aim was to create an Android Application supporting Virtual and Augmented Reality that could be run on multiple existing Android Platforms without the need of expensive hardware. Also, we were able to make the application light weight by using 3D models having lower number of Polygons, so that it run in even low spec smartphones. Without the need of high spec hardware, the cost for this implementation has been very low, which indeed would be beneficial for the common people who are going to use these systems. Thus, we have successfully managed to create an Educational Android application that has following advantages: Low Cost, High Efficiency, Reliable, Interactive, supports Virtual and Augmented Reality.

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