Learning Based Interface Modeling using Augmented Reality

Akshay Indalkar[1], Akshay Gunjal[2], Mihir Ashok Dalal[3], Nikhil Sharma[4]

[1] *Student, Department of Computer Engineering, Smt. Kashibai Navale College of Engineering, Maharashtra, India*
[2] *Student, Department of Computer Engineering, Smt. Kashibai Navale College of Engineering, Maharashtra, India*
[3] *Student, Department of Computer Engineering, Smt. Kashibai Navale College of Engineering, Maharashtra, India*
[4] *Student, Department of Computer Engineering, Smt. Kashibai Navale College of Engineering, Maharashtra, India*

ABSTRACT

Augmented Reality (AR) is a widely growing field with a lot of scope in future. It is basically a technology that maps a virtually created world onto the real world that we live in. In an AR based application, digital models of objects like trees, boxes, etc. are rendered on a video camera feed, giving the user an illusion of the presence of the digital objects in real world. "Pokemon Go" is one great example of Augmented Reality application, which has gained worldwide popularity. We are going to provide an E-learning platform which is a mobile based augmented reality application. This application helps the student to learn or study any concepts efficiently, by providing an experience based learning model. The proposed E-learning application is a combination of real world and virtual world to give users an interactive user interface. It is developed as a substitute to the traditional ways of learning from textbooks that have textual contents within it, aiming to a relatively low efficient memorization based learning. E-learning application allows user to interact with the information which is being presented virtually on their phone screen. This project aims to build an interactive E-learning application which makes use of AR, i.e. an AR based learning-model, to help the user get a better experience at learning about various things. The proposed AR model aims to increase the user involvement in the product being delivered, by increasing interactivity, providing ease of operation, and other elements like audio narration, thereby increasing the efficiency of users' learning.

Keywords : - *Augmented Reality , Unity 3D, Vuforia ,Scenes*

1. INTRODUCTION

Augmented Reality is a technology that is used to create virtual environments embedded within the real environments. The virtual environments are made up of digital models and digital objects that can be constructed and placed in the environment as per the scope of the application being developed. Looking at the popularity of the Augmented Reality technology, it is evident that the emerging technology has widespread scope in various fields. It has been used in the widely popular game called "Pokemon Go"; it also has uses in Civil Engineering where the virtual architectures can be interacted with in real environments; it also has uses in the field of Entertainment where we can make use of virtual worlds to make animations and film scenes look even more realistic. Because of the immersive nature that Augmented Reality provides, its benefits can be used in the field of education also to enhance the efficiency of student's learning.

1.1 Augmented Reality and Learning

Applications based on Augmented Reality provide an immersive experience to the users, i.e. the users are more likely to remember the live experience as compared to the textual counterparts. Moreover, it is more likely to recall events that one has supposedly "experienced" as compared to the ones that the same person had "read" or "learned". Developing applications based on Augmented Reality that create the virtual environments corresponding to certain concepts of the students' syllabus have a potential to impart knowledge upon the students with a much better efficiency as compared to the conventional way of gaining knowledge via textbook reading.

Moreover, it is faster to grasp new concepts if there are practical examples regarding the concepts. With Augmented Reality, concepts can be elaborated with practicality. Say for example, we want to learn about Gravity. Now, with Augmented Reality, a virtual simulation of a gravity[4] based world can be created where the user can experience the effects of gravity by interacting with the objects present in the virtual world. The user can move the object to various positions and the logic developed in the application will move the object under the influence of the virtual world's gravity. This motion can be observed and the user will have a practical experience of the gravitational concepts. Similarly, with good programming, applications can be developed to demonstrate various concepts that a student may study like Geometry concepts, Chemistry concepts, Biological concepts, etc. These applications provide practicality, and thus provide an effective way of learning.

To support the intended use of Augmented Reality in learning sector, we can see that in [1] the impact of learning via AR is evidently high, as the recorded feedbacks were positive and students reported this way of teaching was more interesting and fun to learn. Therefore, the motive of creating an AR based mobile application aiming to facilitate efficient learning is justified.

2. DEVELOPMENT OF THE AUGMENTED REALITY APPLICATION

To develop the desired AR application described in this paper, there are multiple platforms available for the designing and modeling of the application. This project makes use of the development platforms that facilitate easy AR development and are easily available, the software platforms namely being Unity3D, Vuforia and Android Studio. All of these platforms can be accessed freely under an open source developer license.

Basically, the approach used in this project is marker based Augmented Reality, wherein a marker (an identifier) is to be located in the real world in the first place, and then the virtual environment is rendered with respect to the marker. Following are the short descriptions of the software platforms used to develop the application:

- Unity3D:

  Unity3D is essentially a game development platform[6], that provides tools to create Game Objects like the player, the enemies, the world objects like stones, boxes, walls, doors, light sources etc., basically the parts that make up a game. Unity3D is basically a game engine that facilitates development of other games. A game engine is the most essential component in a game, which governs the interaction of the entities in the game.

  The scope of Unity3D can be expanded, making it possible to develop so called "scenes" for the AR applications. These scenes contain the virtual environments that will be used in the AR application. Using the tools in Unity3D, we can associate the scene's objects with certain behaviors using scripts and other components, thereby making it possible to design scenes as per the requirements of the application. This platform is the one where the AR application's practicality is designed.

- Vuforia:

  Vuforia provides the SDK (Software Developmet Kit) required[7] to build the AR application's core model, i.e. the tools to facilitate AR. Vuforia SDK is imported in Unity3D platform to enable AR development. Unity3D enables the virtual "scene" development whereas the Vuforia SDK associates these scenes with the AR components like the AR Camera, Marker Database, Image Targets etc.

Vuforia maintains a database of markers, which are basically identifiers with respect to which the virtual environments will be rendered. These databases are to be imported in the Unity3D platform, after which the Unity3D platform can be used to design the scenes with respect to the markers. Vuforia also provides an AR Camera which has the tracking capacity to track the markers from the databases, and accordingly render the AR scenes.

- Android Studio

Android Studio is a platform that can be used to develop Android based applications, that can be deployed for use on the mobile platforms supporting Android OS. The use of this platform is limited to the Application Building in our project, i.e. the SDK tools provided by the Android Studio are used here to make the Android Application Package (apk) file for the developed AR application, in order to deploy the application on mobile platform.

3. SYSTEM ARCHITECTURE AND WORKING

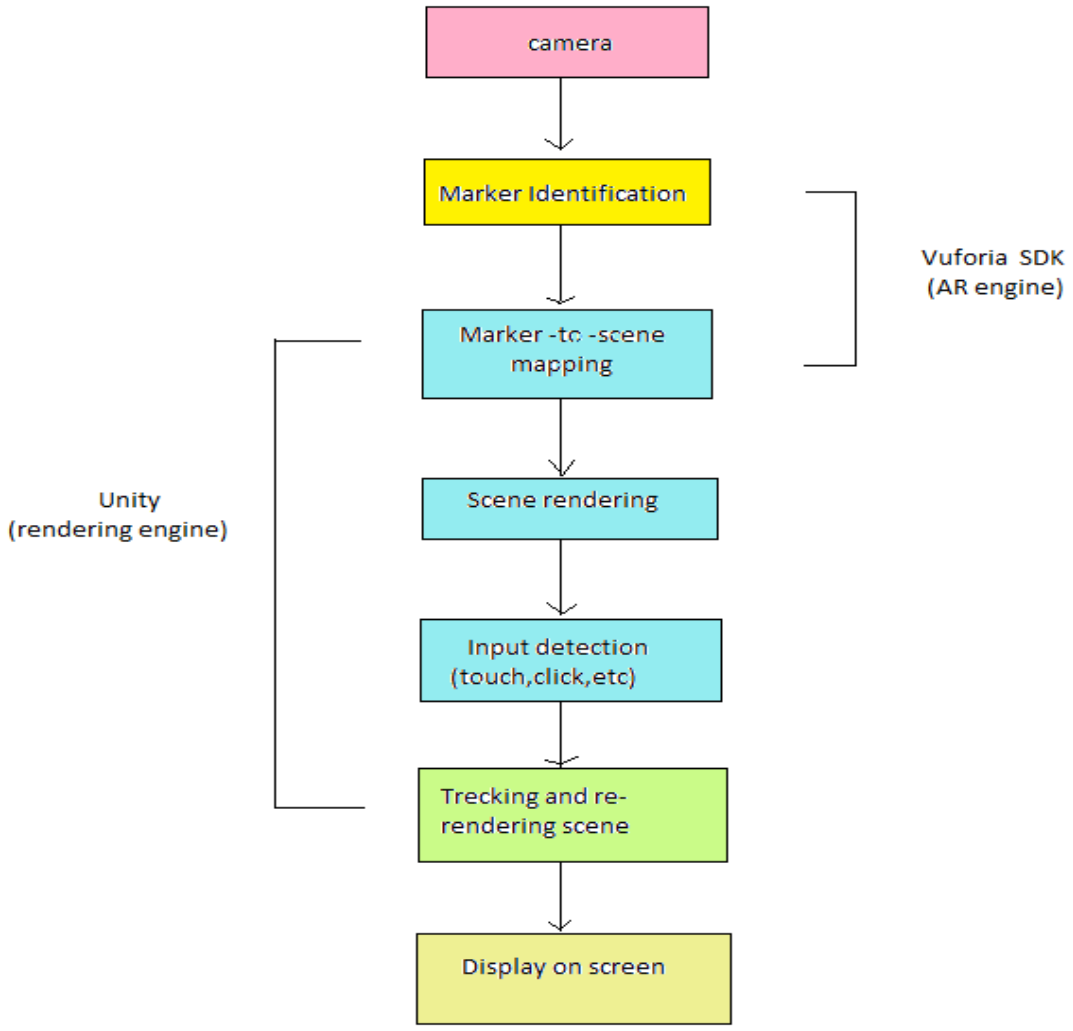

Fig-1: System Architecture

- Initially the Mobile AR application is installed and opened.
- The camera of the smart phone is used to identify the marker to render the different scenes(collection of virtual objects).Marker is nothing but a image on which the scene resides.There are different marker for different scenes.
- Once the marker is identified the correspondent scene will be rendered.
- The user then start interacting different virtual objects(i.e scenes) to learn any concepts of its interest.there is also text-to-speech option provided to user.
- When the user give any input to the AR application it will display information and 3-D virtual object.
- The camera need to be at optimal distance from the marker for continous rendering of virtual object. That is why continous tracking of marker is done by the camera and re-rendering is done when camera goes away from the marker.

4.Related Results

- Chemistry model

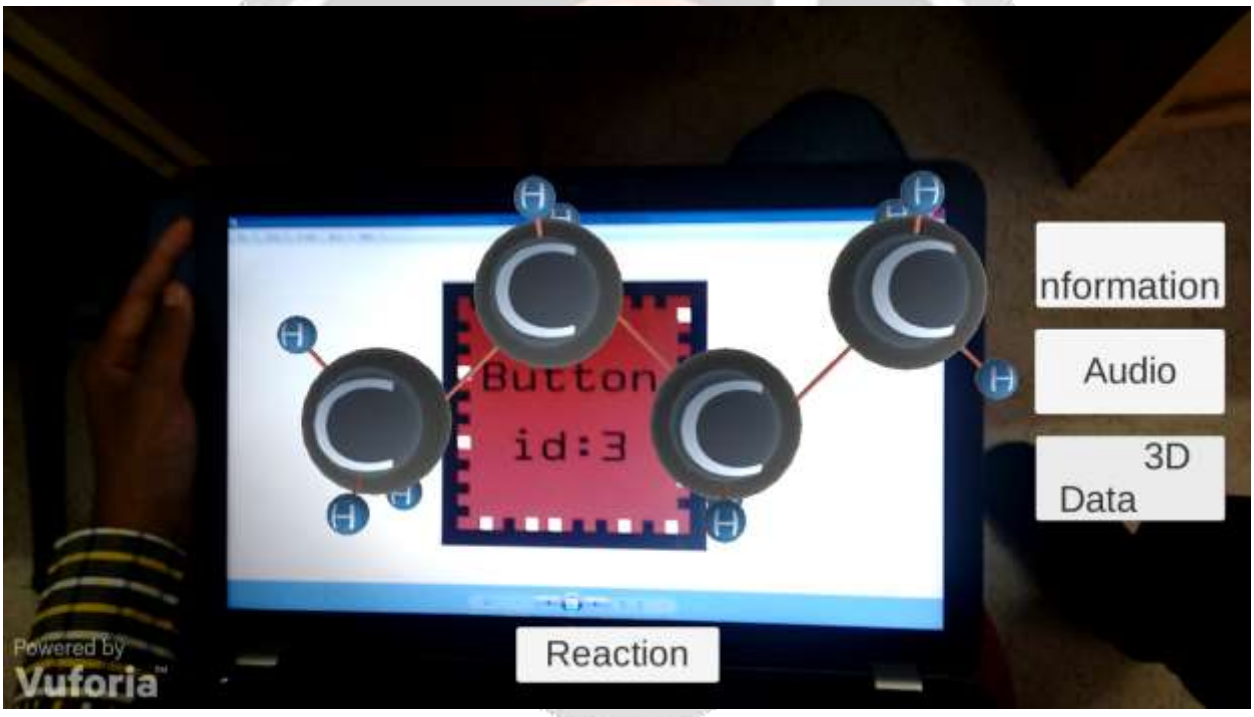

Fig -2: Chemistry model

Fig-2 shows a chemistry model of learning where different elements when react with each other gives a chemical compound. The user will interact with the AR application for learning. Various option such as information, audio And reaction among the elements is provided to the user. Audio option in the Fig-2 converts the text information into audio which is a text-to-speech feature.

- Biology model

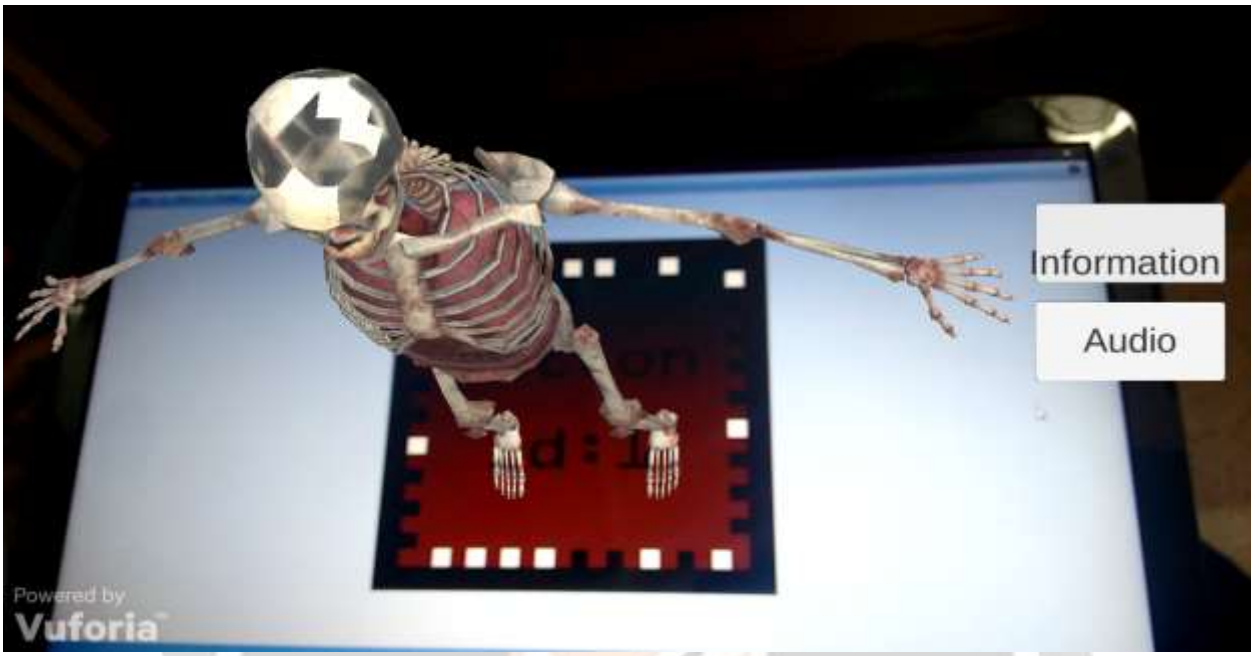

Fig -3: Biology model

Fig-3 shows Biology model of learning where user can learn various organs. The information about it. In fig-3 skeleton is shown the user will interact with the virtual object in this case the skeleton to learn various information.

- Solar system model

Fig-4: Solar System Model

Fig-4 represents Solar system model. Initially all the planets will revolve around the sun. Different buttons are provided to the users so that the user can choose a particular planet and gets it information. Zoom in and zoom out feature is also provided in the AR application. The user will have full access to the application as user can switch between various scenes or model to learn. Learning through the AR application is easier, interesting and fun.

5. CONCLUSIONS

This paper gives one approach for learning using augmented reality where we develop an mobile based Augmented reality application using Unity 3D and Vuforia. The application provide better experience for learning by interacting with 3D models/scenes. It will provide an interactive way to experience things. Using this application any topic or concepts the user wants to learn can be embedded using AR technology. The application contains primary modules such as Solar system which will give information about all the planets using 3D model of various planets, second module is chemistry reaction model which will show reaction of different chemical compounds using 3D animation and last module is biology module which will give information about various organs. In this way learning will become fun and interesting along with the improvement in the retention , concentration and performance of the user.

6. REFERENCES

[1]. Min-Chai Hseih, "Teachers' and Students' Perception Toward Augmented Reality Materials", Department of Information Management, Fortune Institute of Technology, Kaohsiung, Taiwan

[2] Yeon-Jae Oh, Young-Sang Suh, Eung-Kon Kim, "Picture Puzzle Augmented Reality System for Infants Creativity", 978-1-4673-9991-3/16/ IEEE 2016

[3] Purva Kedari, Puja Mahamulkar, Eram Khan, and Shalakha Kholi, "Augmented Reality using Hand Gesture Recognition System and its use in Virtual Dressing Room", International Journal of Innovation and Applied Studies ISSN 2028-9324 Vol. 10 No.1 Jan 2015,pp.95-100.

[4]. Shivnarayan Rajappa and Gaurav Raj, "Application and Scope Analysis of Augmented Reality in Marketing Using Image Processing Technique", 978-1-4673-8203-8/16/IEEE 2016.

[5]. Hong-yi Pai. "An imitation of 3D projection mapping using augmented reality and shader effects", Department of Multimedia Design, National Formosa University.

[6]. http://www.unity3d.com

[7]. http://www.vuforia.com