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Research Paper

Augmented reality for history education

Manu Raghaw*[1], Joy Paulose[2], Bhargavi Goswami[3]

[1]*Department of Computer Science , Christ University, Bangalore, India*
[2]*Department of Computer Science , Christ University, Bangalore, India*
[3]*Department of Computer Science , Christ University, Bangalore, India*
**Corresponding author E-mail: manu.raghaw123@gmail.com*

Abstract

Augmented Reality is live, direct or indirect view of a physical real world environment whose elements are augmented by personal computers (PC) that produces the information such as sound, video, designs or GPS data. This paper shows an instructive mobile application based system model on Augmented Reality which is used to learn subjects like history through augmented videos. The objective of development of this system model is to make the learning interesting for the young generation. Unity 3D and Vuforia Augmented Reality Software Development Kit (SDK) is used for the development of this model. The prime purpose of this application model is to enhance the learning process with digital technologies. This paper has step by step implementation instructions for the development of augmented reality modeling that can supplement the current teaching-learning environment to generate interest among young generation in less interesting subjects such as History, Geography, etc.

Keywords: *Augmented Reality, Ar Mobile Application, Learning*

1. Introduction

Augmented Reality (AR) is a technology which provides the environment of existing real world by using sensors, sound, video, graphics, images, Global Positioning System (GPS) and text. First Introduced in 1960, Augmented Reality has gained popularity only through recent innovations such as 3D-9D objects implementation or Augmented Reality applications [1]. With the Introduction of new interfaces interacting between humans and computers, researchers are inspired to contribute in other areas where augmented environment can be introduced [2]. This technology is a combination of simulations, sensors and mixed reality that generates the perception of real scenes by the users providing them the feel as if the person in the real situations [3].

Considering the traditional method of teaching and learning, young generations are running away from the learning environment of theory lectures because other graphical gadgets create interesting environment for them. The surprising statistical reports predict that more than 75 percentage of the world's populations will own smart phones in coming five years [3]. As a solution to the challenge faced by pedagogy of current education system, Augmented Reality is a one stop solution.

Instead of bringing the youth away from the graphical gadgets, education should be incorporated in these graphics enabled gadgets such as smart phone apps, videos, visit through simulations, etc by means of augmented reality. Augmented Reality can drastically shift the diverted interest of youth from games and videos and can be brought back to subject knowledge of History, Chemistry, Physics, Geography, etc. Since, teaching and learning theory subjects such as history have been a major concern because it has stories, 2D images, some dialogues and majority of contents. Students, while learning the subject of history, feel monotonous and boredom as the most of the content has paragraphs. For teachers, making a student understand history is an uphill struggle. In this paper, authors propose a system model by generating a marker based augmented reality objects to overcome this major problem currently existing in the world of education.

This paper shows an instructive mobile application based system model on Augmented Reality which is used to learn history through augmented videos. The inspiration behind this project is to coordinate significant savvy innovation of Augmented Reality into the learning procedure in order to improvise the learning outcomes among the young generations.

Section 2 shows the literature review done by the authors of this paper followed by section 3 that provides the details of designed system model. Section 4 shows step by step procedure for development of system model. Section 5 provides details of the resultant system model and its working. Paper is concluded in Section 6 followed by references.

2. Literature Review

Numerous research papers have delineated the blending of Augmented Reality innovations with potential outcomes obtained by implementation of recent mechanical advancements in Augmented Reality. Most referred research papers demonstrate that Augmented Reality will help in improving the standard of training in implementation of real environment situations in systems.

A few scientists examined the benefits of utilizing Augmented Reality in training and education. One of the researches was done by scientists from University of Sussex [4]. The research states that the ordinary instructional techniques have filled its need well, yet their square measure parameter has few lacks. One of the biggest issues with the ordinary systems square measure was keeping

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up the engagement of teacher with the understudies students to keep their interest in the subject. The examination found that utilizing Augmented Reality applications enabled the student community to visualize the contents using 3D modeling and multimedia visualizations. Researchers were successful to develop 3D outline of the instructing material for students for better understanding of the subject. Furthermore, the understudies could adequately see the presented subjects utilizing the hypermedia content developed by researchers. The scientists finished their examination by discovering that Augmented Reality so supplied the students with a satisfying interesting content to keep interest in line with subjective contents [4].

In paper [5] authors introduced an inventive approach that offerd preferred e-learning over the past virtual reality instructive applications. This research determines how learners perceive their experiences in the virtual space and use communication strategies (CSs) in the process of advancing communicative competence in English. The proposed technique supplied students with dialogues in virtual system, enabling students to accomplish their participation in conversation of shared objectives using Virtual Reality. The conventional content based or electronic virtual reality frameworks were by and large less appealing to understudies as a result of their absence of 3D inundation and constant voice communication. Authors proposed an intelligent virtual English classroom based on Virtual Reality. The objective was to upgrade students English communication skill [5]. The proposed application promoted positive student attitude and interactive learning experiences.

Study led by scientists of [6] intended to audit the benefits of utilizing Augmented Reality in Mathematics. The students struggled with the complexity of the subject which repeled them from the subject such as Maths. With AR applications the understudies students were prepared to work specifically inside the AR house and see the 3 dimensional articles with its applicability. Furthermore, AR applications helped the understudies to comprehend the propelled issues and build relations with real time applications of Mathematics in 3 dimension visuals. Developed AR applications were intended to advance teaching learning experience for teachers and students both, as indicated by an investigation led by the authors of [6]. The investigation tried development of an AR application that requires at least two clients to cooperate with a specific end goal to acquire the right outcome [6].

Paper [7] described Augmented base mobile application which was used to learn chemistry. This application basically focus on two things first is organic chemistry and second is general chemistry. Organic chemistry threw light on the structure of carbon compounds wherein general chemistry depicted reaction of four common components' combination of hydrogen, oxygen, sodium and chlorine [7]. This paper gave clear insight of chemical bonding using graphics which was the major requirement of undergraduate teachers. The applications are user friendly and in line with the subjective content.

The authors of [8] came up with a mobile based 3D geometry construction tool designed for maths and geometry subjects named as Construct 3D. It was based on "Studierstube" named as Mathematics and geometry education with Collaborative Augmented Reality System (MCARS). It happens to be a 3D tool specially designed for geometric and mathematical education [8] where the authors have tried to improvise spatial derivation abilities and maximize the flow of learning. With hybrid hardware setup, the use of Construct 3D was a testbed for future evaluations. "Construct 3D" is on easy tool to learn and explore spatial equations and skills [8].

Paper [9] described desktop based game application "AWAKENING". The main objective and focus of this paper was to present Gamification as the better way to teach students over the traditional classrooms. And the authors created a history based game tool to achieve this goal. This game was developed by unity 3d. This game explained regarding cultural arousal, non secular and social reforms in Bharat before independence. It included western impact and origin of Brahmo Samaj, Arya Samaj, Prarthana Samaj and Ramakrishna movements that lead Bharat into a brand new horizon and tried to defeat the non secular and social superstitions yet as unwanted customs[9]. This introduced students with the historic characters and their profound features and characteristics.

Paper [10] portrayed their application SMART that was an instructive framework utilizing Augmented Reality innovation developed by The authors. Their venture utilized AR innovation for showing low training level ideas, similar to the proposed that of transportation and sorts of creatures. Their framework overlayed virtual models like truck, car and plane, on the imperative time video sustain appeared to entire category [10].

In paper [11] a minimal effort intelligent condition including AR innovation for instructing and learning improvements exhibited. The advancement of the arrangement was that it can propose understudies high intuitive human-PC interface for model control and subsequently watching the subtle elements in 3D space. "Auto desk 3DSMax" was used for 3D scenes creation and for expansion through ARMedia Plug in. The impact of this approach was expanded the way that understudies are included in collaboration with AR learning objects, as well as in a creating procedure of 3D learning objects [11].

Paper [12] described application "MARIE" which was centered up on upgrading the educating and learning process in Augmented Reality. This system is for engineering students to improve their learning methods [12] using simulation of machinery used by them in workshops.

The authors of [13] intended to develop a 2D standardized identification hand held augmented reality upheld learning framework called "HELLO" ("hand held English dialect learning association"), to enhance understudies' English level. The proposed framework comprised of two subsystems: an English learning administration framework and a portable learning devices framework [13], one for teacher and one for learners. Authors intended to create interest in the subject of English, by bringing interactive communication and developing linguistic skills, they contributed towards the aim stated in the paper.

3. System Model

In this paper authors propose a system model of a mobile application as shown in Fig.1 which is used to learn history using augmented video. In this application scanned images are demanded from users and it will show the history related to that particular image. For example, if the scanned image of map of India is provided, it will show up the videos stating India's history.

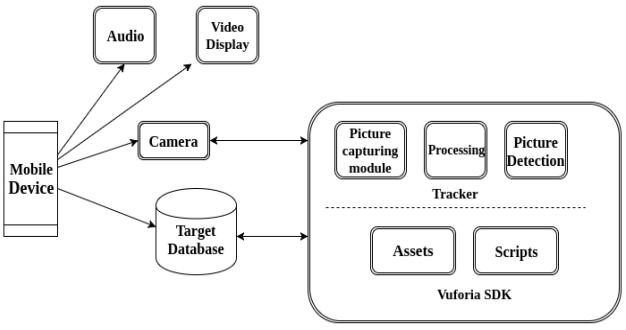


Fig 1: Architecture of System Model

This application is developed by using Unity3d and Vuforia Augmented Reality Software Development Key (ARSDK). Here Unity3D is used to create the application and Vuforia AR SDK is used to link the Augmented Reality camera and the image tracker. Tracker is used to detect the image target which is stored in the database. Assets and Scripts working along with access of Target Database is explained in details in the same section after describ-

ing the model. As shown in Fig. 1 first step is to open the application camera and scan the targeted image using mobile device. Once the image is scanned, it is sent to the picture capturing model for recognition. If the image is recognized it is sent to the processing model. Processing model then detects the marker position and send it to the tracker model. Tracker model then identifies marker and send it to the rendering model. Rendering model using picture detection will mark a virtual object to the marker and hence the augmented video will be played.

4. Setup of System Model

In this section step by step procedure for setting up the system model is discussed. Complete details of step by step procedure followed for setting and configuring the Augmented Reality based model of teaching and learning is provided in this section with the aim of inspiring more researchers to the domain of Augmented Reality so that they come forward and contribute to such Teaching Learning Modeling.

Table 1: Reference of figure according to steps followed system modeling

Step	Particulars	Reference Figure
1	Creation of Project	N/AFig 2, Fig 3
2	Importing created packages	
3	On creation of login account of developer.vuforia	Not applicable
4	Add target database	Fig 4, Fig 5
5	Generate license Key	Fig 6
6	Provide license key in Unity	Fig 7
7	Provide videos generated by developers	Fig 8
8	Create Android Application to support AR.	Fig 9, Fig 10

The following steps are recommended for generation of AR based model over Unity using Vuforia that was followed by the authors during the development phase of History based AR Model which is provided in Table 1.

Step1: The first step is the creation of a new project and creation of a new scene using Unity Tool. This tool is open source and available at [14].

Step 2: Next step is importing created packages and vuforia videos package using assets menu which is shown in Fig 2 and Fig 3. To allow developers of the creation of the package and including it in model for usage, this step is inevitable.

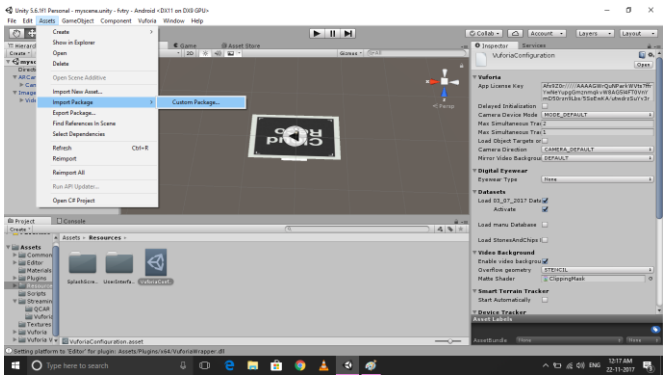


Fig 2: Selection of custom package in Unity3D

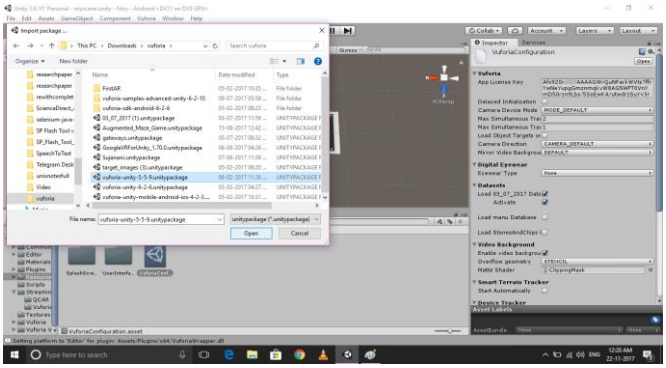


Fig 3: Import Package Vuforia in Unity3

Step 3: On the developer.vuforia, creation of login account followed by login procedure is the next step. This step has been made mandatory for the usage of open source tools and thus, inevitable too. The intention behind development of database is to provide faster image based search operation.

Step 4: Using Target manager database is added. In database, system developers are supposed to provide image target once the database is created. Before proceeding further, download the database package and import in unity 3d in assets and loading procedure of data base is invoked as shown in Fig 4 and Fig 5.

Step 5: On developer.vuforia, using license manager license key is generated as shown in Fig 6. Without this step, developers are not allowed to move towards configurations.[15]

Step 6: The generated license key is to be provided in vuforia configuration over unity 3D. This license key is used as connectivity between vuforia database and unity project as shown in Fig 7. Once this step is performed, system developers are connected to the database successfully.

Step 7: Further, in unity platform, path towards assets folder is followed to access StreamingAssests where, newly created videos are provided. After providing the video, system developers need to set the path of the newly provided videos to the playback script where system developers must also provide icons related to play, error and loading as shown in Fig 8.

Step 8: Once this procedure is completed next step is to create the android App for this project. For this process, over unity platform system developers need to configure build setting. Configuration is done for selection of scene and selection of android platform followed by invoking the procedure of build and run as shown in Fig 9 and Fig 10.

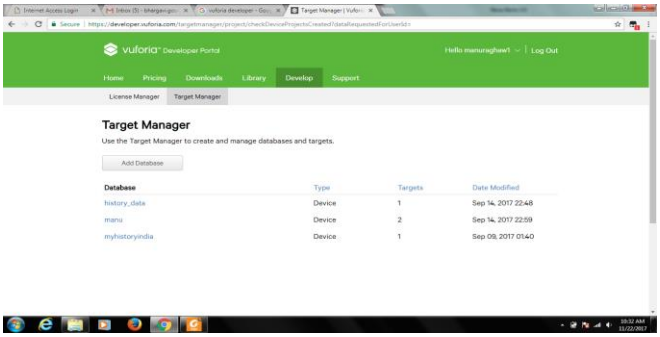


Fig 4: Download history package from vuforia

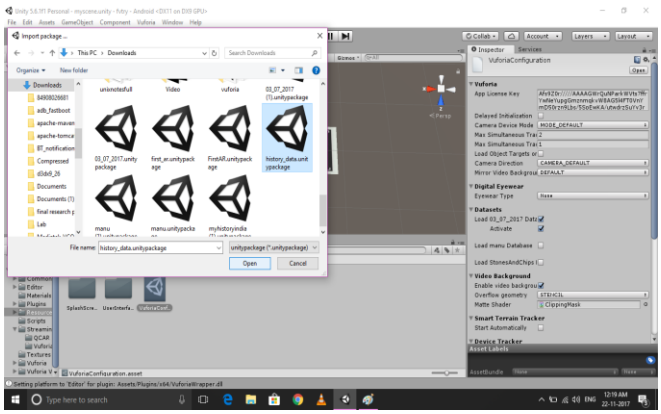


Fig 5: import history package in unity3D

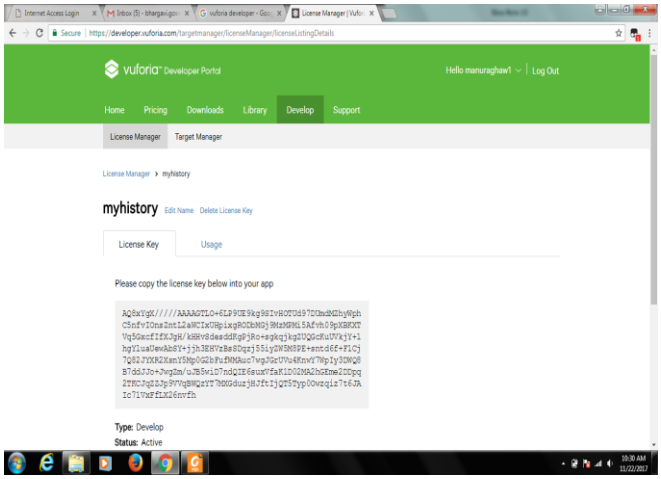


Fig 6: Copy API key from license manager

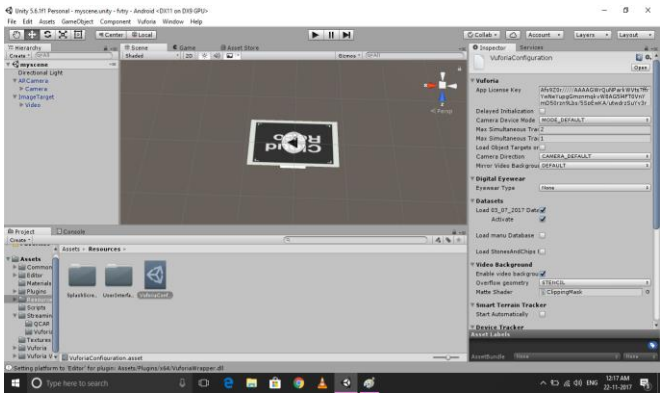


Fig 7: Provide API key in Vuforia Configuration

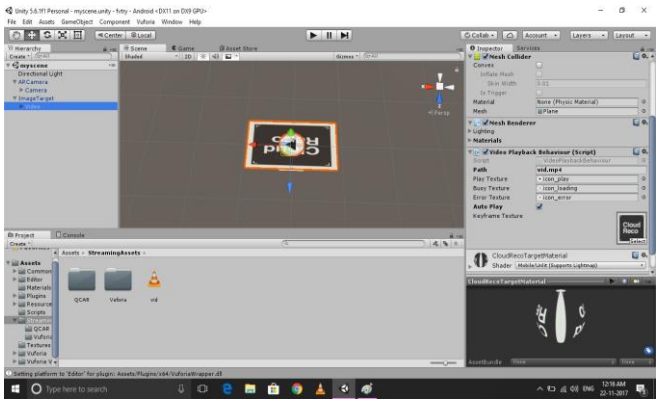


Fig 8: Add video and perform video configuration

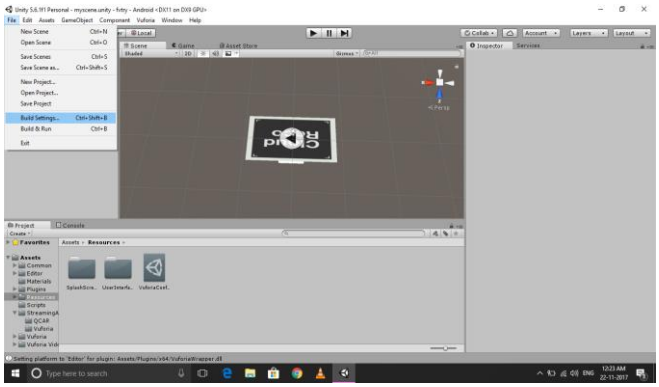


Fig 9: Configuration of build setting

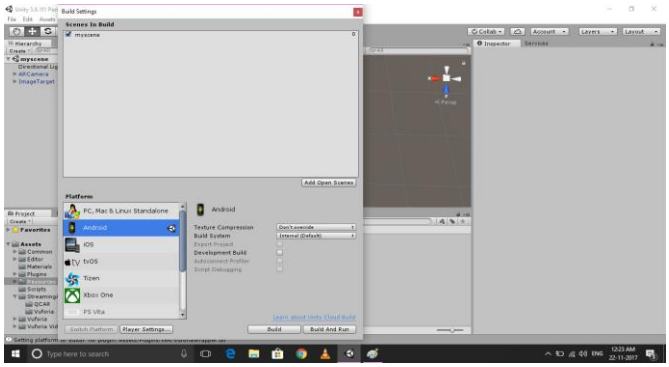


Fig 10: Configuration of platform setting

Now, system model is ready and details about working of the system model is provided in next section.

5. Working of System Model

Once the working of the entire model is developed, it provides the service of history related augmented videos supporting system to the students and all those who wants to learn History using Augmented Reality. It is developed with the intention to support student community in the focus and hence provides assistance to the tutor community to make the classes interesting. Once the development of the system model is ready, it provides the User Interface that is shown in Fig. 11 and Fig.12. An android phone is required for execution of this application. First, user open the application camera and scan the targeted image as shown in Fig.11. Next, image is scanned using the camera and scanned image is sent to the picture capturing model for performing recognizance. On successful recognition of image, it is to be forwarded to pro-

cessing model. The detection of marker position is done by Processing model before sending it to the tracker model. Further, the identification of marker is done by Tracker for further processing done by rendering model. After all the process completed by Rendering model marking of virtual object to the marker will be performed which will now initiate the loading of video to be played. Thus, the related video starts playing as shown in Fig.12.

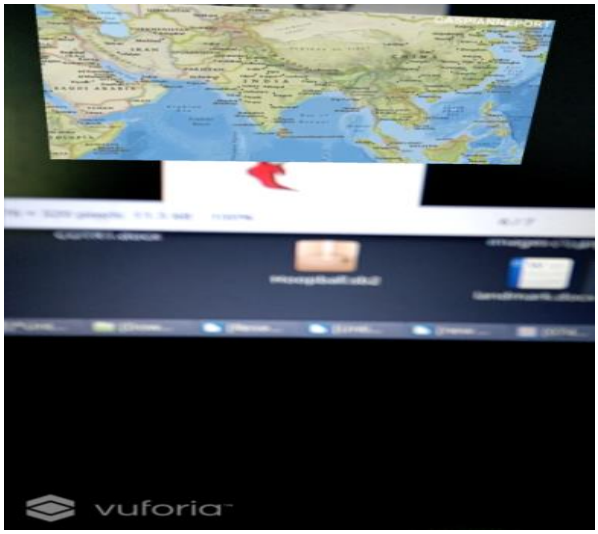


Fig 11: Augmented Video 1

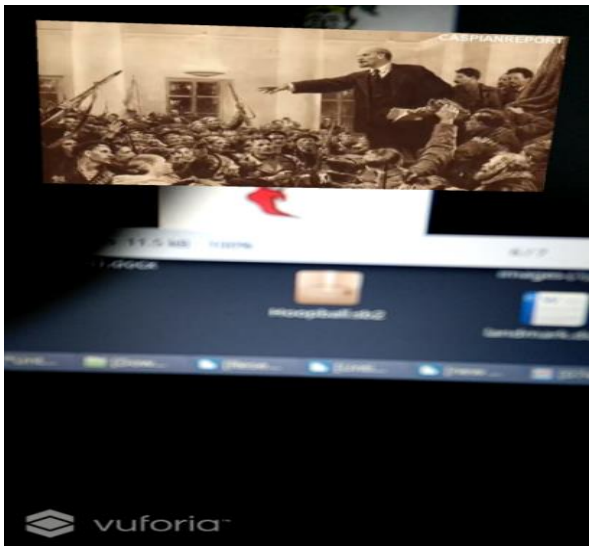


Fig 12: Augmented Video 2

6. Conclusion

This paper introduces a scholastic portable application of Augmented Reality intended to encourage understudies students adequately to see history through videos and learn the history related curriculum actively with interest. The inspiration driving this undertaking of important sensible innovation into the teaching learning domain through augmented reality is profound contribution to instructive techniques for teachers for their pupils, making the class interactive, live and interesting, consequently improving the instructive cum students involvement and performance results**.**

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