A SURVEY ON AUGMENTED REALITY APPLICATION FOR SCIENCE EDUCATION

Gokul K
MCA
College of Engineering Trivandrum

***Abstract*—Augmented reality (AR) is an enhancing area that is getting more and more used in different areas. The educational sector has benefitted tremendously due to the advancement in technology. A lot of technologies have been used in the educational sector. Augmented Reality is one such emerging technology that has huge promises in the field of education.an Immersive Augmented Reality application in conjunction with a book, can act as a new smart learning method by engaging as many of the user's senses and human functions as possible.**

***Index Terms*—Immersive Augmented Reality; Smart Education,Augmented Reality, Interactive Learning.**

I. INTRODUCTION

The advantage of applying virtual reality in the education was to present those invisible situations and abstract concepts with static or dynamic methods, transferring the abstract concepts into concrete knowledge and allowing the learners to feel and experience [1], [2]. Due to the fact that the leaners could not be perceptive about the changes in the surroundings when entering the virtual reality, a technology combining the real world was extended—Augmented Reality.mensional concepts, not only allowing the learners to observe abstract phenomena of science with their visibility but also letting them operate the tools and interface; such learning method could improve learners' perception along with their understanding in the learning. Moreover, in order to make the learners be immersive in the learning activity and achieve better learning performance

II. LITERATURE SURVEY

This section presents related literature concerning about the augmented reality application in the field of science education and how it improves the learning experience.

A. Review of E-Learning

The structure of e-learning is more likely to resemble a language or a conversation rather than a book or a manual. That is based on the network that have the dynamic information, obtain the teaching resources, allow learners to participate in the complex interactive virtual teaching activities, and other work condition. Creating a virtual environment which supports the information transmission of gaining knowledge, provides the opportunity to educators and Learners who and strengthen the teaching and learning experience . Though the information technology, digital link and peer collaboration, learners can search information to create content and collaborative learning . Most e-learning theorists are already there, and are exploring how learning content - whether professionally authored or created by students - can be used as the basis for learning activities rather than the conduit for learning content .

B. Augmented Reality

Augmented reality is an emerging technology which provides a direct view of real world supplemented by computer-generated material in the form of multimedia. Overlaying computer-generated imagery (CGI) onto actual physical surfaces is the core function of augmented reality systems. A composite or mixture of real and computer generated information is thus created. The term augmented reality emerged from research on mixed reality in the early 1990c's and has been defined as a real environment being augmented by virtual objects . Features of AR include immersion, navigation and real-time interaction . Digital information is superimposed on the real environment for the user's perspective, related with real-time interactivity.

1) Marker based Augmented Reality: Markers are images that can be detected by a camera and used with software as the location for virtual assets placed in a scene. Markers based image are square and using black and white color. Simple augmented reality markers can consist of one or more basic shapes made up of black squares against a white background.A camera is used with AR software to detect augmented reality markers as the location for virtual objects. The result is that an image can be viewed, even live, on a screen and digital assets are placed into the scene at the location of the markers.

2) Object based Augmented Reality: Object is nothing but any Real Image we used as scene, tracks its position, and display by playing a video or any digital information in the image's place.

C. Unity Editor

Unity editor is game engine used for developing game and AR based applications.unity editor with android build support are used to create the application.The Unity3D encouraged the AR based application to be less conflicted on the basis of its versions as it provides unique environment for executing codes on the handheld devices. The usage of third party tools (Vuforia and Unity3D) increase the safety parameters for execution as AR based application as it reduces the performance related interceptions by the kernel level environment as the Vuforia's performance on the variety of platforms is recorded as consistent and reliable. The core features used in the current

AR based application by the Vuforia are the image targets, object recognition, smart terrain with the support of Unity, cloud and text recognition and the virtual buttons. vuforia packages are imported to setup AR camera and preflabs and image targets are selected from the preflabs .these image target are configured.AR camera is setuped with tha licence key of vuforia target manager.

D. Vuforia Engine

Vuforia can serve as AR enabler for mobile devices on the real time basis. For defining the logical relations, pattern recognition and augmented reality. The dataset of 2D and 3D compiled in the form of database by using Vuforia, which is later imported into the "Unity Editor" for the developmental purpose. Interestingly, Vuforia provides APIs and extensions for wide range of handheld devices and development of android, iOS and AR applications. The 'Target Management System' (TMS) responsible to track and identify the image recorded by the user and match it to the existing data pool set of objects within the database. Ideally the intelligent TMS' tracking system consumes optimum time to identify and relate the user's input within the database. However, the visibility, image sensing, observable contrasts and blurriness of input image directly affects the performance of target tracking by TMS. To get the desired results from the TMS, the Vuforia Engine use the operations of camera for input. In other words, the Vuforia engine works like a bridge between the rendering platform and the operations of TMS in the current scenario. While compiling and integrating the lines of code to form logical arrangements within the application, the platform of Unity is used, where the 'Object Oriented Programming' (OOP) approach is followed by initializing, defining and calling the particular methods and attributes to classify each of the entity. After using the target management system which comprises of the engine and the database, offered by Vuforia, the Unity helps to produce the rendering platform and provide linking-in the audio, visuals, motions (i.e. Rotation and Zooming), lights direction and scene sensing to make each of the entity more interactive and appealing for the end-users. Furthermore, the functional and nonfunctional attributes like error handling, vuforia behaviour related scripts and databases are also entertained by this platform.

E. System Architecture

1) camera: A real-world live video is feed as an input in unity module. This live video stream is given as an input to the Image Capturing Module.

2) Image Capturing : The input to Image Capturing Module is the live video feed from the camera of a mobile device. This module analyses the camera feed, by analyzing each frame in the video.

3) Image Processing : Inputs to Image Processing Module are the images from Image Capturing Module. These images are processed using an image processing technique to detect

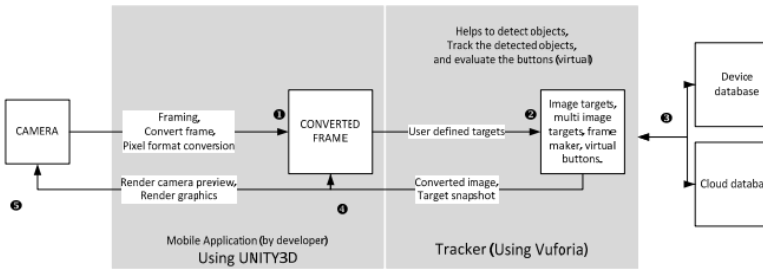

Fig. 1. System Architecture of the proposed system

the AR camera. Detection of AR camera is essential to determine the position, where to place the virtual object. Once the AR object is detected, its location is provided as an input to the Tracking Module.

4) Object Tracking : The tracking module is "the heart" of the augmented reality system; it calculates the relative position of the camera in real time.

5) Rendering Module: There are 2 inputs to Rendering Module. First is the calculate position from the Tracking Module and other is the Virtual Object to be augmented. The Rendering Module combines the original image and the virtual components using the calculated position and renders the augmented information on the display screen of the mobile device

III. CONCLUSION

AR technology is an effective tool that integrates real learning world with virtual world created by computer software and it is Easy to use and interactive. Student can acquire much more knowledge and experience in learning by using this technology in education as compared to the traditional method of learning. This technology has also increased their motivational level and the results indicated that the AR technology provided a fun and engaging environment. All the 3D models can be used again and again (reusable) without getting damaged. Therefore, it's an effective foundation to use AR technology as an educational tool. AR features are able to engage students in Learning processes and help improve their visualization skills.students can get clear understanding of chemical reactions and experiments through visuals and animation through this make learning easy. The features can also help teachers to explain well and make the students easily understand what they are taught.

REFERENCES

[1] R. T. Azuma et al., "A survey of augmented reality," Presence,vol. 6, no. 4, pp. 355–385, 1997ture by polarization analysis', IEEE J. Ocean. Eng., 2005

[2] ino F. Augmented Reality: A class of displays on the reality-virtuality continuum. In, SPIE Proceedings: Telemanipulator and Telepresence Technologies

[3] S. Cai, X. Wang, M. Gao and S. Yu, "Simulation Teach-ing in 3D Augmented Reality Environment," 2012 IIAI International Conference on Advanced Applied Informat-ics (IIAIAAI)

[4] H. López, A. Navarro and J. Relaño, “An Analysis of Augmented Reality Systems,” 2010 Fifth International Multi-Conference on Computing in the Global Informa-tion Technology (ICCGI 2010)
[5] Azuma, R. T. (1997). A survey of augmented reality. Presence: Teleoperators and Virtual Environments
[6] Serio, Angela Di, M. B. Ibáñez, and C. D. Kloos. ”Impact of an augmented reality system on students’ motivation for a visual art course.”
[7] . Cabero Almenara and J. Barroso Osuna, ”The educational possibilities of Augmented Reality”, Journal of New Approaches in Educational Research..
[8] http://www.augment.com/blog/5-reasons-use-augmented-realityeducation
[9] Lee, Kangdon. ”Augmented Reality in Education and Training.”
[10] S. Yuen, G. Yaoyuneyong and E. Johnson, ”Augmented Reality: An Overview and Five Directions for AR in Education”, Journal of Educational Technology Development and Exchange,