Augmented Reality and Application Sample on Education

Mustafa Ulas, Safa Merve Tasci, Sevilay Ulas

Abstract— **Augmented reality (AR) is a technology which is getting more popular in recent years. Augmented reality can work with many platforms, such as mobile devices, embedded and desktop systems. As it has many applicable area, one of the efficient area of AR is education. Supporting materials must be used to improve the quality of learning in education. Especially innovative tools that support visual learning method has an important place in education. The studies which revealed the significance of the visual education increased the needs for the advanced educational materials. In this study, we have tried to give information about augmented reality and innovative tools that support visual learning methods. A sample innovative augmented reality application has been given for education. We indicate the methodology of the study and application results.**

Keywords— *Augmented Reality*, **E-learning, Image Processing, Education Methods**

I.   Introduction

A.   *Augmented Reality*

Augmented reality is basically seen in the applications in which virtual world and the real world are brought together transiently. It is a user-friendly technology that can be used in all kinds of devices that have a camera, screen and operating system. Its working principle is enabling the camera to detect the marker located in the real world and mounting the virtual 2D or 3D image on the detected image. Figure I is demonstration of the working steps of augmented Reality [1].

Augmented reality applications are divided into two as the ones working with and without a marker. The ones working with a marker need a marker in the real world. The ones working without a marker are less complex. They operate by measuring the depth and dimensions of 3D objects. There is also another augmented reality web browser applications which are not classified within either of these two categories. These applications use GPS technology as well apart from camera, screen and operating system [1].

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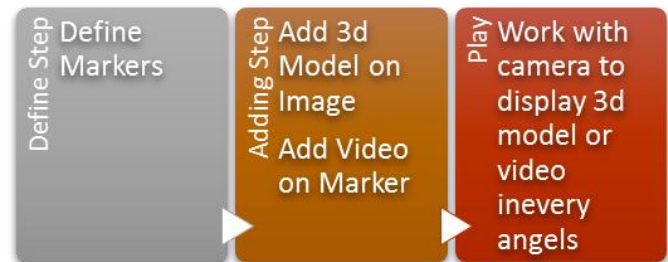Turkey

Figure 1 Working Steps of Augmented Reality

Augmented Reality projects can be used in various areas such as, security, health social media...and etc., but its use is most favorable in the Education area. It has a structure that can particularly be supportive in enhancing the quality in education. It supports the visual learning method which is an integral part of permanent learning.

B.   *Visual Learning*

The efficiency provided with the use of such supportive agents in educations is discussed in various studies [2]. Duschla and Osbomea have proposed discussion- based interaction methods to support learning [3,4,5]. Baker and Oneill have studied computer based applications to enhance learning [6]. Students learn by reading, observing, listening, responding and participating in the learning process. Meanwhile teachers apply several different educational methods. Some of them aim to teach by explaining, others by discussing with a visual and some others by transferring the theoretical knowledge into application [4,7].

In the studies performed by several researchers, there have been numerous applications suggested for supporting the learning process. Basic aim is to create an effective learning. These studies revealed that the technology has contributed to education with the concept of interactive learning [4,7,8,9,10].

In this study a supportive application about augmented reality which has a facilitating effect on visual learning is presented. This application offers a hybrid and innovative educational approach by bringing classical tools and technology together.

C.   **Effects of Visual Learning and *Augmented Reality* on Education**

In recent studies, it is seen that technological applications have been widely used in enhancing the efficiency of education. By using different methods an efficient interaction between the learner and the educational material is provided. Use of technology as a device in education goes in parallel

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with the improvements in the field of computing. The first applications performed in the computer assisted education are aimed to support the visual learning. Delivering the educational contents by way of virtual media such as Internet and CDs has enabled learners to reach the information rapidly and more efficiently [6,7,8,9,10,11]. In addition, web-based interactive educational methods have also provided a more effective access to information. Specially designed software with a needs analyses and social media-based educational materials can be seen as examples to such improvements [9]. In the study performed by Ulas and others, it is argued that social media tools could be used as an agent to enhance the quality and efficiency of the desired education [7,9].

These studies are mainly about the efficiency of the applications by which visual and audial interaction is provided as a supportive educational method [8,12]. This hypothesis has an instructive quality with the examples of educational applications designed by such studies. In this study, some applications are developed within the scope of this goal and some suggestions about innovative educational tools have been made.

Actual world is chosen as the application area of AR. Developed tools have a facilitating effect on life in general. Deep impacts of mobile products on the human life and their widespread use have resulted in using them in educational settings as well [9]. Augmented reality applications are innovative resolutions that have a potential of a contribution on learning process. It is argued to have efficient results on education in the study performed by Ulas and others [8,13].

II. Innovative Resolution on Learning : Augmented Reality

Augmented Reality is a technology gaining a popularity recently. The shortest definition can be as "mounting virtual images on real images transiently". Many applications can be developed by using augmented reality. Due to rapid developments in technology and increased mobility of technological devices it is now available to develop augmented reality tools for tablet computers and smart phones as well. This evolutionary process has affected not only the devices but also the developed applications themselves. While there were only augmented reality applications working with markers now there is no such a limitation and applications can be developed by using inartificial image processing techniques. In addition to these improvements, development of smart goggles which are examples of wearable technology can now take augmented reality applications one step further. Augmented reality applications are basically the applications in which virtual world and the real world are brought together transiently.

A. Developed Application with Augmented Reality

In this application it is aimed to play a randomly selected movable 3D model as an animation and an introductory video about the model itself. With this 3D model and video, a

augmented reality application triggering visual learning on any subject. This application is based on adding a virtual content by augmented reality on cards which have been designed as a physical content. The marker cards given as examples are shown in figure 2.

Figure 2 Used Markers

When the application captures the markers with the camera virtual content will be displayed on the screen. 3D Model and video will be located as motion-sensitive to the marker. Within the time in which marker is seen by the application 3D Model and video will be generated on the motion-sensitive screen. An image of the developed application can be seen in Figure 3. If the card or camera angle is changed, 3D model and video can be formed again in a proper angle.

Figure 3 Developed application screenshot

In the application developed in the scope of this study, is developed for android systems by using Viforia. It is possible to develop applications by using Vuforia, Unity3D and Android SK. The application developed here is designed by using these two different tools. Unity3D is used for developing 3D application and Android SDK is used for Virtual Button and PlayBack [1,7,8]. The application has two distinctive roles. The first one is to display a video showing the relevant planet on the marker by using virtual button and the second

one is to play the video introducing the planet upon clicking the button[8].

III.   Conclusion and Discussion

It is a well-known fact that the external tools facilitating the visual learning play an important role on developing efficient learning methods. Within the lights of this fact it is required to develop more innovative applications providing contributions on the interactive learning. This study presents supportive educational tools and innovative resolutions on the field of education. Within this context model applications and solutions on augmented reality tools are provided. It is suggested to design educational materials which are both interactively designed and trigger visual learning by using AR. A model application is presented here for this aim. With this application and the cards, planetary system is animated with a 3D model and a video to provide permanent learning.

Acknowledgment

References

[1]   M. Ulas ve S. Tasci, «A Review About Augmented Reality Tools And Developing A Virtual Reality Application Based On Education,» %1 içinde *International Journal of Arts & Sciences*, Harvard University, Boston, USA, 2014.

[2]   D. J. Johnson ve H. R. Myklebust, Learning Disabilities; Educational Principles and Practices, Grune & Stratton, 1967.

[3]   R. A. Duschla ve J. Osbornea, Supporting and promoting argumentation discourse in science education, Studies in Science Education, 2008.

[4]   «Learning and Teaching Styles in Engineering Education,» *Engr. Education,* cilt 78, no. 7, pp. 674-681, 1988.

[5]   J. Dewald, J. Yao ve Y. Lan, «Development of Brain-Computer-Interface for stroke survivors,» [Çevrimiçi]. Available: http://www.dewaldlab.com/jun/R21-BCi.jpg. [Erişildi: 15 July 2013].

[6]   E. L. Baker ve H. F. O'Neil, Technology Assessment in Education and Training., 1994.

[7]   M. Ulas, N. Bozkurt, S. Taşçı, A. Boyacı, A. O. Tanyıldızı, M. M. Karabulut ve S. Ulas, «Çağdaş Bilim Merkezlerine, Öğrenimi Destekleyici Öğretim Uygulamaları Ve Yenilikçi Çözüm Önerileri,» %1 içinde *North Africa and Middle East Science centers network 4th General Assembly Meeting*, Bursa, Turkey, 2014.

[8]   U. M. ve T. S.M., «A Review about Augmented Reality Tools And Developing A Virtual Reality Application Based on Education,» %1 içinde *International Journal of Arts & SciencesI (IJAS)*, Harvard University, Boston, USA, 2014.

[9]   A. U.F. ve Ulas M., «The Use of Social Media Elements in Distance Learning,» %1 içinde *International Journal of Arts & Sciences (IJAS)*, Harvard University, Boston, USA, 2014.

[10] E. Akbal ve M. Ulaş, «The Design Of The Web Based Foreign Vocabulary Learning System,» *e-journal of New World Sciences Academy, Engineering Sciences, ISSN:1306-,* cilt 7, no. 1, pp. 38-46, 2012.

[11] İ. İsmail, «Bilgisayarlar, Görsel Tasarım ve Görsel Öğrenme Stratejileri,» *The Turkish Online Journal of Educational Technology – TOJET,* cilt 2, no. 3, 2003.

[12] J. W. E. Keefe, Profiling & Utilizing Learning Style, ERIC, 1988.

[13] *"Zenginleştirilmiş Sanal Laboratuvar ", 2120323'nolu TUBİTAK 1512 Projesi. S.M. TAŞÇI, Dr.M. ULAŞ, Proje Bütçesi: 100.000 TL,* 2013.

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