



Utilization of Augmented Reality Technology as an Interactive Learning Media

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Abstract. This study discusses the use of augmented reality technology as an interactive learning medium. Innovative learning media at this time have a very important role in terms of improving the quality of learning. The main point in the use of information and communication technology, especially on mobile devices such as smartphones and android tablets which of course have camera features so that they can run augmented reality (AR) application technology. The purpose of this study was to analyze how the use of augmented reality technology in education midwives as an interactive learning medium that can support the learning process of students. This study uses qualitative research methods using data collection techniques through literature studies or commonly known as library research. In the research the results obtained are analytical descriptive because this research is a qualitative research. The results of this study are the application of information and communication technology in the form of augmented reality applications in the field of education as a learning medium that can help students in facilitating learning and creating a pleasant learning atmosphere.

Keywords: Augmented Reality, Learning Media, E-Learning

1. Introduction

The rapid development of information and communication technology in the field of education has an influence on improving the quality of the learning process. Based on these conditions, various efforts and innovations have been made to improve the quality of education [1]. This is related to education which has a very important role in developing human resources in order to advance a nation. Various efforts that can be made to improve the quality of learning in the education sector include increasing teacher professionalism and pedagogy, interactive learning media, curriculum, learning facilities and the education system [2]. One of the most important efforts that need to be considered in the learning process in improving quality in education is complete, good, and supportive learning facilities [3,4]. In addition, the use of information and communication technology in learning is an important effort to adapt to increasingly sophisticated technological developments.

Information and communication technology is currently experiencing significant development, thus affecting all aspects of life ranging from the fields of art, culture, politics, economy, and education. Especially in the field of education, utilizing increasingly advanced information and communication technology can change the function of conventional books, teachers, and learning systems. By utilizing information and communication technology can have a positive impact such as creating various technological innovations that can be applied, one example is the use of computers as a presentation tool, the application of e-learning can increase student learning motivation [5], smartphones as a means to support the learning process students both at school and at home [6].

The existence of a smartphone at this time is certainly one of the most important things. Most students from every level of school to university are already using smartphones. This is in accordance with the results of a research survey regarding smartphone users among students who obtained a percentage of 91.69% of the total number of students as the research sample having their own smartphone [7]. With the presence of smartphones, it is very useful in terms of helping students to learn flexibly without being limited by place or time [8]. Therefore, using smartphones as learning media needs to be considered because it can support the learning process.

Application development can support smartphone devices that can be utilized by various fields including education. Technological innovations are increasingly varied and sophisticated that can be used by smartphone users as a support in the learning process, because it can affect increased access to education and create new learning media [9]. One of the new learning media that utilizes advanced technology that is currently developing is augmented reality technology on smartphones. Augmented Reality (AR) is one type of interactive technology that combines two objects between virtual objects and real objects so that they can produce 3D objects on the screen. The use of AR technology allows users to interact directly through the digital world, the display of objects in the real world will be displayed virtually in the digital world, so that users can interact in the digital world as in the real world [10]. By implementing AR applications, the learning process will be more interactive, interesting, increase student learning efficiency and support the learning materials to be studied [11].

The application of AR technology has a very important role in education as a learning medium, this is because the learning process becomes interactive [12], the concept of learning material is easier to understand by students [13], learning using AR does not require a lot of money, is flexible, and easy to learn. In addition, learning using AR technology can support students to think critically and be easier to remember because the learning strategies applied are more attractive. With the AR learning media, it is possible to help students in the learning process independently. The development of AR technology is very important to do because it can increase interest in learning and increase their learning motivation so that it can produce good learning achievements [14].

Learning media based augmented reality is able to realize the learning styles of students at this time, including in generation Z, where this generation is easy to adapt to technological developments, one of which is digital devices and easy to accept learning models that are integrated with information and communication technology [15]. Students as Generation Z are equipped with better multitasking abilities and are more productive when compared to the previous generation. This is because communication and information technology facilities, one of which is the internet, are more easily accessible to students, so Generation Z has good skills

in processing a lot of the information they collect. Therefore, the application of AR in learning can help students in developing cognitive abilities and technical skills.

2. Method

In this study, the method used is a qualitative research method using data collection techniques through literature studies or commonly known as library research. The purpose of using this research method is to obtain relevant, accurate, and correct data so that the research objectives can be achieved. In the research the results obtained are descriptive analytical because this research is a qualitative research. The stage of this research is to study literature from various journals that are relevant to the topic of this research, namely the use of augmented reality technology as an interactive learning medium, then a comparison is made with previous studies, and the results of the comparison are analyzed. The research method used in most of the research that has been done previously is development research. While in this research using literature study.

3. Results and Discussion

Augmented reality applications produce 3D animations related to learning that has been carried out in the development process. In this application, there are features that are displayed such as the menu display selection feature to be able to choose the learning material to be studied using interactive 3D animation. The interface design of the menu display in the AR application is the design of the AR application with a focus on the experience and interaction between the user and the application. The purpose of this interface design is as an initial display design that is made in a simple and efficient manner so that it is easier to understand in its use. An example of the interface design of this AR application can be shown in Figure below.

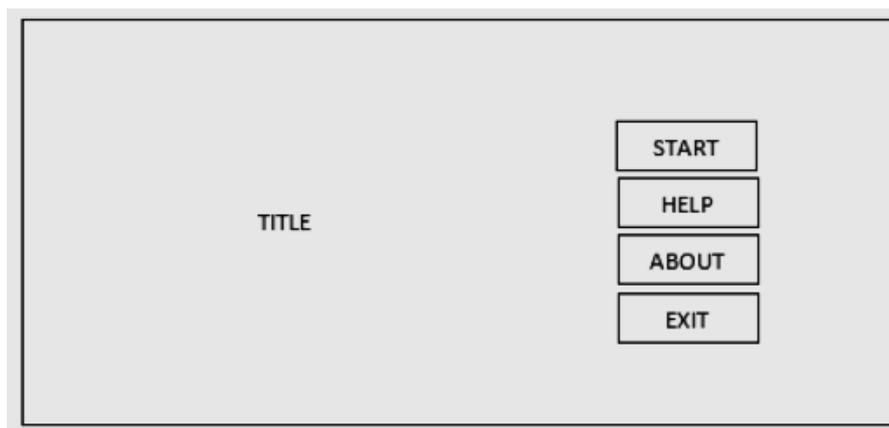


Figure 1. Main Menu UI Design

In Figure 1 is a display of the main menu of the AR application by displaying buttons such as the start button which functions to start detecting the material that will be displayed in the AR application, then the help button to provide instructions to students as users to make it easier to use the AR application, then the button about is used to display information about the AR application used by the student, and finally the exit button is used when finished using the AR application. The following is an example display of the buttons on the main menu.

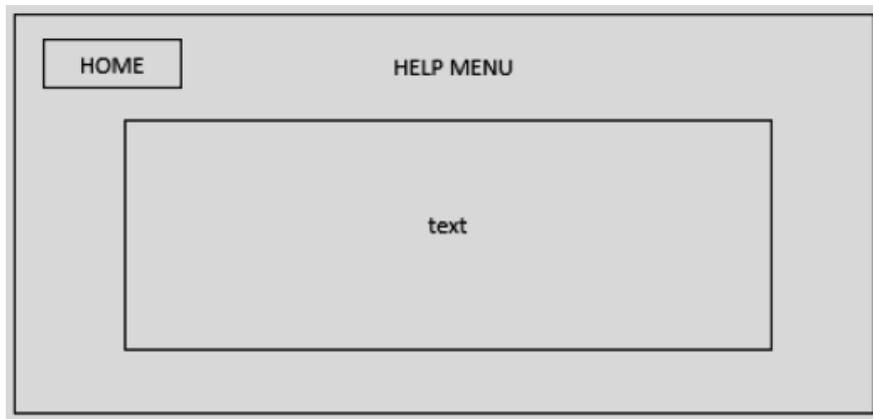


Figure 2. Help Menu UI Design

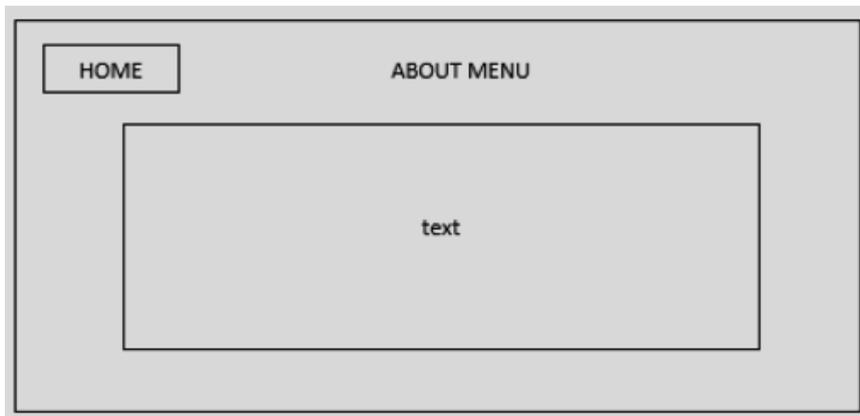


Figure 3. About Menu UI Design

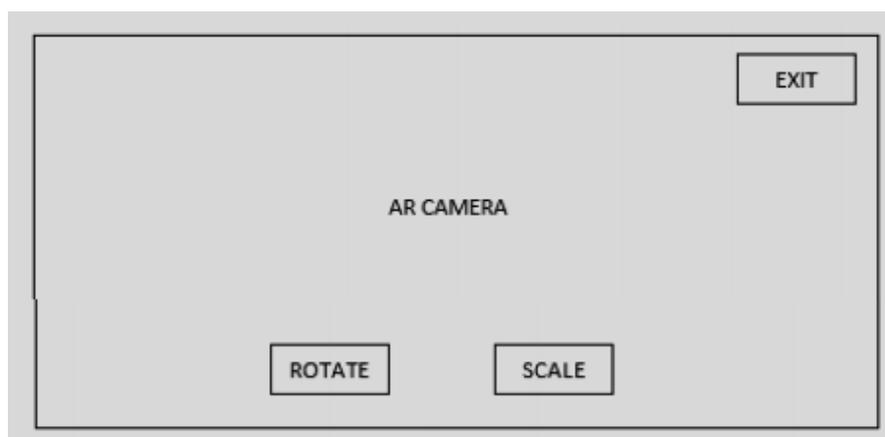


Figure 4. Augmented Reality Menu UI Design

Based on the AR menu figure, there are three buttons displayed including the rotate button which is used to rotate an object or material to be studied by rotating it clockwise or counterclockwise. The design of 3D interface design modeling in this AR application by utilizing sketchup software. The 3D model created in SketchUp will then be exported in the

form of a .dae file. After that, the process of importing the required materials into the Unity software is carried out. After the development process using the Unity software is complete, the resulting file form will be converted into .apk which type of file can be installed on an Android smartphone. AR development in Unity uses the Vuforia SDK which is downloaded on the official website.

With operating system support for iOS, Android, and unity3D, the Vuforia platform supports AR application developers to be able to use the application for almost all types of smartphones and tablets so that their use can be said to be flexible. In addition, this AR application developer is also given the freedom in terms of designing and creating applications according to the objectives to be achieved and making applications that have the following capabilities:

1. High-level computer vision technology that can allow application developers to create special effects on mobile devices.
2. Continuously recognize multiple images.
3. Tracking and detection of images has a level that can be modified.
4. Flexible image database settings

In the figure below is the structure of vuforia.

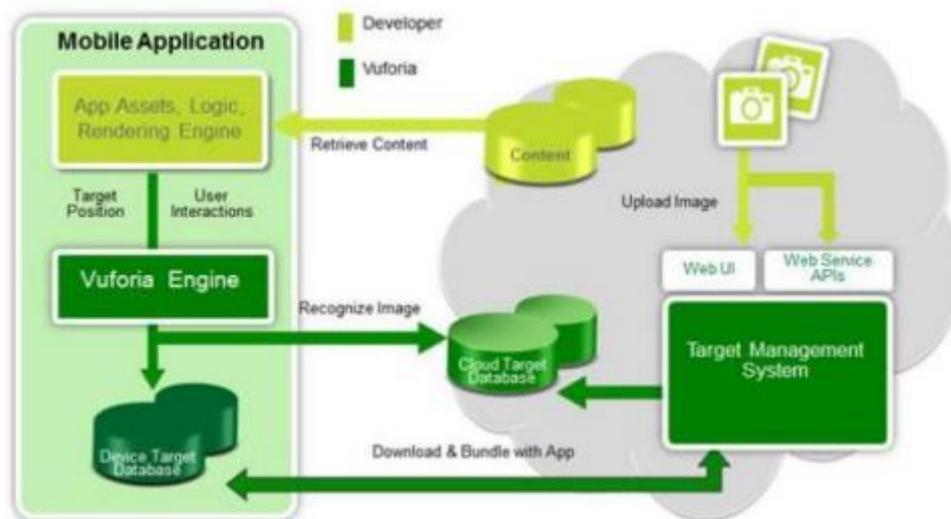


Figure 5. Vuforia Structure

As for an example of the display of the menu image when operated via an Android smartphone, the display of the image is to prepare a prototype of learning media. An example of an AR application storyboard design when displayed on an Android smartphone is shown in Figure 5.

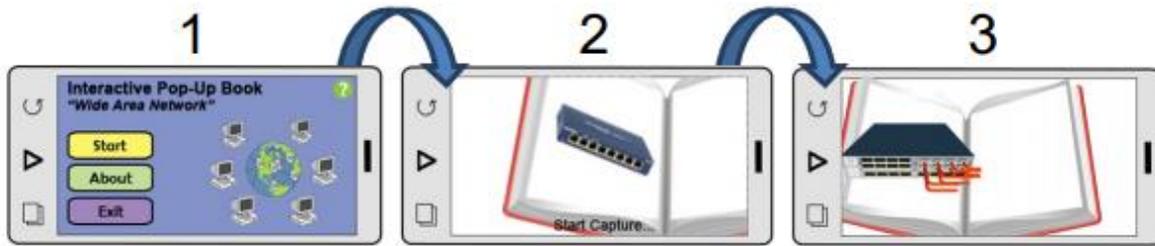


Figure 6. Application's storyboard

There are several things that must be considered when developing AR applications, including the quality of the 3D animation that will be created, designing the best possible application quality by producing applications that save data memory so that they are not too burdensome for smartphone devices, then the application file size is sufficient and not too large. . This AR application has significant potential to stimulate cognitive development and motivate students in independent learning, has a positive influence in matters relating to the learning process, and can also create an environmental atmosphere during an active learning process so as to create a new atmosphere and improved student knowledge system. But besides that, there are obstacles in implementing AR applications during the learning process which lie in some students, namely the smartphones used by students lack data memory so they fail to download applications, student smartphone versions that do not support applications, and with increasingly technological developments. The rapid provision of support for AR applications is increasingly creating for learning materials. So that in order to be able to design and develop high-quality learning media products by involving realistic elements that can complement each other, collaboration is needed that involves experts from various industries such as programming, engineers, administrators, designers, teachers, and students.

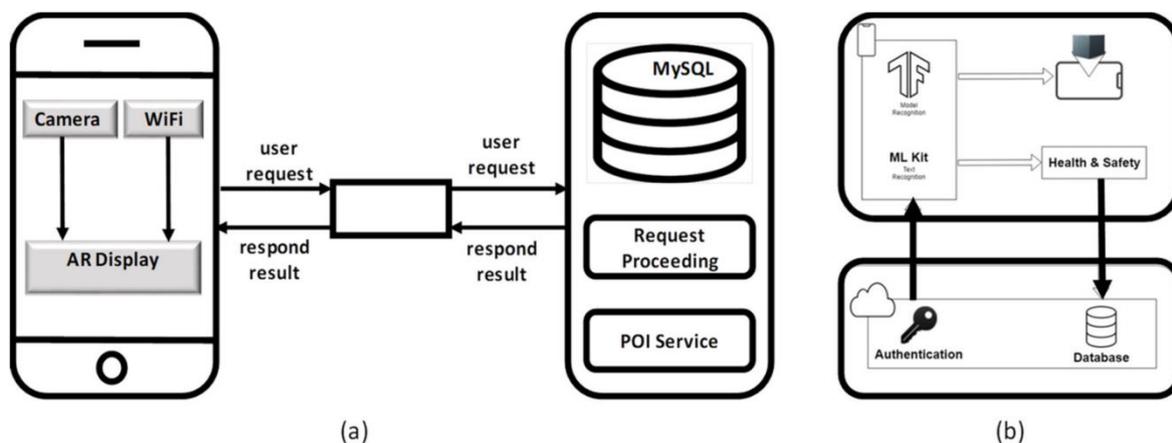


Figure 1. Application Architecture AR

Based on Figure 7 above, it shows the flow in developing AR applications. The flow for students as AR application users is only enough to open the application that has been downloaded on their respective smartphones then direct the camera which automatically opens in the application towards the marker object to the webcam or rear camera when using a smartphone. After that, 3D objects will be displayed on the respective device screens used during the learning process.

4. Conclusion

The use of AR technology as an interactive learning medium in the learning process at various levels of schools and universities, in my opinion, has enormous potential in increasing student independence. In this study, based on literature study activities from various journals relevant to the research topic that resulted in the use of AR technology as an interactive learning medium. The role of smartphones is not only as a supporter during the process of learning activities by improving the quality of education, but smartphones can encourage new learning innovations through media development and in many ways. One of them is augmented reality technology that can improve the function of smartphones in the field of education. So that the use of smartphones and the use of augmented reality technology can help educators and students in several ways, including making learning more fun, increasing student learning independence, and increasing the quality of education in a country.

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