

An Android-based Augmented Reality Application Design for the Physics Book of Grade XII ; Chapter 7 Theory of Relatively

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ABSTRACT

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Generally speaking, there are still numerous institutions that employ learning methods that are relatively inefficient. For instance, they still rely on traditional book media. where, the use of book media is still relatively inefficient, especially in material that requires a high level of understanding. The Work System Design Method for this augmented reality application uses several software, namely Blender3D, Unity, and Vuforia. This system's design includes interfaces or display interfaces that depict application workflows described through Flowcharts. Through this final project, we have developed a mobile-based augmented reality application that boasts several key features. The Main Menu includes pointer buttons to other menus, while the AR Menu displays the 3D object. The Help and About menus are also available. Our conclusion is that this augmented reality application can assist students who are keen on learning, and it can alleviate difficulties in understanding complex subjects.

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I. Introduction

Education is the most important thing in one's life, because education has the duty to determine and guide one's future. Although not everyone thinks like that. However, education can also shape a person's talent and expertise and is also used as a benchmark for their quality of each person [1]. In general, there are still many educational institutions in Indonesia that use inefficient learning methods, namely through the medium of books and the delivery of information by teachers. The use of these learning methods is less effective and efficient in fostering student interest in learning, especially in materials and subjects that require a high level of understanding, such as physics at the high school level [2].

Information and communication technology currently provides great opportunities for the delivery of learning to be more effective and attractive by utilizing augmented reality [3]. In solving the problem of the inefficiency of existing learning methods in educational institutions in Indonesia with the help of current information technology, which has developed so rapidly. The author took the initiative to implement the book by utilizing augmented reality technology as an alternative to problem solving by creating three-dimensional objects on each image in the multimedia book.



II. Method

A. Augmented Reality

Augmented reality can be defined as a combination of real objects with a virtual world, where later it will be displayed in a real environment, and run automatically interactively in real time and can be integrated with the virtual world. Display technology accordingly, interactivity is possible through certain input devices, and good integration requires effective explanation.[4]

The methods developed in augmented reality currently consist of two methods, namely marker-based tracking and markerless augmented reality. The marker method of tracking is a method that requires markers, which are generally in the form of black and white images. Markerless augmented reality is a method of realism where users no longer need to use markers or pictures to display virtual objects directly.[5]

B. Flowchart

The design of the work system for this augmented reality application uses several different software packages, namely Blender 3D, Unity, and Vuforia. The design of this system includes the interface or interface display and the application workflow, which is described using a flowchart.

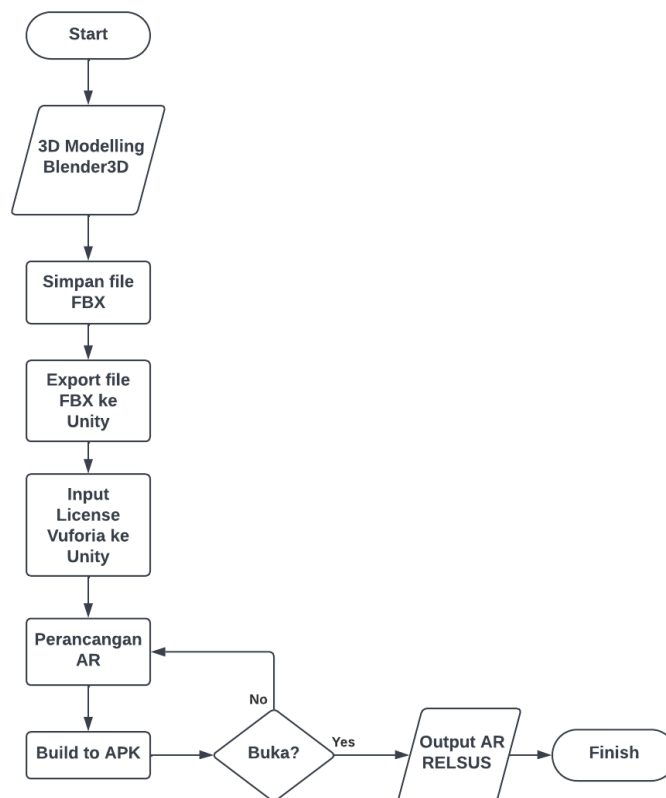


Fig. 1. Flowchart of the application creation process.

Flowchart Description

1. Start: when we run, it will go to Blender3D for 3D modeling Chapter 7.
2. 3D Modeling in Blender3D: Create 3D objects with modeling and rigging techniques in Blender3D, then go to the FBX file saving stage.
3. Save the FBX file: After creating the 3D object at the 3D modeling stage, save the file in FBX format. This format is popular and simple to set up.
4. Export the FBX file to Unity: then export the FBX file that we saved from Blender3D to Unity.

5. Input the Vuforia license into Unity: take the license code in Vuforia, and then input the license code into Unity. Serves as a link between Vuforia and Unity.
6. AR design: AR camera setup, 3D object layout, and markers.
7. Building an APK: This stage is to build the APK that we designed at the AR Design stage into an APK file. The function of the APK file itself is so that it can be installed on Android.
8. Open: if you select yes, it will proceed to RELSUS AR Output and if you select no, it will return to the AR Design menu.
9. AR RELSUS Output: Output or output from the build process. This stage is the result of our Special Relativity AR.
10. Finish: done.

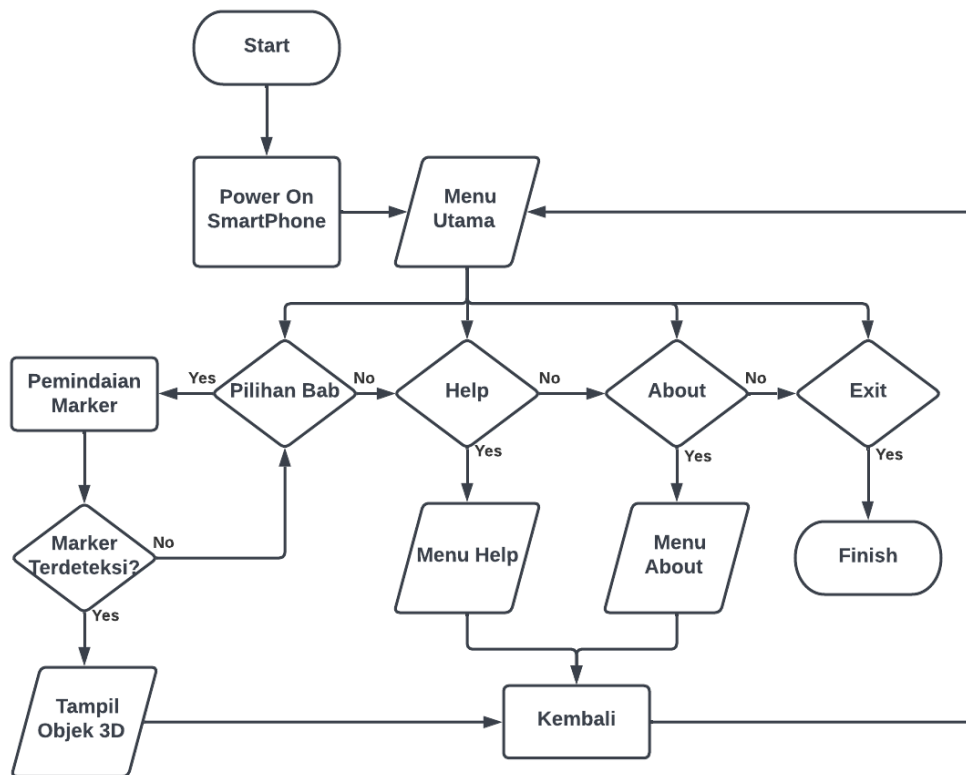


Fig. 2. Flowchart of the application.

Flowchart Description

1. Start.
2. Power on the smartphone: turn on the smartphone, and then go to the Main Menu stage.
3. In the main menu: In the main menu, there are 4 options, namely, Chapter options, help, about, and exit.
4. Chapter Selection Chapter selection will lead to the marker scanning stage, which will detect markers and display 3D objects.
5. Scan Marker: This section will open the camera features on the smartphone.
6. Marker Detected?: is part of checking or validation.
7. Displaying 3D Objects: Displaying 3D objects will display output in the form of 3D objects.
8. Back: This process will redirect us back to the main menu.
9. Help: This Help button will display a Help Menu, which will explain how to use the AR application.

10. The help menu: This help menu will display how to use it and other assistance to make it easier for users to use the application.
11. About: The About button will also display an About menu, which contains information about the application maker or designer of the AR application.
12. The about menu: in the about menu will display the version and identity of the maker and designer of the application.
13. Exit: This button will direct us to exit and close the AR application.
14. Finish: done.

III. Results and Discussion

A. Main Menu Display

The main menu displays several buttons, namely the Scan AR, Help, and About buttons. Where the buttons will direct to the intended menu.



Fig. 3. Main Menu.

B. AR Menu Display

In the AR menu, there are several buttons that function for sound and music, and there is also a material button to display material according to the 3D object being scanned.

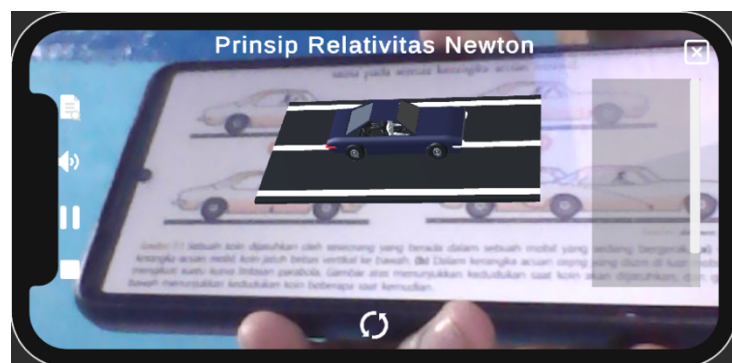


Fig. 4. AR Menu.

C. Help Menu Display

In the help menu, there are steps or information on how to use the application.



Fig. 5. Help Menu.

D. About Menu Display

In the about menu, there is information about the maker of this software.

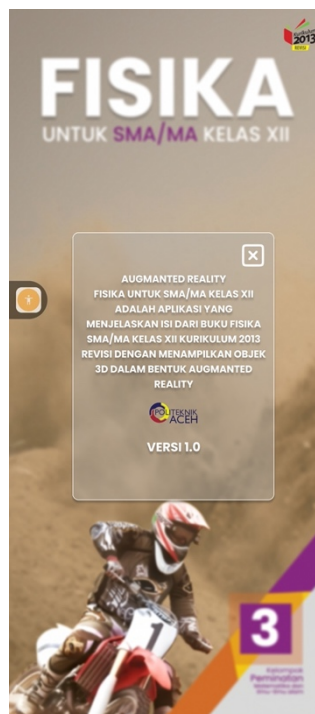


Fig. 6. About Menu.

E. Graph of Questionnaire Test Results.

Figure 7 is a graph of the results of the questionnaire test conducted on 10 students of MAN 3 Rukoh class XII. The questionnaire given consisted of 10 questions.

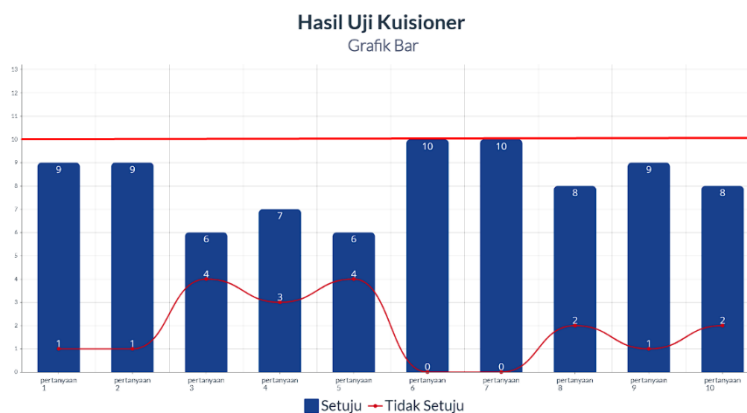


Fig. 7. Graph of Questionnaire Test Results.

IV. Conclusion

Based on the discussion in the previous chapters, the following conclusions can be drawn:

1. The design of an Android-based augmented reality application was successfully built using Unity, Vuforia, and the Android SDK.
2. This augmented reality application can help students develop an interest in learning.
3. This application also overcomes problems with conveying things that are difficult to understand without clear images.

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