

Utilization of Augmented Reality Technology in Learning Media Introduction to the Names of the Android-Based Human Senses System

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Abstract

The development of computer technology is currently very advanced. Computers are used in all areas of human life, one of which is Augmented Reality (AR) technology. AR has been widely used as a tool for interactive learning media. Learning media that uses AR technology can improve student understanding. The learning media for recognizing the names of the five sensory systems in humans applies the concept of AR which uses a markerless method which will display 3D objects without a marker being detected. The material on the human sensory system is very interesting to study because it relates to daily activities regarding how our bodies can sense objects around humans. AR technology is really needed to better understand the material of the human sensory system.

Keywords: Augmented Reality; Mobile Learning; human elements; Android Mobile Application; 3D Animation Media.

1. Introduction

Augmented Reality (AR) media has become a utilization or an intermediary tool in everyday life. Augmented Reality has become a medium to contribute to human life, such as games, virtual tourism objects, and learning media. However, the application of Augmented Reality media in the world of education as a learning medium is still rarely used [1]. Through quantitative and qualitative analysis, our results show that students who are tutored with more complex AR content learn better and show a wider variety of inquiry styles.

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Furthermore, AR visual representations appear to stimulate students to think about a wide range of scientific ideas, to make deeper connections between scientific concepts, and encourage students to have a more active learning style with increased transitions between inquiry activities. We discuss possible reasons and wider implications for these findings [2]. AR has been widely used as a tool for interactive learning media. Learning media that use AR technology can improve student understanding. Learning media for the introduction of the names of the five senses system in humans applies the concept of AR that uses a markerless method that will display 3D objects without a marker being detected. The material of the human five senses system is very interesting to learn because it is related to daily activities about how our bodies can sense objects around humans.

Digitization is having an increasing impact on teaching. This development affects all educational institutions from primary to secondary and tertiary education, as well as all disciplines. The Corona pandemic in particular has brought the digital aspects of teaching to the fore, and teaching concepts have had to be adapted to the new circumstances [3]. One such technology that is experiencing increasing attention in educational research is Augmented Reality (AR). Between 2011 and 2016 the number of papers investigating the effect of AR in education increased from 8 to 26 annually. Despite this increasing research effort, which largely suggests AR has a positive impact on learners, wide scale adoption of AR has not occurred within educational settings. In 2016 it was predicted that the roll-out of AR in education would take two to three years, then in 2019 AR was at “four to five years from adoption”. It seems we are moving further away from wide scale adoption of AR in education rather than closer [4]. Based on many systematic reviews and meta-analyses, it has been concluded that AR is effective. Recently, however, researchers have criticized the fact that the empirical basis for this conclusion is based on results from methodologically problematic media comparison studies [5].

The five human senses are the result of complex psycho-physiological phenomena allowing us to perceive our environment. It is important to stress the psychoneurological aspect of biological processes involving our senses. Indeed, without this link between memory and senses, the latter would not be as important [6]. The five senses (sight, smell, taste, hearing, and touch) are generated by the eyes, nose, tongue, ears and skin. The sense organs transport information to brain to help people understand and perceive the external environment. Moreover, the five senses are important channels for us to communicate with the outside world. Human beings' five senses constitute their own perceptual body. Through these senses, human beings can understand and experience the external world, and furthermore produce a certain behavior [7]. Based on the existing problems, a mobile application is designed and built that utilizes augmented reality technology as a learning media for the android-based human five senses system.

2. Research Method

a) Research Stages

The research method used in this study in general is a case study method which is divided into data collection and software development (Augmented Reality). In general, the description of the methodology in this study is explained through several stages. The data collection method used in this research is literature study, which is

collecting information from various sources related to research such as books and journals [8]. In Figure 1 it is explained that the initial stage in making this application is problem identification, where before building and designing applications, researchers make observations to see what problems exist, then researchers collect data such as literature studies from various kinds of literature studies, then researchers analyze the system of the application, then researchers conduct feasibility tests on applications that are built such as displays, buttons, system responses, and in the final stage researchers implement applications that have been completed as a whole.

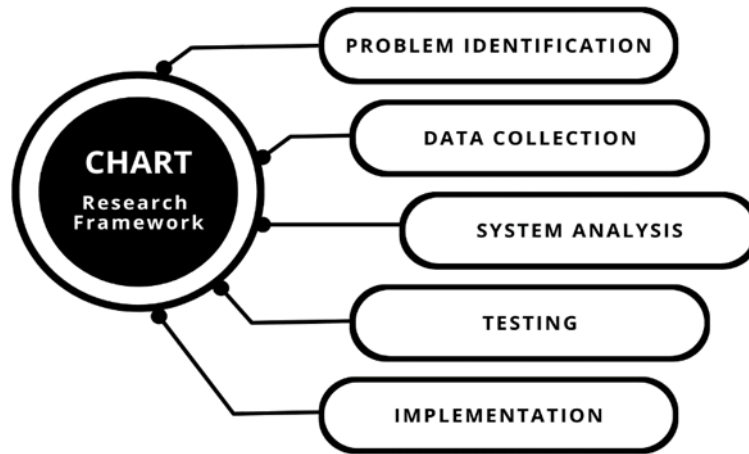


Figure 1: Research Framework Chart.

b) Ongoing System Analysis

In Figure 2, it is explained that the initial condition of the learning system is still using books (physical) or it can be called the learning process still using manual techniques. With this initial condition, the researcher has a proposal or suggestion for the formation of an android-based learning media application for the introduction of the names of the human five senses system.

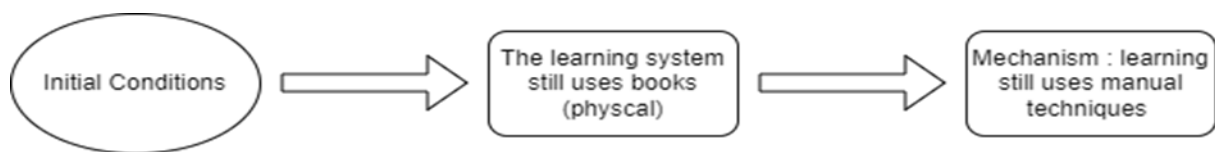


Figure 2: Current System Analysis.

c) Required Analysis

In Figure 3, it is explained that the proposed model or proposal for building an application is learning that previously used books (physical), now implementing a digital system, namely with 3D AR (Augmented Reality) applications, applications that are made have features that can add more detailed user knowledge, and applications that are made can facilitate users in learning media because they are easy and attract user interest.

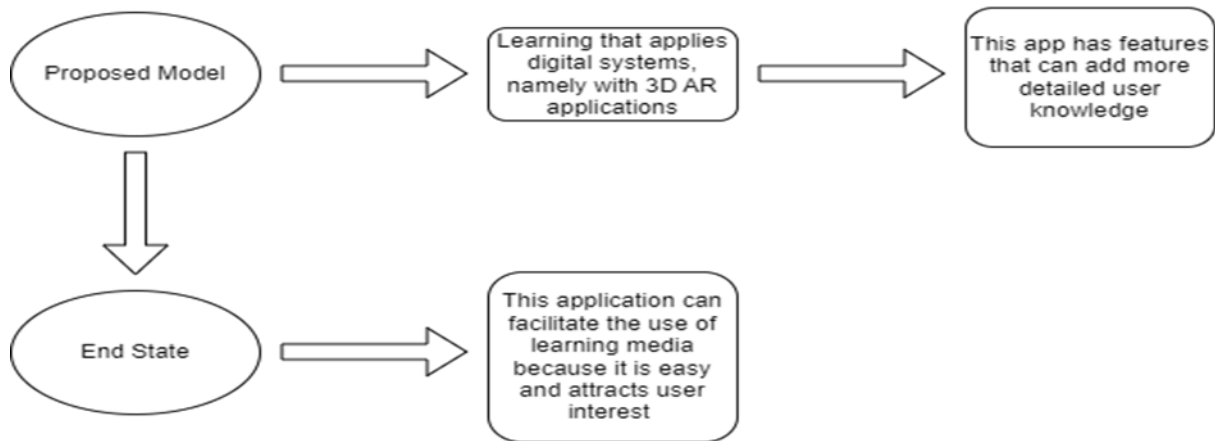


Figure 3: Required Analysis.

d) System Architecture

In the unity stage, researchers create a User Interface (UI) display along with the elements contained in the application, then in the code section (creating program code), researchers create source code for several elements in the application such as, UI display, buttons, and display features. Furthermore, at the rendering stage, the objects that are inserted will be combined and tested which is useful to find out whether the application is suitable for use or not. If everything is ready to be used, then the user runs the application which will display the User Interface (UI) display and the application will later issue an output in the form of 3D objects, text, and audio.

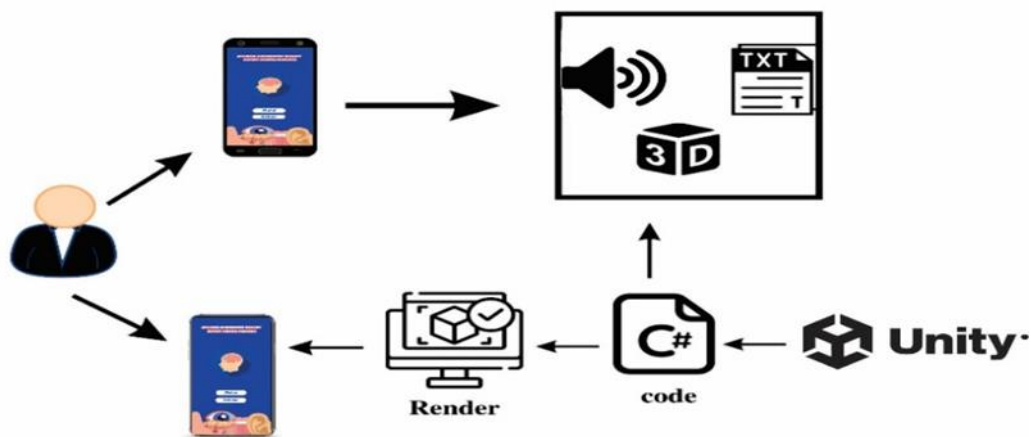


Figure 4: System Architecture.

e) Usecase Diagram

In the Use Case Diagram, the User runs the application to the 'Main Menu', the main menu is a menu found on the initial page when the application is run, there are several menus, namely the 'Play' menu, 'How to Use',

'Quiz', 'About', and 'Exit'. Furthermore, the user chooses several menus, one of which is 'Play' which Play, if the conditions are met, can display 3D objects along with object descriptions and object audio, for the 'How to Use' menu, which is a menu that displays how to use the application, on the 'Quiz' menu, which is a menu where the user will do some questions about the human sensory system, on the 'About' menu will display the biodata of the application maker, and the 'Exit' menu is a menu or button to exit an application that is running. When the user chooses the 'Play' menu, it will display several object options which then the system will display the object, object description, audio from the object description.

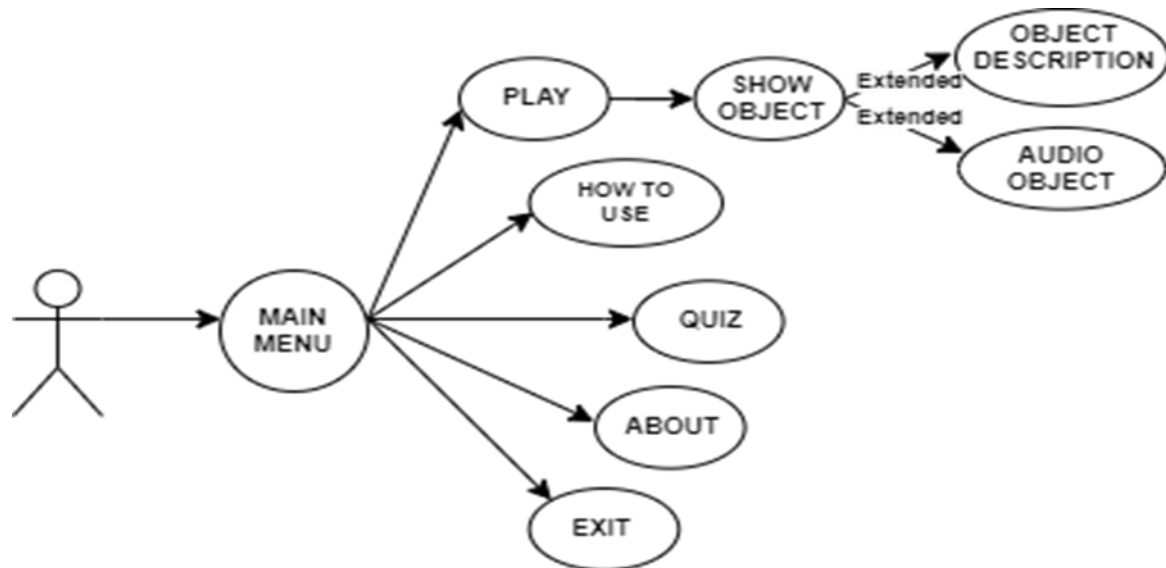


Figure 5: Usecase Diagram.

f) System Flowchart

When starting the application, the application will display a splashscreen which means the main page of the application, when entering the main menu, there are several menus such as 'Play', 'How to Use', 'Quiz', 'About', and 'Exit'. If the user chooses the 'Play' menu, it will go to the 'Select Sensory System' page, if the user has done activities on that page, the system will lead to the 'Quiz' page, the user is asked to do 10 questions, when the question work is complete, the system will return to the main menu. If the user clicks on the 'How to Use' menu, the system will go to the application usage page. If the user selects the 'Quiz' menu, the system will display a quiz page containing questions about the human sensory system. When the user selects the 'About' menu, it will go to the about page which contains the bio of the founder of the application. When the user wants to exit the application, the user is asked to click the 'Exit' button which then the system will provide an option whether the user wants to exit the application or not.

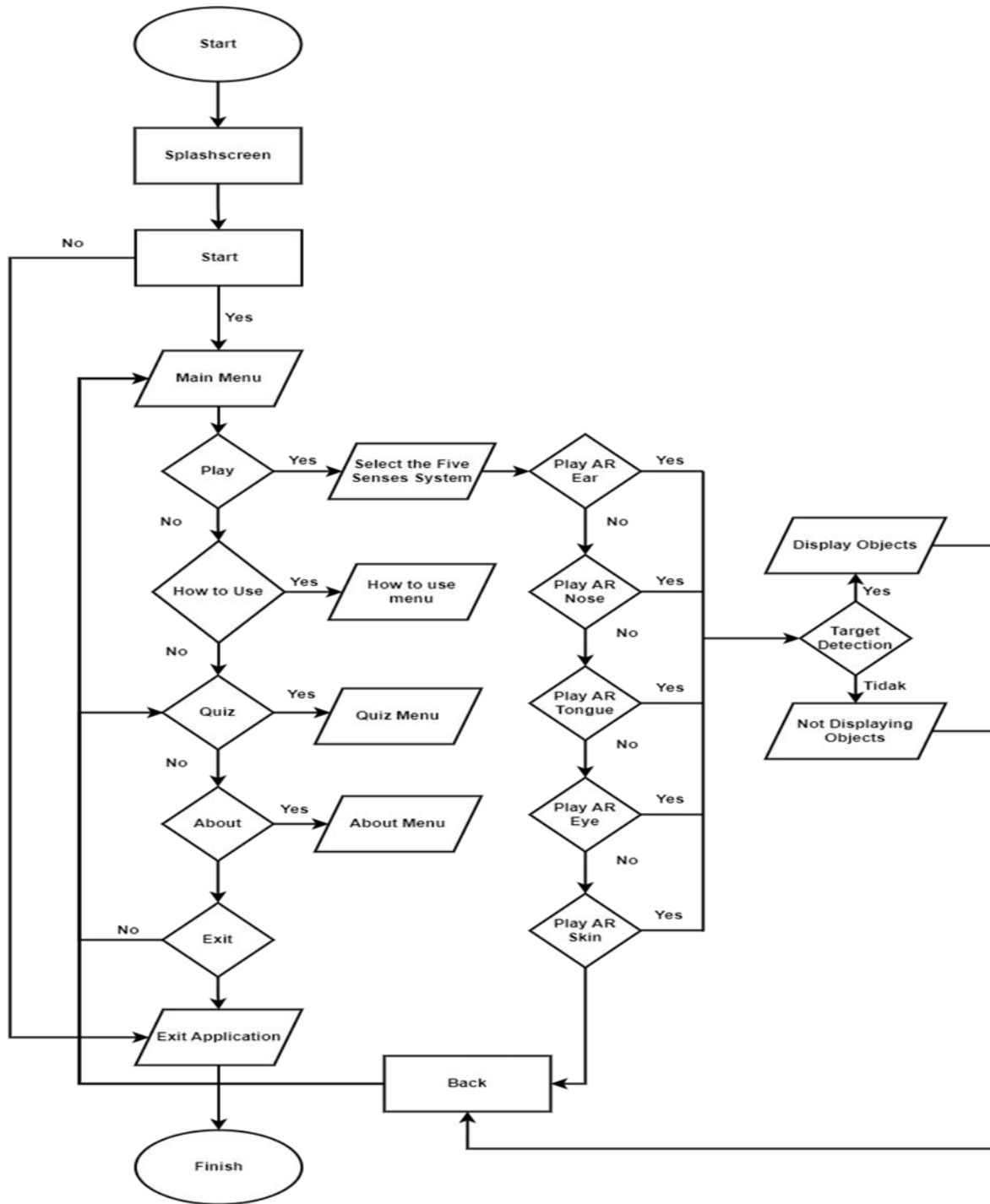


Figure 6: System Flowchart.

g) Activity Diagram

In this menu diagram in the Activity Diagram, the user here starts the initial stage by opening the application, then the system will display SplashScreen, the system will display the main menu, then the user selects one of the menus, namely the 'Play AR' menu, if the user wants to proceed to the next display, the system will run the camera which is forwarded by detecting the target in the form of a flat field, and displaying objects, descriptions, and audio. If the user wants to return to the main menu page, the user is asked to do 10 questions,

after the question has been completed it will go to the main menu page.

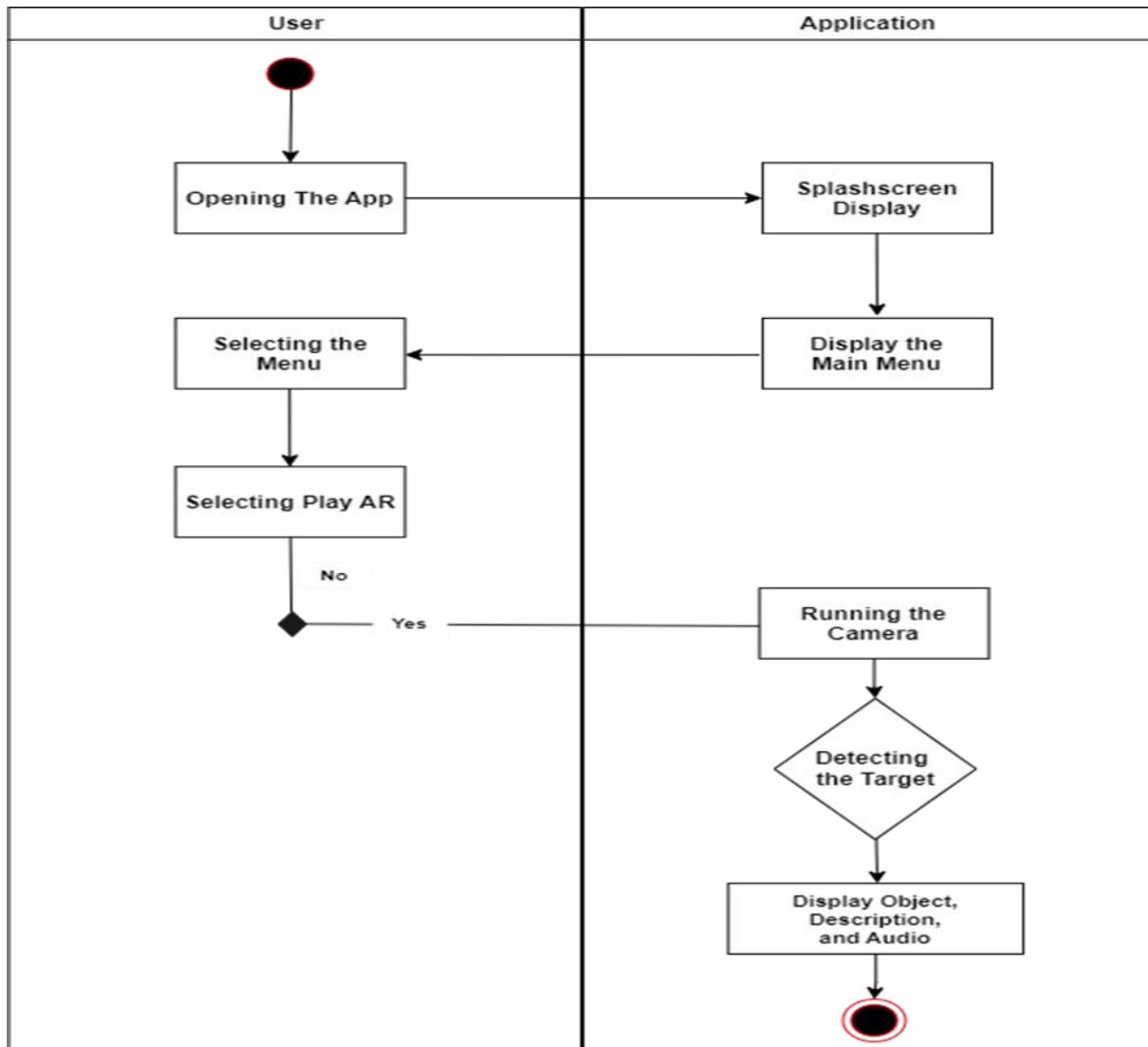


Figure 7: Activity Diagram.

3. Implementation

a) Splashscreen Page Implementation

This display is the initial page that will appear when the application is run before going to the main page, on the splashscreen display, there are 2 user choices, namely the 'Start' button and the 'Exit' button, the 'Start' button serves to start entering the application while the 'Exit' button serves to take the user out of the application.



Figure 8: Opening Screen Display.

b) Main Page Implementation

This display is the main page of the application which contains menus and buttons that can be selected by the user to operate the application. The application provides several menus and buttons, including the 'Scan' menu, 'How to Use' menu, 'About' menu, About menu, and 'Home' button to return to the splashscreen page.



Figure 9: Main Page Display.

c) Implementation of Play AR Page

This display is a page containing 5 human senses in 3D. Later, the user is asked to choose which object he wants to display, after the user chooses, the camera automatically turns on and will point to a flat field which then

displays various 3D objects of the five human senses.

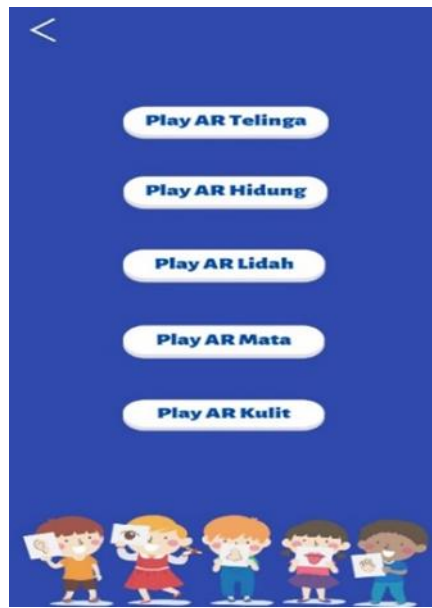


Figure 10: Play AR Page Display.

d)Implementation of AR Ears



Figure 11: Ear Page.

e) Implementation of AR Nose

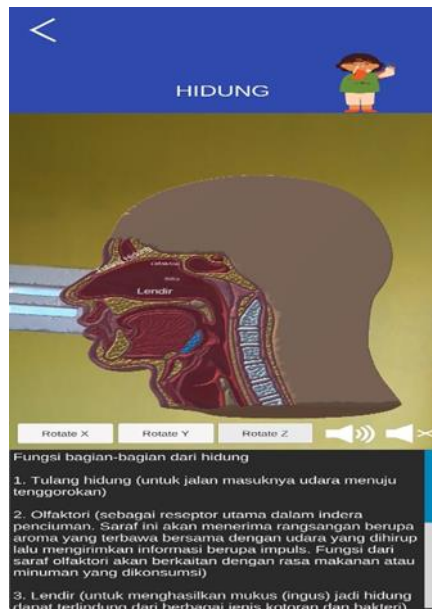


Figure 12: Nose Page.

f) Implementation of AR Tongue



Figure 13: Tongue Page.

g)Implementation of AR Eyes

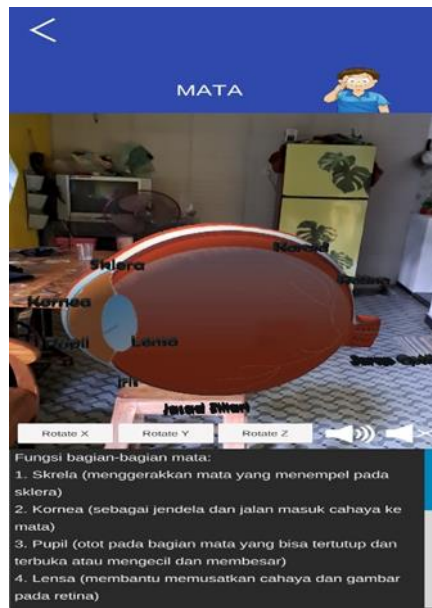


Figure 14: Eyes Page.

h)Implementation of AR Skin



Figure 15: Skin Page.

i) Implementation of How to Use Page

This display is information on how to use the application, where users can read first before using the application so that everything is directed.

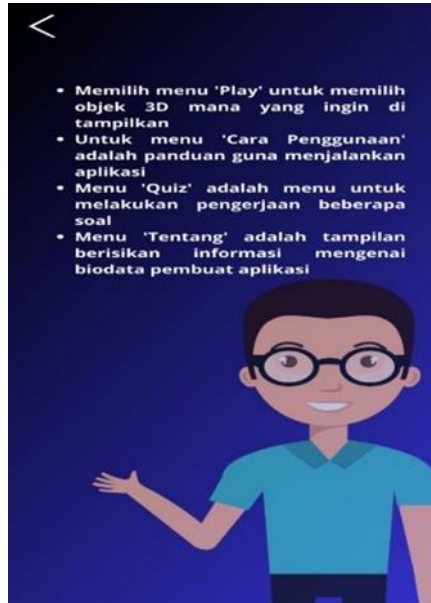


Figure 16: How to Use Page Display.

j) Quiz Page Impelementation

This display is a quiz question processing page that has 10 questions. Where the user is asked to work on multiple choice questions that will generate a value if the answer is correct, if the answer is wrong then the user does not get a value.



Figure 17: Quiz Page Display.

k) About Page Implementation

This view is the content of the bio information of the application builder, there is a photo, the name of the application builder, place and date of birth, major, and campus.



Figure 18: About Page Display.

l) Exit Page Implementation

This display contains a question whether the user wants to exit the application or not, if 'YES' it will exit the application, if 'NO' it will return to the home page.

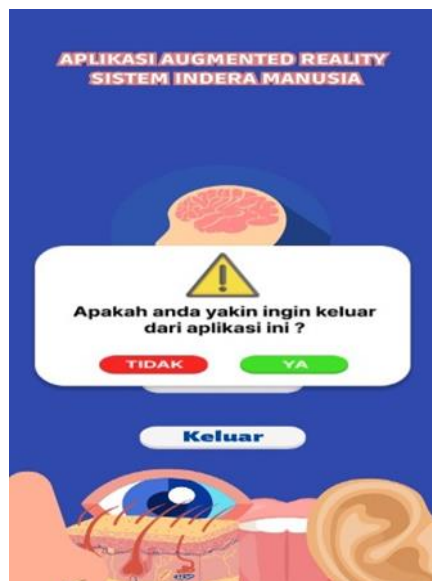


Figure 19: Exit Page Display.

4. Conclusions

The application developed in this study using 3D models to visualize anatomy has many advantages such as clarity and easiness for understanding the 3D anatomy model, giving different choices in visualizing 3D anatomy models from various organs of the human body, having interactive features of 3D anatomy models that can be displayed from various viewpoints and body layers, and meeting the requirements of learning quality materials for users. This application is very useful in providing visualization of student learning materials and creating a better interest in learning anatomy material subjects. Mobile apps with augmented reality technology also create the desire of students to use this application higher as a complementary tool for learning and understanding human anatomy [9]. Other learner characteristics and skills should also be considered for research, to inform the design for specific target groups of AR-based learning applications. AR seems to have a bright future for education – if it is implemented adequately for specific learning goals [10].

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