

Android-based of Augmented Reality Technology to Introduce the Central Kalimantan's Traditional Musical Instrument

Gressensia Olivia Neno Aumenu^a, Sulisty Dwi Sancoko^{b*}

^{a,b}*Universitas Teknologi Yogyakarta, Yogyakarta, Indonesia*

^a*Email: gressensiaoliviana@gmail.com*

^b*Email: sulisty.dwisancoko@staff.uty.ac.id*

Abstract

Preserving Indonesia's diverse identity consisting of ethnic groups, cultures, languages, and arts is very important. To promote one of the traditional arts, namely traditional musical instruments, as a means of cultural preservation, Augmented Reality technology can be utilized. This research aims to design an Augmented Reality application for Android that displays traditional musical instruments of Central Kalimantan. This application uses Unity 3D, Vuforia SDK, and Blender 3D, and applies the Markerless method. This application displays 3D models of traditional musical instruments, with accompanying audio and text descriptions. The purpose of this application is to provide a comprehensive, interactive, and visually authentic overview of the traditional musical instruments of Central Kalimantan.

Keywords: Augmented Reality; Traditional Musical Instrument; Central Kalimantan; Markerless; Android.

1. Introduction

Traditional musical instruments are an integral part of traditional music and one of Indonesia's cultural heritages as stated in Law Number 5/2017 concerning Culture Promotion. These traditional musical instruments can be in the form of one or a set of instruments. These musical instruments have various forms and functions, and they can be further explored in the field of education [1]. One of the regions with traditional musical instruments is Central Kalimantan. Some types of musical instruments typical of Central Kalimantan include Kangkanung and Garantung, both musical instruments are played by beating. This musical instrument also has a function as a or ritual media, entertainment media, self-expression media, communication media, dance accompaniment, and economic means.

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* Corresponding author.

To support this facility, there should be a promotional media that can help introduce traditional .

Indonesian musical instruments to the public. One of the promotional media that can help introduce and help people know more about musical instruments in Indonesia is by using augmented reality technology.

Augmented Reality is a technology that combines 2D or 3D computer-generated objects into the real environment around the user in real-time. Augmented Reality (AR) is a type of technology that interactively combines real and virtual objects that will generate 3D objects to be displayed on the screen [2]. Augmented reality (AR) is a contemporary visualization technology that extends sensory perception through digital objects. The key characteristics of AR have been defined by as follows: real and virtual objects are displayed simultaneously, interactions run in real time, and both virtual and real objects are registered geometrically [3].

Accessing information to recognize traditional musical instruments is commonly achieved through literature books, browsing, or utilizing tutorial CDs that are flash based. The content of the books is typically limited to images and text. Similarly, online sources in the form of textual descriptions and 2D dynamic static images are comparable to book sources. The failure to utilize technology to preserve regional musical instruments results in a lack of knowledge about these instruments among the younger generation, leaving Indonesian culture vulnerable to theft by other nations. A possible solution to this issue is to introduce regional musical instruments to young people through the use of Android-based augmented reality technology.

Based on the description of the problem above, the proposed solution to the problem in this study is the introduction of musical instruments using AR (augmented reality) technology, based on several previous studies that have proven that AR technology provides the solutions needed for similar problems such as the introduction of modern technology, musical instruments that bring up 3D objects [4].

2. Research Method

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 [5].

2.1. System Architecture

The steps taken by the researchers to build this application are in unity. Researchers prepare objects that will be used, create source code to provide button functions and features, as well as user interface (UI). They then do render which works as a modelling process, test whether the application is feasible to use. If it is feasible and ready to use, then the user will run the application and the user interface (UI) will appear, producing output in the form of 3D objects, descriptions, and audio.

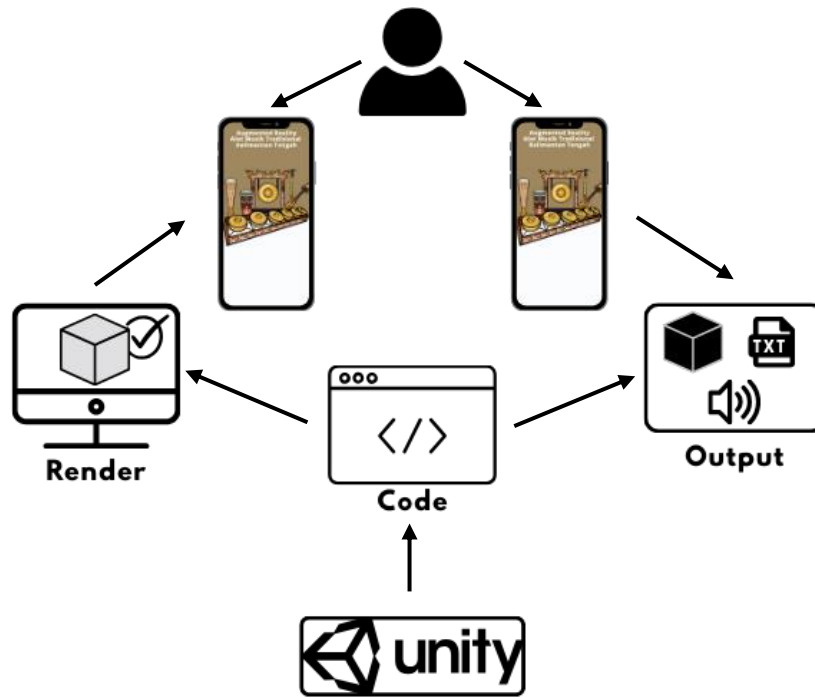


Figure1: System Architecture

2.2. Use Case Diagram

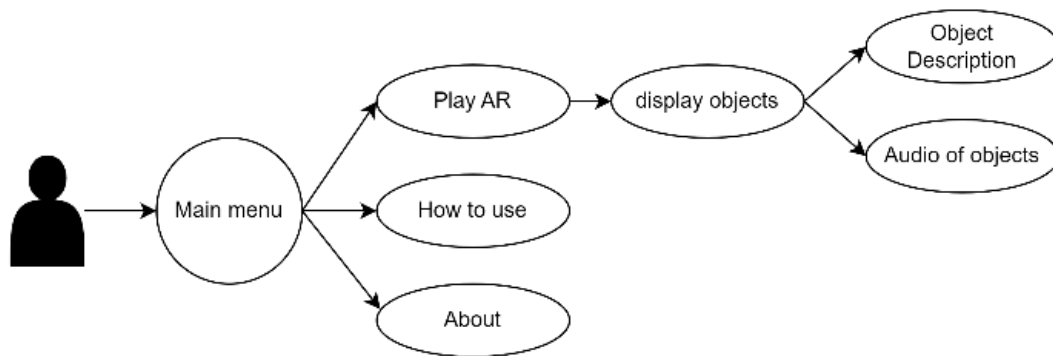


Figure2: Use Case Diagram

Use Case Diagram explains the interaction between the user of a system with the system that will tell how a system is used. Use case diagram consists of an actor and the interaction it does, the actor can Human form as the user interacts with the system [6].

The user starts the application and then enters the Main Menu, which contains the 'Play AR' menu, the 'How to Use' menu containing an explanation of how to use the application, and the 'About' menu, containing a description of the application maker and matters related to the application's creation. If the user selects the "Play AR" menu, the object will appear along with its description and audio of the musical instrument.

2.3. System Flowchart

Flowchart Android system is a sequence of events that occur on Android-based mobile [6]. First, the user will arrive at the starting page, which displays two buttons. If the user selects the 'Exit' button, they will exit the application. If the user selects the 'Play' button, they will be directed to the main menu. The main menu features three options. Selecting the 'Play AR' menu will prompt the user to choose a musical instrument from a list. After selecting a musical instrument, the application will detect a target and display its object, description, and audio. Otherwise, the user will return to the previous menu. Opting for the 'How to Use' menu will display instructions on how to use the application. 'About' will provide information about the application.

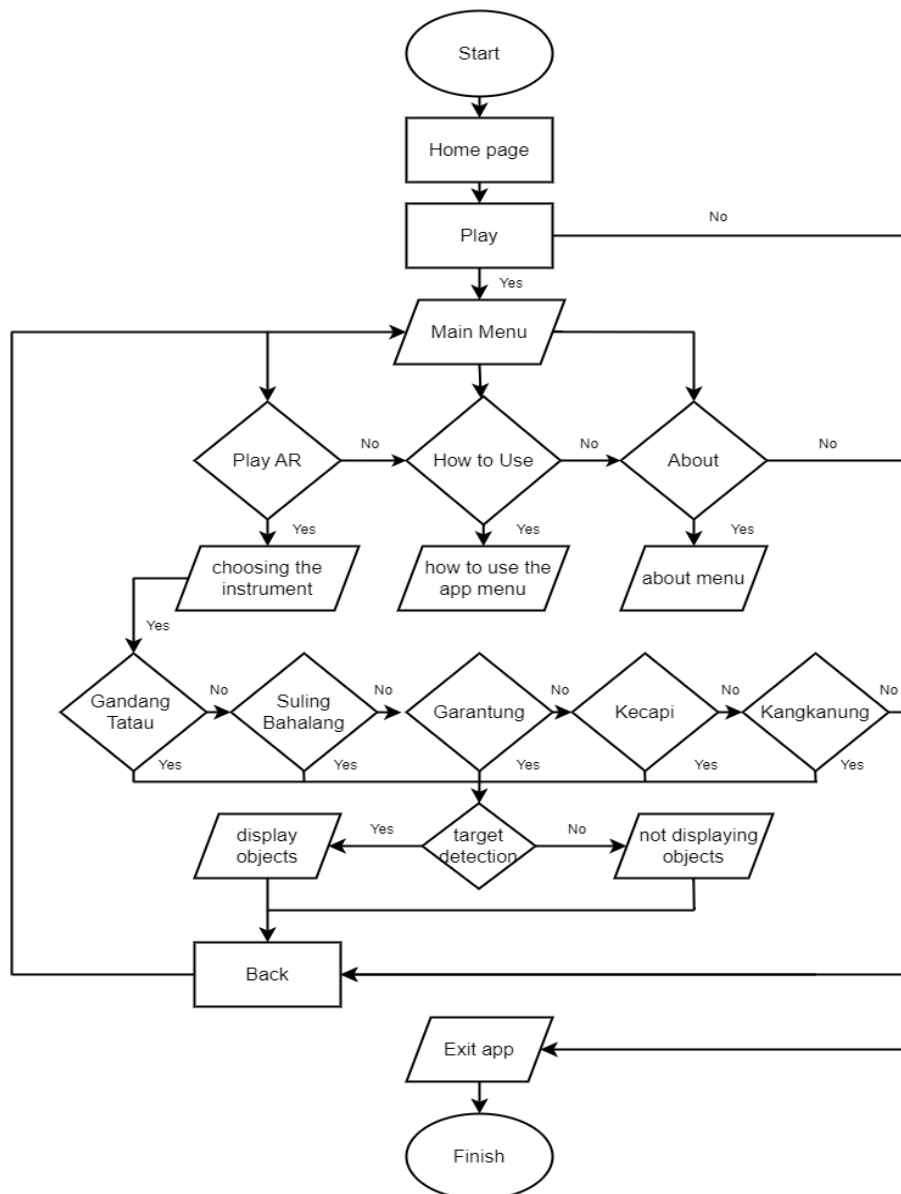


Figure3: System Flowchart

2.4. Activity Diagram

Activity diagram is a diagram that describes the workflow or processes that occur within a system. In addition, the activity diagram contains information about objects, states with transitions, and events. This diagram is an extension of the use case diagram which has an activity flow [7]. The user opens the application and is directed to the Start page. From there, the main menu appears, and the user selects the Play AR option. The application then launches the camera to detect the target. Once the target is detected, objects are displayed along with their descriptions and accompanying audio.

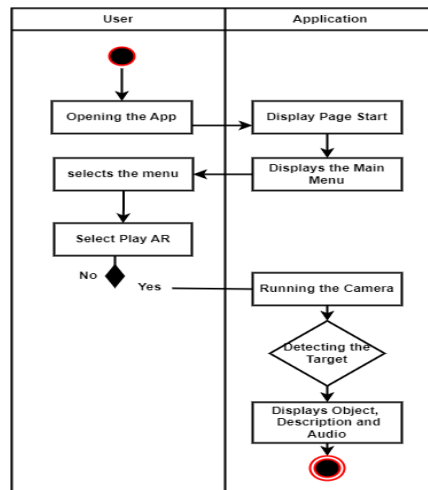


Figure4: Activity Diagram Play AR

The user opens the application, then the Start page appears. After that, the application displays the main menu, and the user selects the How to Use menu. Then the application displays a how-to-use page.

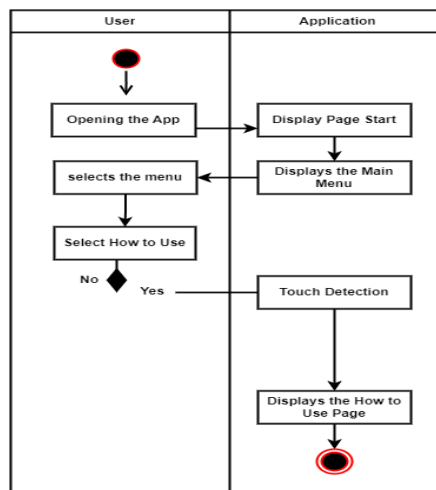


Figure5: Activity Diagram How to Use

The user opens the application, and subsequently the Start page is displayed. Afterward, the main menu appears. The About menu is then selected by the user, which then leads to the display of the About page.

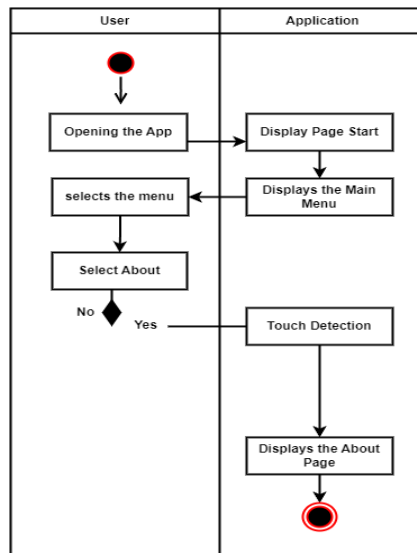


Figure6: Activity Diagram About

The user opens the application and is directed to the Start page. From there, they select the Exit menu, and the application will be successfully exited.

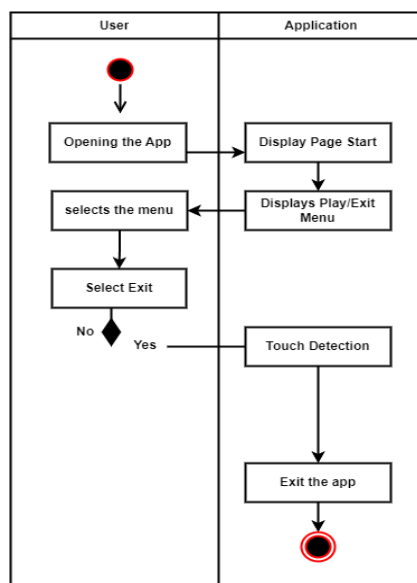


Figure7: Activity Diagram Exit

3. Implementation

3.1. Start Page and Main Menu Page

On the start page, there are two buttons: ‘Play’, which takes the user to the main page of the application, and ‘Exit’, which closes the application. The main menu offers three options: ‘Play AR’, ‘How to Use’, and ‘About’.

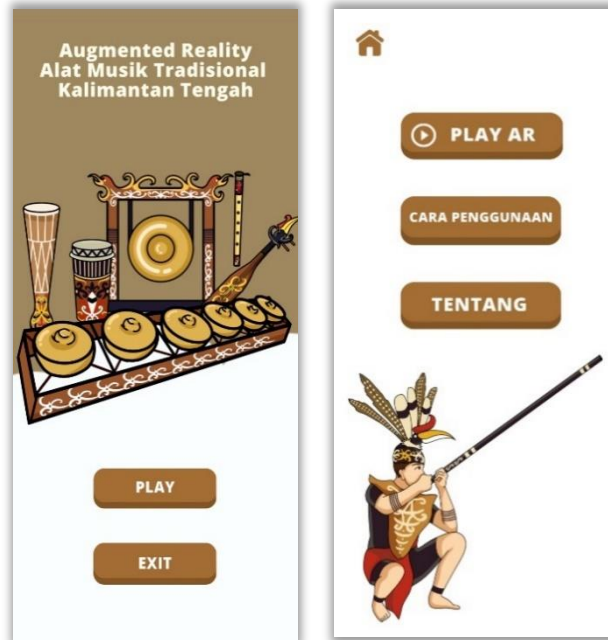


Figure8: Start Page and Main Menu Page

3.2. Play AR Menu and Gandang Tatau Page

This page is a leading to the display of 3D objects. The user chooses the desired musical instrument and then the application opens the camera to detect the target on a flat plane. After that, a 3D object and its description will appear. If the user wants to hear audio from the object, they can press the sound button to start and mute to turn off the audio. If the user wants to return to the main page, they can select the back button located at the top left of the page.

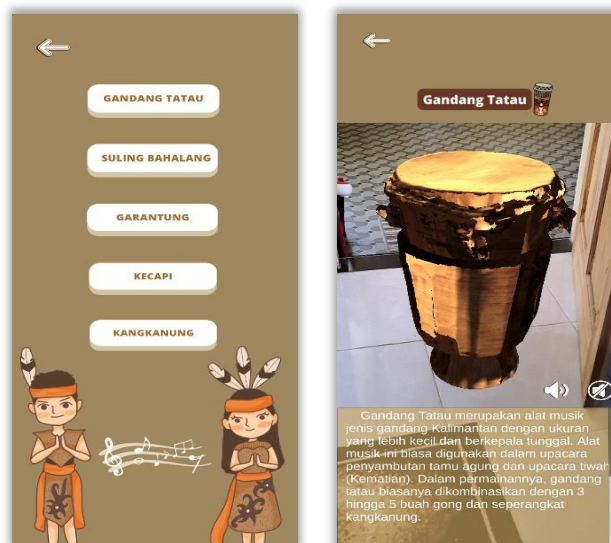


Figure8: Play AR menu and Gandang Tatau Page

3.3. Suling Bahalang and Garantung Page

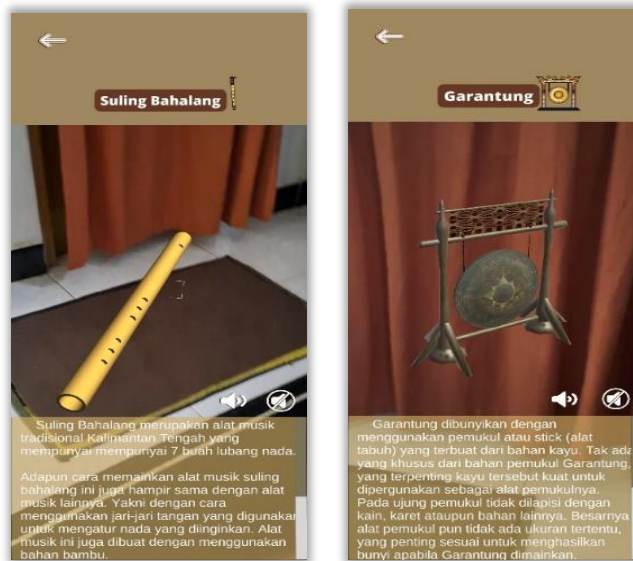


Figure9: Suling Bahalang and Garantung Page

3.4. Kecapi and Kangkanung Page

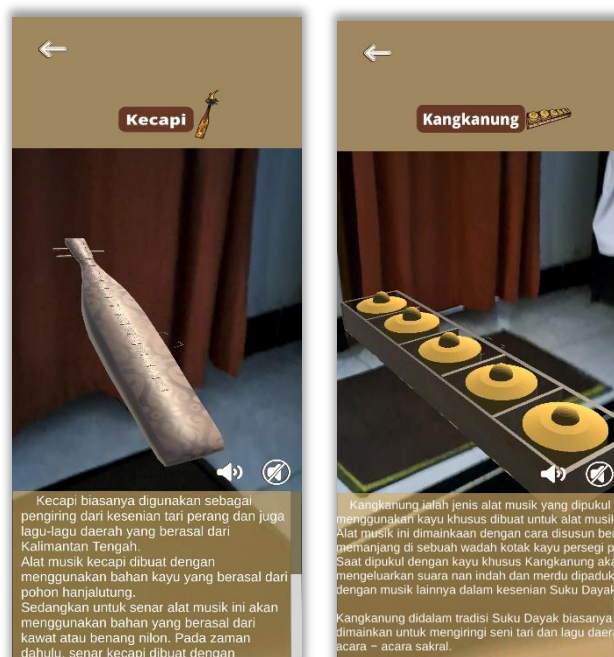


Figure10: Kecapi and Kangkanung Page

3.5. How to Use and About Page

The how to use provides instructions for operating the Central Kalimantan traditional musical instrument mobile

application. On this page there is also includes information on how to navigate the application and features a back button to return to the main menu. Additionally, the about page details the developer's background and related information.



Figure11: How to Use and About Page

4. Discussion of Result

The next stage is testing or testing which aims to ensure that every function in the system can run as it should. The test used at this stage is black box testing. This black box testing is done to look for errors in functions that are damaged or faulty. Errors sought include software interface errors, performance errors, data structure errors, and initialization or termination errors [8].

Table1: Black Box Testing

No	Testing Activities	Testing Results	Conclusion
1	Click the Play button	Display the Main page	Success
2	Click the Musical Instrument Selection button: Gandang Tatau, Suling Bahalang, Garantung, Kecapi and Kangkanung.	Displays the Musical Instrument 3D object page, description, and audio.	Success
3	Click the how to use button	Display the how to use page	Success
4	Click the about button	Display the about page	Success
5	Click the Exit button	Exit the application	Success

5. Conclusion

Based on the results of the study, several conclusions were obtained, namely that Augmented Reality technology is one method that is quite effective to be used as an introduction medium, especially the introduction of musical

instruments [4]. This research has developed an augmented reality application capable of recognizing traditional musical instruments of Central Kalimantan. The application detects targets on a flat surface and presents 3D objects, descriptions, and sounds of the instruments which were created using Vuforia SDK, Blender 3D, and Unity 3D software. This research has developed an augmented reality application capable of recognizing traditional musical instruments of Central Kalimantan. Additionally, the application allows for visualizing objects and accessing information about the traditional instruments. The result showed augmented reality technology is proven on imitating traditional music instruments such as sounds, visual and interaction which could serve as an alternative way to preserve digitally [9].

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