

# APPLICATIONS LEARNING MUSICAL INSTRUMENTS IN INDONESIA USING AUGMENTED REALITY TECHNOLOGY

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## ABSTRACT

*The 3-dimensional animation designed and presented as learning media has grown rapidly nowadays, 3-dimensional animated characters in regional musical instruments can be one of the learning media for the general public especially children. How to present different learning 3-dimensional animation content, can attract the general public and children to learn, one of them using augmented reality technology. Augmented reality is the practice of combining image media with a 3-dimensional object that brings out 3-dimensional objects from cyberspace to the real world. This way can be a form of learning, where users can see and understand that learning can be conveyed through efficient learning, in the concept of augmented reality, users not only play with this application but can Learn knowledge about regional musical instruments in Indonesia. Development of the learning system of Multimedia applications regional musical instruments in Indonesia using Augmented Reality technology is able to provide knowledge in learning that is not only in general public but also for children Children who want to add insight into the knowledge of regional culture art, especially local musical instruments in Indonesia..*

**Keywords:** *Multimedia Learning, Augmented Reality, Musical Instrument Area.*

## 1. INTRODUCTION

The Indonesian nation is a very large nation with its diversity with ethnic, cultural, language and religious backgrounds. In this diversity, Indonesia is a country that is very rich in the uniqueness of it. Technology is a tool that many people use to facilitate and fulfill their individual needs. Augmented Reality (AR) is a technology that combines two-dimensional or three-dimensional virtual objects into a real three-dimensional environment and then projects the virtual objects in real time [1]. Nowadays AR is growing and start many applications and libraries that can be used to develop AR. The less interest in learning the general public especially children due to the development of entertainment technology that precisely Increasingly presenting interesting and interactive things such as cartoon movies and 3D animations. While the learning media that is currently used is still dominated by books that contain writings and drawings only.

Technology 3D image is widely used for the entertainment industry that is indeed more attracting interest from children and the general public. With the existence of AR technology, materials in the educational world that looks boring can be simulated and created 3D objects so that the general public especially children can directly interact with the AR object. The use of an Augmented Reality technology-based trainer is very useful in enhancing the teaching learning process because Augmented Reality technology has entertainment aspects that can inspire learners to understand of material delivered through 3D visual representation by involving user interactions in Augmented Reality frames. It is hoped that the learning Media application of regional musical instruments in Indonesia using Augmented Reality technology can create new learning tools and methods to understand Indonesia's custom and culture. Interactive and interesting and can help convey information about regional musical instruments in Indonesia.

## 2. SYSTEM ANALYSIS AND DESIGN

In designing this application the author uses a system modeling language called UML or Unified Modeling Language consisting of Use Case diagrams, Activity diagrams, Class diagrams, and Sequence diagrams. Here's a description of the UML or Unified Modelling Language.

### 2.1. USE CASE DIAGRAM

Here is a view of Use Case diagrams Media Application Learning local musical instruments in Indonesia using Augmented Reality technology :

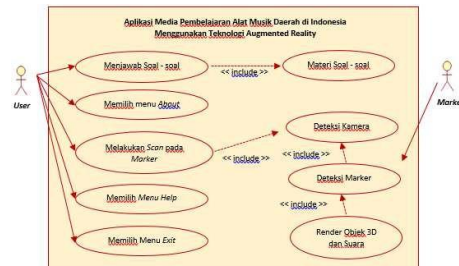


Figure 1. Use the system Diagram Case

In Figure 1 Use Case Diagram, this section describes each description of the Use Case Diagram performed by a user/user. Start from the process of selecting Start Scan, help, about, and exit. Users start to log in using the application and the system will perform marker detection. Once the marker is found then the system renders the object. In the Help menu will be displayed page how to use this AR application. While on the menu about the AR application will be in display information about the developer of the application. The exit Menu is used if the user wants to exit the application.

### 2.2. USE CASE DIAGRAM

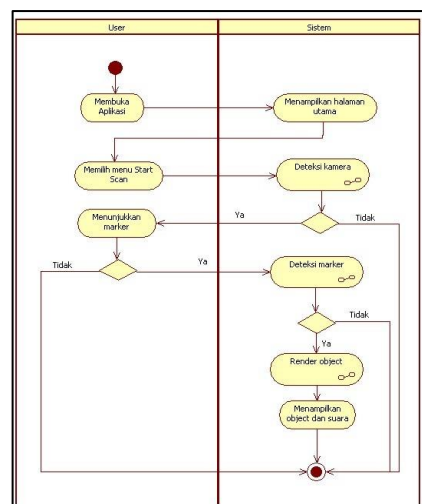


Figure 2. Activity Diagram

In Figure 2. Activity Diagram, the activity process of the Start menu diagram scan starts when the user opens the application by tapping the app icon, then the system displays the app's home page. After that the user selects the Start menu scan, then the system detects the camera. If the camera is not detected then the process is complete, while if the camera detected the user will show marker. If marker is not shown then the process is complete, while marker indicated system detects marker. If the marker is not detected the process is complete, whereas if the marker detected the system will render the object. The object and sound will display if the system finishes rendering the object.

## 2.3. CLASS DIAGRAM

A diagram Class is a specification that if an instantiation will result in an object and is the core of an object-oriented development and design. The Class describes the state (attribute or property) of a system, while offering a service to manipulate that State (method or function). Figure 3.14 is a diagram class of the Learning Media application of regional musical instruments in Indonesia using Augmented Reality technology.

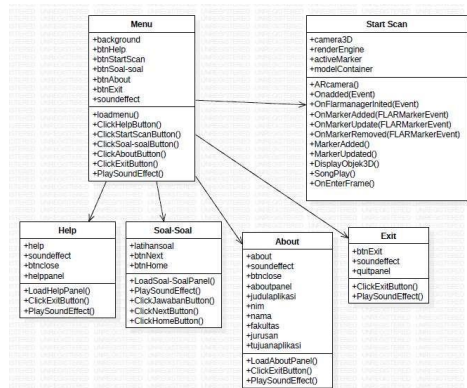


Figure 3. Class Diagram

## 2.4. SEQUENCE DIAGRAM

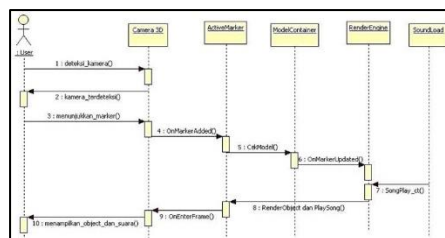


Figure 4. Sequence Diagram

In Figure 4, described smartphone will detect the camera, if it has been detected then the user will show the marker book towards the camera, then the camera will look for objects in the database, if available, it will render the object then displayed into 3-dimensional object on the smartphone screen.

## 3. SYSTEM IMPLEMENTATION

### 3.1 System Analysis

System analysis is the development of early phases used in decrypting and elaborating the whole parts into the Components section in order to identify and evaluate an application to know the barriers Happen, And the expected needs of the learning Media application of regional musical instruments in Indonesia using Augmented Reality technology can run in accordance with its functions.

### 3.2 Hardware

Based on the literature study on AR technology development projects, the minimum hardware specifications required by the developer for AR technology are as follows:

- I. Processor Intel Core i3 or so on.
- II. Minimum RAM 2 GB
- III. Optimum uses VGA Card with the ability to render 3D graphics, such as Nvidia GeForce 6xxx or ATI 1xxx series.

While the minimum hardware specifications required by the user for the AR technology are as follows:

1. Smartphone or tablet with the minimum Android operating system Jelly Bean.
2. It has a camera to capture imagery that is then processed by applications already installed on the smartphone and has a minimum RAM of 2 GB.

### 3.3 SOFTWARE

The software required by the developer build the application is as follows:

1. Windows 10 Home Operating system.
2. Blender 3D Animation.
3. Vuforia SDK dan JDK.
4. Unity 3D
5. Photoshop 2020
6. CorelDraw
7. Wondershare Filmora

### 4. OBJECT IMPLEMENTATIONS

After analyzing the system, the next step is to implement 3D objects using Blender 3D and Unity 3D software. Blender Application used is Blender 3D. This 3D object creation implementation uses blender 2.79 software. Following is the image that generates the implementation of 3D object creation in the blender. In Figure 6 is 3D object modeling from regional musical instruments in Indonesia using Blender 2.79 software. The first step is to create a 3d object from a hand. The hand 3d objects function to create moving animations like playing a musical instrument. The object created originally was just a plain texture with no color. Here's the 3d object view from hand.

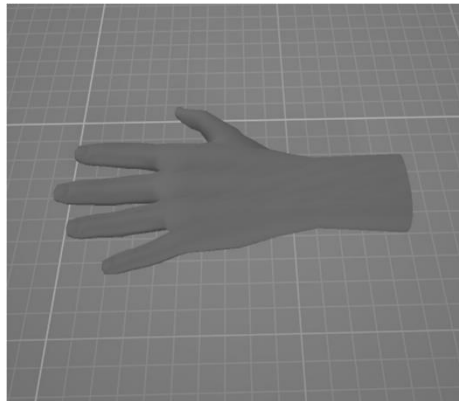


Figure 5. *Hand Objects 3D*

After creating the hand 3d object, then the next step creates a 3d object from the musical instrument. Here's an example of one of the 3d objects from a siter instrument.

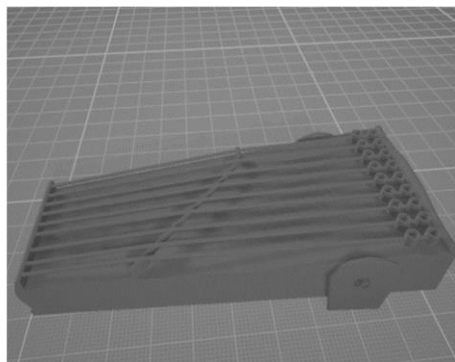


Figure 6. *3D object modeling from regional musical instruments*

After the 3D object modeling stage, the next step is to make the process of adding skins to the 3D object and imported into the prepared Unity project.

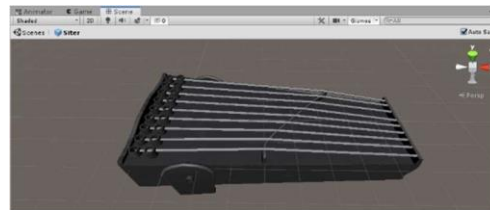


Figure 7. Imported 3D Object display

Figure 7. It is a 3D object that has been imported into the Unity project. At this stage there are also several settings to adjust the layout of the 3D objects, the direction of the camera, and the lighting.

## 5. USER INTERFACE IMPLEMENTATIONS

The design of an application display interface from the Learning Media application of regional musical instruments in Indonesia using augmented reality technology is implemented using the features found in Unity 3D. Of Start Scan page display interface.



Figure 8. Start Scan page Display

In Figure 8, on this page the user is looking for a marker, the camera will continue to perform tracking marker until the corresponding marker is found. When a marker is detected and successfully read by the system it is in this screen that the user can see a 3-dimensional object displayed right above the marker detected.

## 6. TESTING BLACK BOX

Testing Blackbox is one of the methods of testing software that focuses on the functionality side, especially on input and output applications (whether it is in accordance with what is expected or not). In the implementation of the test, the media used in the form of 3 kinds of different Android smartphones, namely with the following details.

Table 1. Testing with Black Box

No	Specification	Pageviews				
		Displaying 3D objects	Scan speed	Conformity of objects with markers	Scan the marker when sufficient light	Scan the marker when lacking light
1.	Oppo A57 Marshmallow, RAM 3 GB, internal 32 GB	Appear	00:15 seconds	Appropriate	Appear	Appear
2.	Lenovo P1ma40, Lollipop, RAM 2 GB, internal 16 GB	Appear	00:35 seconds	Appropriate	Appear	Appear
3.	Redmi Note 7 Pro, Pie, RAM 4 GB, Internal 32 GB	Appear	00:08 seconds	Appropriate	Appear	Appear

## 7. CONCLUSION

Based on the results of analysis, implementation and testing of the media applications learning local instruments in Indonesia using augmented reality technology can be drawn conclusions as follows:

- [1]. The design of an augmented reality application for the introduction of this regional musical instrument uses Multimedia Development Life Cycle, because it is structured and planned. In this case, the contents displayed in the Media application learning local instruments in Indonesia using augmented reality technology in the form of instrument recognition from various regions in Indonesia.
- [2]. Implementation of media application learning local instrument in Indonesia using augmented reality technology consists of implementation environment of software architecture, software data structure, and software interface.
- [3]. Can be run on smartphones with minimal specifications using 2 GB RAM, Jelly Bean version and 16 GB internal.

As well as suggestions that can be given by the authors based on research results making media applications learning regional musical instruments in Indonesia using augmented reality technology, among others are as follows:

- [1]. For the 3D object shown, the next stage of development is expected to display a more interactive animation.
  - [2]. The application is still focused on development on the Android platform, so for further development it is expected that this application can not only be accessed in Android smartphones but on other platforms.
- The use of this application is expected not only to help provide general and in-depth learning in children but also in the general public who want to know the local instruments in Indonesia.

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