



Animal Recognition Application Using Mobile-Based Augmented Reality at TK Gmim Solafide Uner

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ABSTRACT

The application for Getting to Know Animals is a learning support application on the theme of animals for early childhood. This application uses augmented reality technology which displays a real environment combined with three-dimensional or two-dimensional virtual objects that are displayed in real time. The aim of this research is to build an Animal Recognition Application Using Mobile-Based Augmented Reality at GMIM Solafide Uner Kindergarten. This animal recognition application uses the MDLC (Multimedia Development Life Cycle) method. The results of this study are animal recognition applications with 3D objects, using mobile-based Augmented Reality technology on the Android operating system, where applications can display 3D animal objects, along with audio explanations. 3D objects can be zoomed in, zoomed out, rotated and dragged, there are material features and game features. Applications to get to know animals can help teachers in the learning process on animal themes for early childhood, can make it easier to introduce animals that are hard to find in the surrounding environment, and can help in creating interesting learning.

Keywords: *Augmented Reality, Application., 3D, Animal, Kindergarten, MDLC.*

1. INTRODUCTION

Kindergarten (TK) is a formal education for early childhood aged six years or less than six years [1-3]. GMIM Solafide Uner Kindergarten is a private school with a kindergarten level located in Uner village, Kawangkoan sub-district, Minahasa Regency, North Sulawesi. Learning at GMIM Solafide Uner Kindergarten, especially in material about animals, still uses conventional methods in the form of books and other two-dimensional media but the school occasionally makes direct introductions by visiting the cattle market / blante or introducing animals that are often found in the surrounding environment but since the covid-19 pandemic there have been no more activities to visit the cattle market/blante. Schools also have difficulty in directly recognizing animals that are difficult to find in the surrounding environment.

Augmented Reality is a technology that displays a display of the real world environment combined with three-dimensional or two-dimensional virtual objects displayed in real time [4]. The use of technology in education is becoming more widespread, making a major contribution to the student learning experience.

One of the latest innovations that is attracting attention is the application of mobile-based Augmented Reality (AR) in the learning process. At Gmim Solafide Uner Kindergarten, children's education is enriched by the use of this technology through an AR-based animal recognition application [5-6].

In this digital era, continued learning requires adaptation to technological developments. This app not only provides an interactive and engaging learning experience, but also allows children to explore the animal world in more depth. By combining reality and virtual elements, children can experience more lively and memorable learning [7-9].

The introduction of animals through AR at Gmim Solafide Uner Kindergarten has had a positive impact on students' understanding of various types of living creatures. This application is designed to introduce animals directly through mobile devices, providing real-life experiences that are difficult to achieve through conventional learning methods [10-11].

With the development of technology in the field of education as a medium or learning support [12]. So this can be utilized to build animal recognition applications using mobile-based Augmented Reality in an effort to

create interesting learning, facilitate in introducing animals that are difficult to find in the surrounding environment and to improve the quality of learning [13-15].

2. RESEARCH METHODS

2.1. Data collection techniques

2.1.1 Observation: Studying and observing directly at the research location, namely at GMIM Solafide Uner Kindergarten.

2.1.2 Interview: Conducting questions and answers to teachers at GMIM Solafide Uner Kindergarten related to the application that will be made Title and Author,

2.1.3 Literature Study: Collecting theories from previous research sources such as books, journals or articles and other information from the internet that can help in the research to be carried out.

2.2. System Development Method

The system development method used is the Multimedia Development Life Cycle (MDLC) method. MDLC is a method that can be used for the design and development of multimedia applications where the application is a combination of sound media, video, animation, images, text and so on. [12]

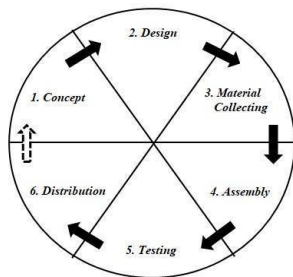


Figure 1. Life Cycle of Method Development

- 2.2.1 Concept: Determining the purpose, who uses it, and the needs of the system to be created.
- 2.2.2 Design: Describe the appearance of the application to be made in detail.
- 2.2.3 Material Collecting: This stage collects or makes the materials needed in the application.
- 2.2.4 Assembly: Is the stage of coding or making applications.
- 2.2.5 Testing: The stage of testing the system to see if the application functions as expected.
- 2.2.6 Distribution: Distribute/distribute the application

3. RESULTS AND DISCUSSION

3.1. Concept

This stage determines the purpose of the application to be created, and who uses it, as well as the needs of the system to be created.

Table I. Concept

Kategori	Deskripsi
Title	Animal Recognition Application Using Mobile-Based Augmented Reality at GMIM Solafide Uner Kindergarten
Aims	support the early childhood learning process and to help teachers create interesting learning, making it easier to introduce animals.
Aplication	Getting to know animals
Type of Multimedia	Interactive and informative learning media for animal recognition using Augmented Reality technology
Platform	Mobile dengan sistem opreasi android
User	Early childhood
Grafic	2d dan 3d
Audio	Backsound, audio effect, suara hewan, suara informasi. dengan format (.wav dan .mp3)

3.2. Design

This stage is the stage of designing the appearance of the scene using wireframes, mockups and storyboards, as well as determining the links of each scene using a hierarchical menu and creating an application flowchart.

There are eight wireframe design and mockup that designed. There are Home Page Wireframe, Select sub-theme page, Wireframe of Sub Theme Page, Material Page Wireframe, AR Camera Feature Wireframe, Games Feature Wireframe, Help and Information Page Wireframe and Application Exit Page Wireframe.

3.2.1. Wireframe, here's a wireframe view of the application:

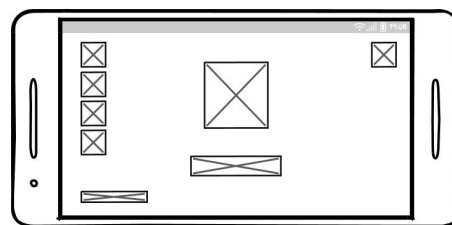


Figure 2. Homepage Wireframe

3.2.2. Mockup, here's a mockup view of the application

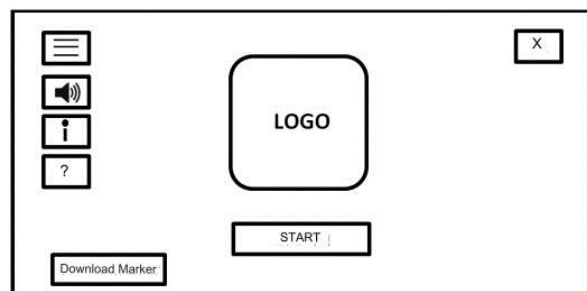


Figure 3. Main Page Mockup

After that, all mockup must have a storyboard that explaining compomnet details. Some example are shown below

3.2.3. Storyboard, here is the application storyboard

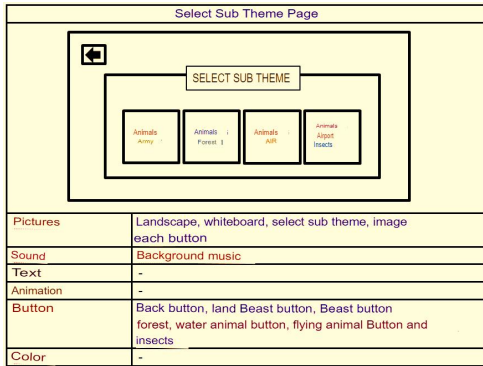


Figure 4. Storyboard of Select Sub Theme Page

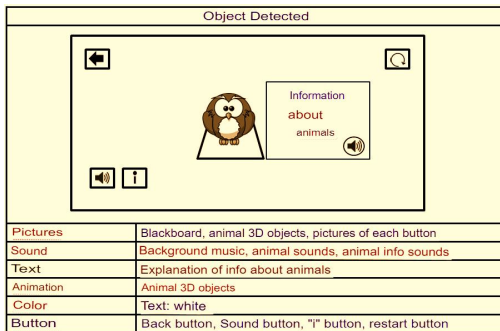


Figure 5. AR Camera Feature Storyboard

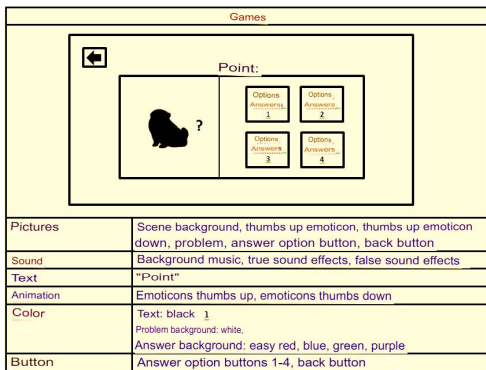


Figure 6. Games Feature Storyboard

3.2.4. Hierarchy Menu

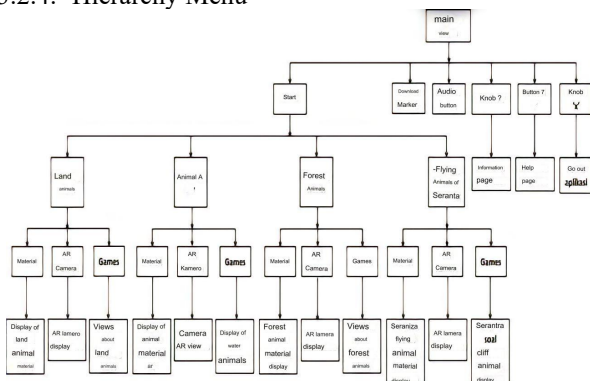


Figure 7. Hierarchy Menu

5) Flowchart

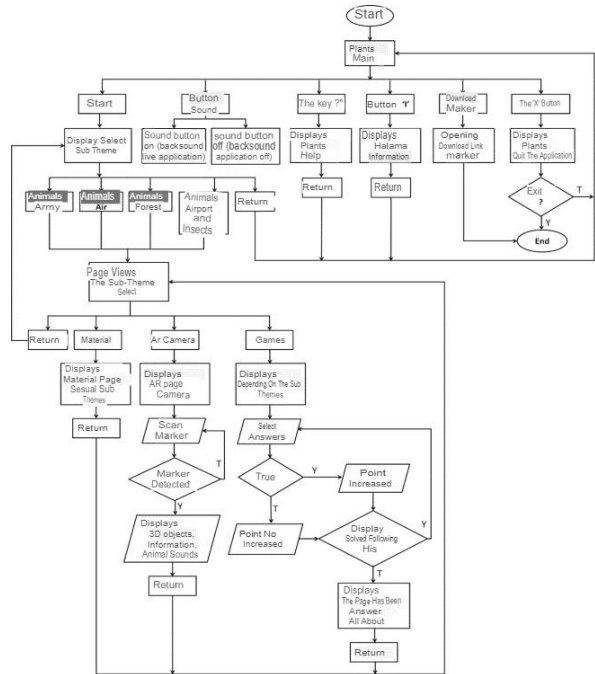


Figure 8. Flowchart

3.3. Material Collecting

In collecting the materials needed to build this application, some of the materials are taken on the internet, and for making interface and marker materials made using the Adobe Photoshop application, the blender application is used to convert 3D objects that have been downloaded on the internet to .fbx or .obj format, and for making or compiling this AR application, made using unity software.

3.4. Assembly

This stage is the stage of making applications based on the materials collected at the material collection stage and made into an application based on the design process.

In making this application using Unity software with the C# programming language. Here is the process of making an application to recognize animals.

The following is a display of the final results of the application to recognize animals.



Figure 9. Display of select sub-theme page

The select sub-theme page has 5 buttons: back button, land animal button, water animal button, forest animal button, branch animal button and insect button.



Figure 10. Sub-theme page display

The sub-theme page has 4 buttons, namely the Material button, AR Camera button, Games button, back button

The material page has an explanation and marker of the selected sub theme, there is an audio explanation of the material. There are 4 buttons, namely the back button, sound button, '<' button and '>' button.

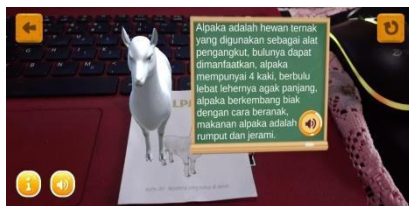


Figure 11. AR Camera Display

AR Camera if detected there is a 3D object as well as the sound of the animal name, and there is an 'i' button, information board about the animal, sound button.



Figure 12. Games View

The Games page has questions in the form of pictures with black patterns that must be matched with the existing choices, there are 4 answer choice buttons that contain pictures of animals.

3.5. Testing

At this testing stage the application that has been built or made will be tested to see if the application functions as expected. The testing method used to test this application is the black box testing method. For testing the functionality of this application was tested by the Developer, 1 Media Expert, 2 teachers and 10 5-year-old kindergarten students. From the test results, each function in the application runs according to the expected / desired results.

Testing of animal recognition applications is also carried out on several devices or smartphones, the following table of device testing.

Tabel 2. Device Testing

Device	Results
Samsung A20 OS : Android 11 Size : 6.4 inches Resolution: 720x1560 Pixels, 19.5:9 rasion Camera : 13 MP	on this device, every function or feature in the application can run smoothly according to design, and the application display adjusts to the resolution of this device.
Xiaomi Redmi Note 5 OS: Android 9 Size : 6 inches Resolution : 1080x2160 Pixels, 18:9 rasion Camera : 13 MP	on this device, every function or feature in the application can run smoothly according to design, and the application display adjusts to the resolution of this device.
Xiaomi redmi 9C OS: Android 10 Size : 6,53 inches Resolution : 720x1600, 20:9 rasion Camera : 13 MP	on this device, every function or feature in the application can run smoothly according to design, and the application display adjusts to the resolution of this device.
Asus Zonefone 3 laser OS: android 7 Size : 5.5 inches Resolution : 1080x1920 pixel, 16:9 rasion Camera : 13 MP	on this device, every function or feature in the application can run smoothly according to design, and the application display adjusts to the resolution of this device.

The conclusion of this test is that the application on the tested smartphone can run smoothly according to the features, and the application display adjusts to the resolution of each smartphone.

3.6. Distribution

The application that has been tested is then built in .apk format so that it can be run on a smartphone device. The application is distributed using Google Drive by sharing the application file link.

The following are details of the animal recognition application.

Application Name: Knowing Animals

Application Format : .apk

Application Size : 140.03 Mb

4. CONCLUSION

From the research that has been done, researchers have succeeded in building an application to recognize animals with 3D objects, using mobile-based Augmented Reality (AR) technology, where this application can run on the Android operating system. The system development method used in this application is the Multimedia Development Life Cycle (MDLC) method with the following stages: concept, design, material collecting, assembly, testing, and distribution. Where the application is able to detect markers and can display 3D animal objects, and there is an audio explanation of each object. 3D objects can be zoomed in, zoomed out, rotated and dragged, there are material features in the form of text and audio and game features.

With this learning media can help teachers in the learning process on the theme of animals for early childhood, can facilitate in introducing animals that are difficult to find in the surrounding environment, and can help in creating interesting learning.

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