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Augmented Reality Technology for Learning Introduction Media of Various Vegetables Android Based using Unity

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ABSTRACT

Technological developments are getting faster over time in all fields and in various sectors, one of the fast developments is gadgets. This affects people at various ages who make gadgets as a medium of information and also learning media for children. Early childhood is the most important period in human life. This is because at an early age children are sensitive to receiving external stimuli, so that children must be given educational stimuli to help physical and spiritual growth and development so that children have readiness to enter education at a further level. The application of Augmented Reality for learning media for the introduction of various vegetables aims to make it easier for Kindergarten and PAUD teachers to deliver learning materials for the introduction of various vegetables to children and is also more interactive because there is additional media for Augmented Reality marker cards that can be scanned with a camera. smartphone and take out a 3D object from the shape of a real vegetable. In this application, there are also practice questions that can be done to train children's memory after getting to know 10 kinds of vegetables. This application can be used on smartphones with the Android operating system.

1. Introduction

Early childhood is the most important period in human life. This is because at an early age children are sensitive to receiving external stimuli, so that children must be given educational stimuli to help physical and spiritual growth and development so that children have readiness to enter education at a further level.

The best way to develop aspects for early childhood can be done in various ways, one of which is by involving children in Early Childhood Education (PAUD). Based on the Regulation of the Minister of Education and Culture of the Republic of Indonesia (Permendikbud) Number 137 of 2014, PAUD is carried out from an educational institution in the form of Kindergarten (TK) / Raudatul Athfal (RA) / Bustanul Atfal (BA), Playgroups (KB) , Child Care Center (TPA), and Similar PAUD Units (SPS).

In general, the teaching-learning process for Kindergarten or PAUD is done face-to-face in the classroom. Teaching and learning activities are communication between individuals or groups to provide knowledge.[1] This process requires teachers who are able to harmonize between learning media and learning methods.[2] In addition to teachers carrying out teaching and learning activities directly in the classroom, teachers can also provide direct interaction with children more easily related to teaching and learning activities that are being carried out, so that children become easier to accept instructions that have been given from the teacher, which in turn makes children more developed in accepting the learning that has been delivered.

However, in the last few months, as a result of the pandemic from the spread of the Covid-19 virus outbreak throughout the world, including Indonesia, starting in mid-March 2020, there has been a change in the teaching-learning system at all levels of education including PAUD and Kindergarten, thus making the teaching-learning process in Kindergarten and PAUD are conducted online.

In this online teaching and learning activity, the teacher as a guide for the teaching and learning process in Kindergarten or PAUD also has difficulty conveying an introduction to the material to children. For example, when the teacher wants to convey material about knowing various vegetables, the teacher will use the material in the book and show

pictures of various kinds of vegetables to children through a gadget camera during a class video call. This becomes less effective in teaching and learning activities when done online, so it is feared that children do not understand the introduction of various types of vegetables delivered by the teacher.

Therefore, the author wants to provide a solution to help online teaching and learning activities to be more optimal by creating an Android-based learning application using Augmented Reality (AR) technology as the medium. Augmented Reality (AR) technology is a technology that allows the addition of synthetic images into the real environment.[3] It is interactive in real time, and is 3D animation.[4]

Augmented Reality can be easily applied in the world of education, because it can provide information that is easy to understand and can illustrate illustrations.[5] In addition, applications using Augmented Reality technology can be operated via smartphones and tablets based on the Android operating system. So that children can learn it anytime.

With all the things that have been explained previously, the author will realize in a research entitled "Application of Augmented Reality Technology for Learning Introduction Media of Various Vegetables Android Based using Unity". With the existence of more informative and interactive learning media, this application can help stimulate children's imagination about the introduction of various kinds of vegetables to make it easier to understand, so that children are interested in learning to know the various types of vegetables that exist.

1.1 Multimedia

Multimedia comes from two words, namely multi and media. Multi means many and media means a tool to convey or make something, an introductory tool, a form of communication. [6]

1.1.1 Multimedia Hardware

Multimedia hardware (computer) is a data processing tool in the form of text, images, audio, video or animation that works electronically and automatically.

1.1.2 Multimedia Software

Multimedia software that is used to process several information media, such as text, images, audio, graphics, video, and interactive. There are so many types of multimedia applications, ranging from just viewing them to creating and editing them. Types of Multimedia hardware:

a. Media Player

b. Audio/ Video Editor

c. Graphic/ Image Viewer

d. Graphic/ Image Editor

e. Animation

f. Graphic 3D[7]

1.2 Application

Ready-to-use applications or programs that are designed to perform a function for other users or applications and can be used by the intended target. An application is a collection of program commands that are created to perform certain tasks. [8]

1.3 Android

An operating system for Linux-based mobile devices that includes an operating system, middleware and applications". In developing applications, Android provides the Android SDK which provides tools and APIs for application developers with the Android platform. [9]

1.4 UML

Unified Modeling Language (UML) an industry standard language for visualizing, designing and documenting software systems.[10] programming language for systems or software with an object-oriented paradigm. [11]

2. Methods

2.1 Data Collection Method

2.1.1 Observation Method

A. Literature Study
   Data collection is done by studying, researching and reviewing various literatures from the library sourced from books, scientific journals, internet sites and other readings related to the research conducted. [12]
B. Field Study
   Field study is a technique of collecting data by conducting research and direct observation of the problems taken. Field studies in making this research carried out directly in the community, which include:
C. Observation
   The observation technique was carried out on early childhood and kindergarten level children in the community. Observation is a way of observing the research object to understand the needs of the research object so that the application to be built can meet user needs.
D. Interview
   The interview technique is a step in scientific research in the form of using verbal communication processes to collect information and data from a resource person. Interviews conducted with related parties, for example to parents or teachers, are intended to seek

information about how to learn from the introduction of various vegetables.

2.2 System Design Method

At the system design stage, the method used by the author in designing a learning media application to recognize various types of vegetables based on Android is to use the ADDIE development method. In this development method there are several stages that must be carried out, namely Analysis, Design, Development, Implementation, and Evaluation. [13]

2.3 Overview of the object under study

RA Qurrota A'yun was established on June 1, 2012 which was founded by the AL-Manar Tangerang Foundation located in Kampung Nagrak Gang Johan, RT 05 RW 06, Kel. Pot, Kec. Pot, Tangerang City. Initially RA Qurrota A'yun had 2 classes which later developed into 4 parallel classes. The establishment of RA Qurrota A'yun was pioneered by the foundation's administrators and parents of children's recitation students whose sons and daughters recited the Koran in the AL-Manar Tangerang foundation, then formed the Founding Body and Management of the AL-Manar Tangerang Foundation.

The purpose of establishing RA Qurrota A'yun is to provide opportunities for the people of Kampung Nagrak and its surroundings to send their children to RA Qurrota A'yun with Islamic nuances in addition to providing protection for the aqidah to the younger generation who live in the very diverse environment of Kampung Nagrak. ethnicity and culture.

At the time of the establishment of Qurrota A'yun in 2012 the number of students was 23 children, the following year 2013 the number of students increased to 37. In 2014 the number of students continued to increase to 44 children, in 2015 the number of students was 51 children, in 2016 the number of students was 59 children, in 2017, in 2018 there were 61 students, in 2019 there were 69 students, and in 2020 there were 65 students. In connection with the stipulation of the Covid-19 pandemic in March 2020, in 2021 RA Qurrota A'yun experienced a decrease in the number of students, namely 47 children divided into 4 groups, namely 1 play group class (KB) 1 class A and 2 class group B.

2.4 Ongoing System Management

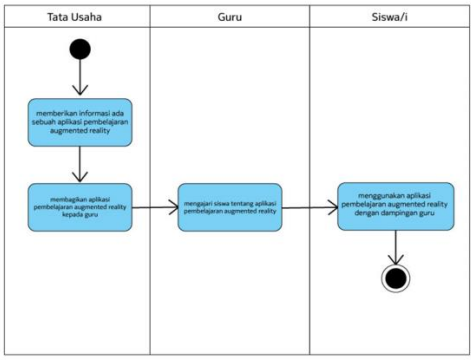


Figure 1. On going system activity diagram

2.5 Problems Encountered

The learning media used by RA Qurrota A'yun still uses conventional media, so problems arise in teaching and learning activities which result in a lack of interest for the students of RA Qurrota A'yun to learn to recognize the types of vegetables. The various problems faced include the following:

1. Use of less effective and interactive media
2. Lack of interest in children to learn to recognize vegetables
3. Children's boredom when learning material about various vegetables
4. Teachers who are not able to create conducive and fun learning when teaching in online classes.

2.6 Alternative Troubleshooting

Based on the problems that arise in the implementation of the teaching and learning process at RA Qurrota A'yun, the authors have several alternative solutions that can be used, including the following:

1. Creating a learning media application using Android-based Augmented Reality technology to help learning activities to introduce various vegetables as learning media to children at RA Qurrota A'yun.
2. Creating a fun online learning atmosphere with the Augmented Reality learning application based on Android, so that children are interested in learning with this application and easily understand the material regarding the introduction of various vegetables by scanning vegetable character picture cards and being able to answer practice questions that are already available on the app.

3. Results and Discussion

3.1 Proposed Procedure

The design of the Augmented Reality application system for the introduction of various kinds of vegetables based on Android [14] is to facilitate the teaching and learning process of RA teachers. Qurrota A'yun to make it easier for students to understand the

material about the types of vegetables. The following is a system design proposed by the author for the system to be created.

1. Principal

a. Showing the splash screen page

b. Displays the main menu and buttons

c. Displays a menu of types of vegetables

d. Display the scanner screen

e. Displaying 3D objects of vegetables

f. Showing the quiz practice questions menu

g. Displays the study program display menu

h. Bring up the back sound

i. Displays the close/exit button

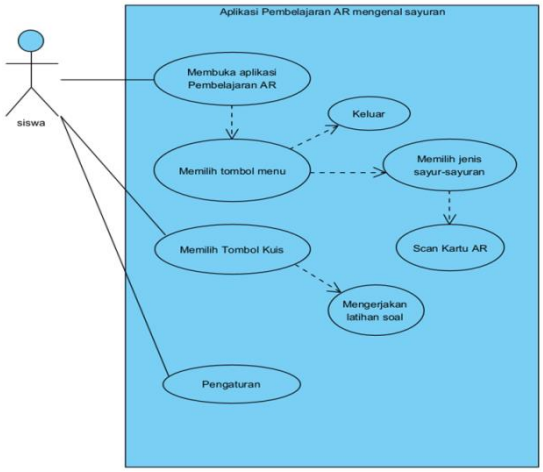
The system design proposed by this author is made using a unified modeling language (UML) [15] diagram, while for making the software using the PHP programming language with a database system using MySQL

1. Use case diagram
2. Activity diagram
3. Sequence diagram
4. Class diagram

3.2 System Design Diagram

3.2.1 Use Case Diagram

In the picture below, the following is a specification of the use case diagram of the Augmented Reality application for learning media for the introduction of various kinds of vegetables based on Android. Where the actor is the user or the use of the application.



Applications

3.2.2 Activity Diagram

The activity diagram plan for the Augmented Reality application for the introduction of various kinds of vegetables based on Android based on the description of each use case diagram above which shows the process of the Augmented Reality application system for the introduction of various kinds of vegetables based on Android below in detail can be explained on each image.

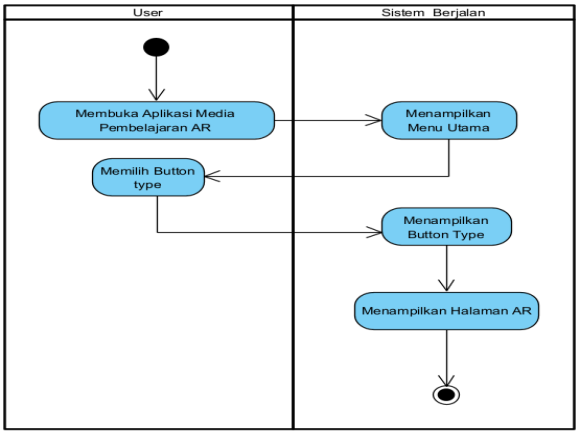


Figure 3. Activity Diagram of Learning Media Applications

Explains the activity when the user opens the Augmented Reality application, learning media for the introduction of various kinds of vegetables based on Android, the system displays the main menu then the user selects one of the Augmented Reality application menu buttons, the system runs the function of the button, which displays the Augmented Reality page.

Figure 2. Use case Diagram of Learning Media

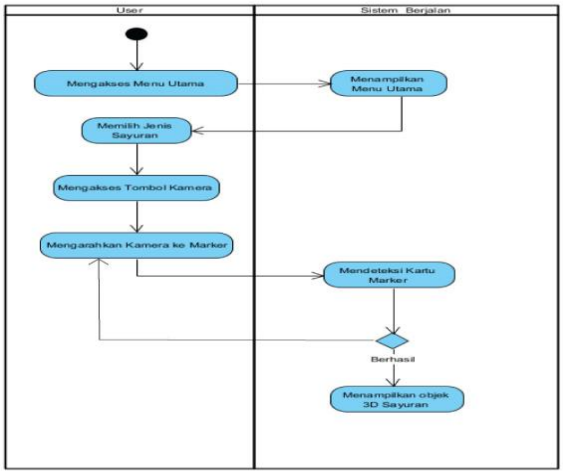


Figure 4. Activity Diagram Button Menu

Describing the activity when the user opens the main menu, the system will display menu options then the user can choose the types of vegetables available on the menu. Next, the user can access the camera button to point the camera at the AR marker card. The system will scan the AR marker card if successfully the 3D vegetable object from the AR card appears on the screen.

3.2.3 Sequence Diagram

Sequence diagrams describe a scenario or a series of steps taken in response to an event to produce a certain output.

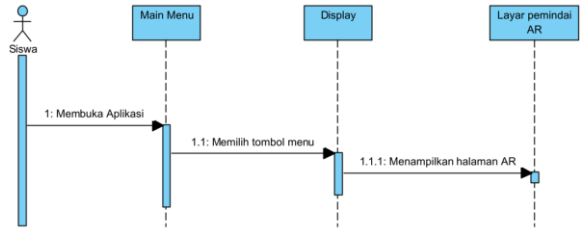


Figure 5. Sequence Diagram of Learning Media Applications

Explanations:

Sequence Name	Sequence diagram of Augmented Reality applications
Actor	User
Short description	The user opens the application, then it will lead to the main menu, after that the user will select the menu button and the system will process it so that it displays the AR page.

3.3 Display Design

Figure 6. Design of Ten Augmented reality Marker Cards

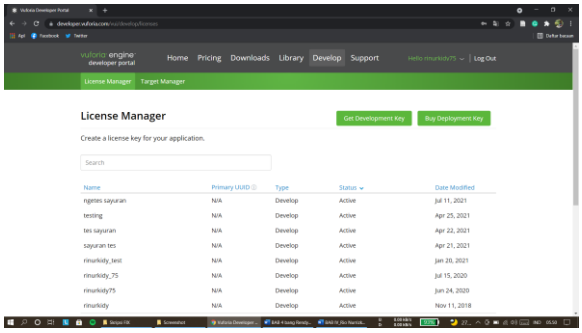


Figure 7. Display of Vuforia Engine

The following is a display of the vuforia engine for making license manager and target manager before starting to create application projects in unity 3D. Because at the time of making the application I was asked to enter a license manager in Unity 3D and create a target manager as a medium for making markers that are used to scan objects that appear.

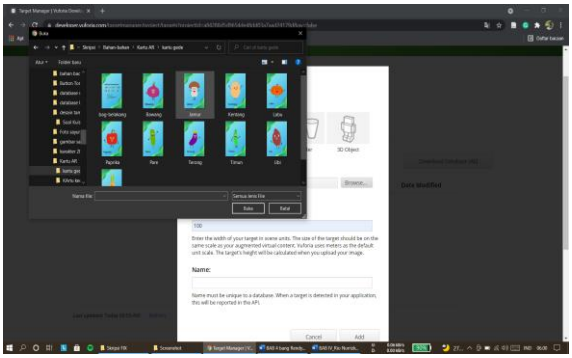


Figure 8. Display Add Image Vuforia Engine

By selecting add target and then selecting single image and input the image that we have created as a marker with a width of 100 then add target.

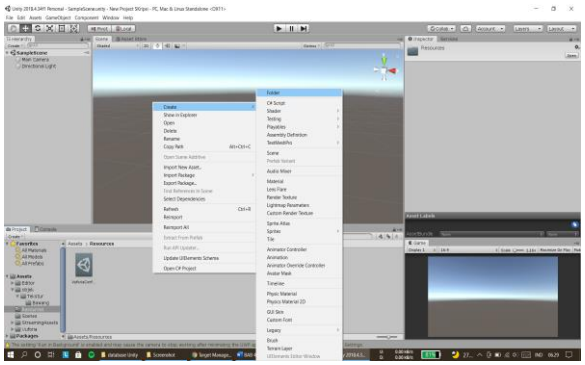


Figure 9. Display when Creating Folders in Assets

The following is a view of creating a folder in assets by right clicking on assets and then creating a folder in it with the name USER to make it easier for us to create the project we want to create.

3.4 Evaluation

The data from the implementation are then analyzed to determine the level of feasibility of the learning media as a whole. The following is a table of the results of the feasibility test from media experts, material experts and students.

Table 1. Feasibility Test Results

KODE	NO ITEM	Kategori Jawaban					
		A		B		Total	
		F	%	F	%	F	%
A B	1)	17	100	17	0	17	100
	2)	17	100	17	0	17	100
	3)	17	100	17	0	17	100
	4)	17	100	17	0	17	100
	5)	17	100	17	0	17	100
	6)	17	100	17	0	17	100
	7)	17	100	17	0	17	100
	8)	17	100	17	0	17	100
	9)	17	100	17	0	17	100
	10)	17	100	17	0	17	100

From the overall data processing above, it shows that of the 17 respondents, the total data obtained on the average respondent answered "A" 100%, "B" 0%

The number of answer categories "A", "B", for the 100% implementation test, thus testing the Augmented Reality application for Learning Media Introduction of various vegetables based on Android Using Unity which was tested for field testing can be said to be good.

Formula Description : F/N×100

P= F/N X 100%

Description:

P = Percentage earned

F = Acquired frequency

N = Number of samples studied

4. Conclusions and Suggestions

4.1 Conclusions

Based on the results of this study, the authors can draw conclusions from research on the Application of Augmented Reality Technology for Learning Media for the introduction of various Android-based vegetables using Unity as follows:

1. Making learning media for the introduction of various kinds of vegetables based on Android using Unity through five stages, namely analysis, design, manufacture, implementation and evaluation. At the analysis stage, it was found that the learning media used was still a book, then analyzed the need for research tools. At the design stage, make flowcharts and storyboards to make it easier for programmers to translate designs into programming languages. At the manufacturing stage, Unity 3D software is used to create Augmented Reality applications. The next stage is testing conducted by media experts, material experts and students as potential users. The last stage is evaluating the data obtained to determine the feasibility level of the product made.
2. Teachers can use Augmented Reality cards to scan 10 kinds of vegetables for teaching materials. And students can also do 10 practice questions in the application to train students' memory after they all scan the Augmented Reality card which contains 10 kinds of vegetables.

4.2 Suggestions

Based on the research results obtained, the suggestions given by the author are:

1. The resulting learning media needs to be further refined to make it more interesting.
2. The resulting learning media needs a more complete development of the material so as to improve the quality of the material presented.
3. Suggestions for the next writer who will design learning media using Augmented Reality technology as a final project is to understand in advance the material to be made for learning media with Augmented Reality technology so that the results of the application are more useful.

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