Alphabet Recognition with Augmented Reality Technology Based on Android Using Extreme Programming Model

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Abstract - Lack of literacy or interest in reading is the cause of children having difficulty recognizing the letters of the alphabet and assembling them into words or sentences because the letters are similar. Early childhood students have difficulty learning letters because there are too many letters of the alphabet that must be memorized, the number of letters of the alphabet there are 26 letters that must be memorized. In addition, early childhood students complain that reading is very difficult to pronounce because the way the teacher conveys reading techniques for students is difficult to understand so that it is boring for early childhood students. This makes it difficult for young children to pronounce letters. In software development using Extreme Programming (XP) where writing programs in pairs, two programming people work together to write programs. Currently, computer vision technology has been used in various industries, including trade, medicine, education, and so on. Augmented reality is one of the computer vision technologies. The technology of computer vision is to combine synthetic images into the real world or vice versa. By making an android application with an extreme programming method that utilizes Augmented Reality technology that can display 3D, animation, and sound so that it looks real, it makes early childhood interested and makes it easier for them to learn the letters of the alphabet.

Keywords: augmented reality, extreme programming, letter recognition, childhood, alphabet

I. INTRODUCTION

Many early childhood difficulties in literacy skills [1]. The influence of lack of interest in reading or lack of literacy and lack of critical thinking in early childhood is still low [2]. Because the letters are similar, but the reading is different. Literacy skills in early childhood are the ability to memorize the letters of the alphabet and assemble them into words or sentences [3]. Early childhood students have difficulty learning letters because there are too many letters of the alphabet that must be memorized, the number of letters of the alphabet there are 26 letters that must be memorized. In addition, early childhood students complain that reading is very difficult to pronounce because the way the teacher conveys reading techniques for students is difficult to understand so that it is boring for early childhood students. This makes it difficult for early childhood to pronounce letters or words.

In software development, there are several methods with extreme programming (XP) models using OOP. In the coding stage, programmers work together on one computer and write programs consisting of 2 people [4]. The extreme programming system development method is a stage development method in simplifying the various stages of the development process so that it is more flexible and determines good and fast communication and is ready to accept changes and improvements whenever there are errors.

Currently, computer vision technology has been used in various industries, including trade, medicine, education, and so on. Augmented reality is one of the computer vision technologies. The technology of computer vision is to combine synthetic images into the real world or vice versa [5]. Augmented reality combines video and computer graphics in real-time with perspective alignment [6].

Augmented reality technology is a technology that uses 2-dimensional or 3-dimensional virtual objects in a real environment [7]. Smartphone users feel as if they are in their environment that presents an interactive augmented reality that attracts users [8]. Blender is software for creating 2D and 3D objects or animations. The features in the blender are video processing, lighting, textures, models, and others [9]. Different from conventional learning and learning using augmented reality. The learning process with conventional methods with manuals that are used to provide understanding to the user about the material presented. The application of Augmented Reality is predicted to be an innovation from learning media. Learning media using Augmented Reality is more interactive and interesting [10].

Learning media is a tool used to make it easier to convey material [11]. In the delivery of material, there are times when it works and sometimes it doesn't. To minimize failure in delivering material, educational media is needed [6]. Learning media can help with technology on smartphones, so learning can be anytime and anywhere. Software developers have developed AR technology that was previously used in PC devices and is now used in smartphone devices [12].

Augmented reality learning media is more interesting for early childhood children to learn the material presented by the teachers[13]. Purpose By making this AR application, researchers can apply multi-media science and informatics techniques obtained from various sources so that they can be applied to scientific works. Benefits Increase children's interest in learning the letters of the alphabet. by introducing the letters of the alphabet with augmented reality using the extreme programming method.

II. METHOD

A. Preparation

In this research, the method is as follows:

1) *Data collection:* Knowledge is basic equipment or material needed in research, it can be obtained from previous research, journals, ebooks, and theses related to the development of augmented reality applications[14]. In collecting data about augmented reality, including markers, animations, vuforia, and software unity. Before making the application, we first install the Android SDK as an emulator for the Unity software when testing ready-made applications, install the Unity software to combine markers and animations with the C# language, install Corel Draw to create markers, then install Blender to create models and animations of similar objects will be created.

2) *Software Analysis and Design:* Analyzing the current system, namely to find out what will be needed for the application to be built, design a proposed system to be built using UML, including use cases, activity diagrams, sequence diagrams, display design. The design is made in the EA application in making use cases, activity diagrams, sequence diagrams.

3) *Software Development:* Making markers in corel draw in making markers must be careful in RGB colors because RGB colors are very influential when we scan markers to run Augmented Reality technology. After the marker is finished, then upload the marker image to the vuforia database. After that create objects and animations and sounds that will appear when Augmented Reality runs. Then open Unity then import objects from blender and import markers from vuforia to unity and change the settings. After importing everything needed, the next step is to create the main menu and the buttons needed. The first button is to scan markers, the second button is to download the required markers, the third button is for how to use this application. The 4th button to exit the application. then the next step is to create a function from the button that has been created using the c # language. After the function of the button and the application is ready, then export it to the android application in the form of (.apk) .

4) *Observation:* Direct monitoring of early childhood students / teachers in using augmented reality applications using the Android OS. Activity participants did direct practice using augmented reality applications in learning to read letters. If they have difficulty doing this practice, they will be given direction from the team so that the problem is quickly resolved.

5) *Software evaluation:* Will evaluate the results of this study and evaluate the use of augmented reality applications in an easier, more interesting and interactive learning process.

B. System Development Method

In making the alphabet recognition application using augmented reality, for the manufacturing and development process using the extreme programming model and for the diagram it can be seen in Fig. 1, the stages of system development are as follows [15].

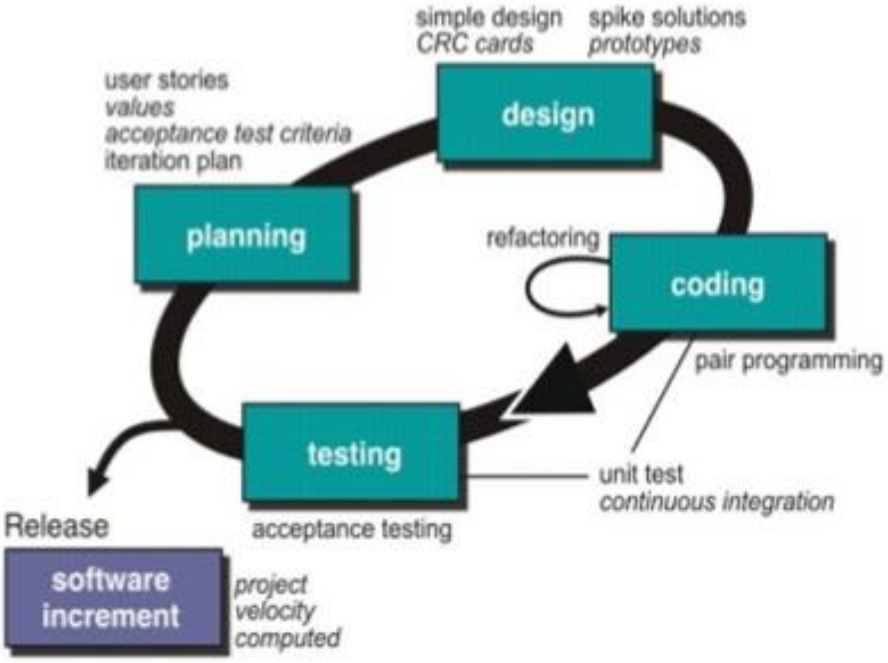

Fig. 1 Extreme Programming Model

1) Planning: At this stage, design the output, function, and features of the software created.

2) Design: This stage makes the design according to the plan by changing the coding structure and simplifying it, but the coding results do not change.

3) Coding: The coding stage, programmers work together on one computer and write programs consisting of 2 people.

4) Testing: This test is carried out by the user on the features and functions of the plans that have been made previously.

5) Software Increment: At this stage add content and services that increase the functionality of the system.

Fig. 2 shows a diagram of the alphabet recognition application activity, namely business process analysis and system design to be made, the stages of the process that will be carried out from the beginning of the user opening the application to exiting the application. When starting to open the AR application, the application menu appears, there are options, select start AR, continue scanning markers, then display 3D objects based on markers, select the back button to enter the main menu. Select the Information for Use, display information on how to use the alphabet recognition application using AR, select the back button to enter the main menu. Select Download Marker, display information and download link button, select the back button to the main menu. Select the exit button then it will exit the AR application.

Fig. 3 explains a use case diagram alphabet recognition is a scenario of the interaction between the user and the system. The menus that will appear in the Alphabet recognition AR application are opening the Alphabet recognition AR application, Starting AR, detecting marker objects, validating marker objects, displaying 3D objects and animations, Downloading Markers, About Applications, exiting. Furthermore, Fig. 4 shows a sequence diagram of the process on the AR start menu, starting with the actor entering the AR application menu, selecting the AR Start menu and then detecting the marker to the system to display the detection screen page. Then the detection screen control provides the detection screen previously requested by the system. Then the system will display the detection screen form as requested. Then the image on the marker is identified by the detection screen. If a 3D trace is found, then a 3D entity will be displayed and a letter object will be displayed on the detection screen. However, if the 3D object tracker is not found, the system will process again from the detection screen.

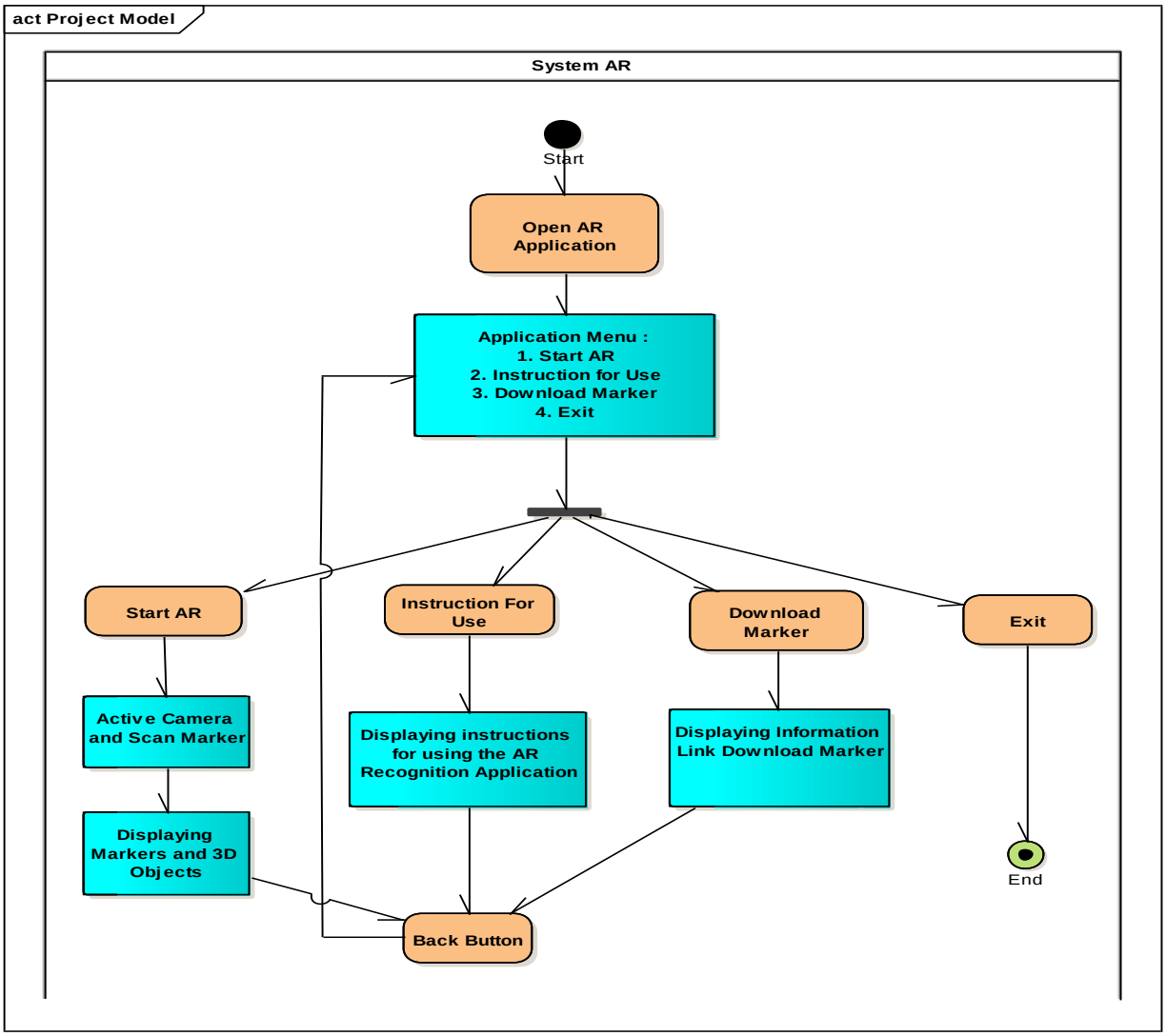

Fig. 2 Activity Diagram Alphabet Recognition

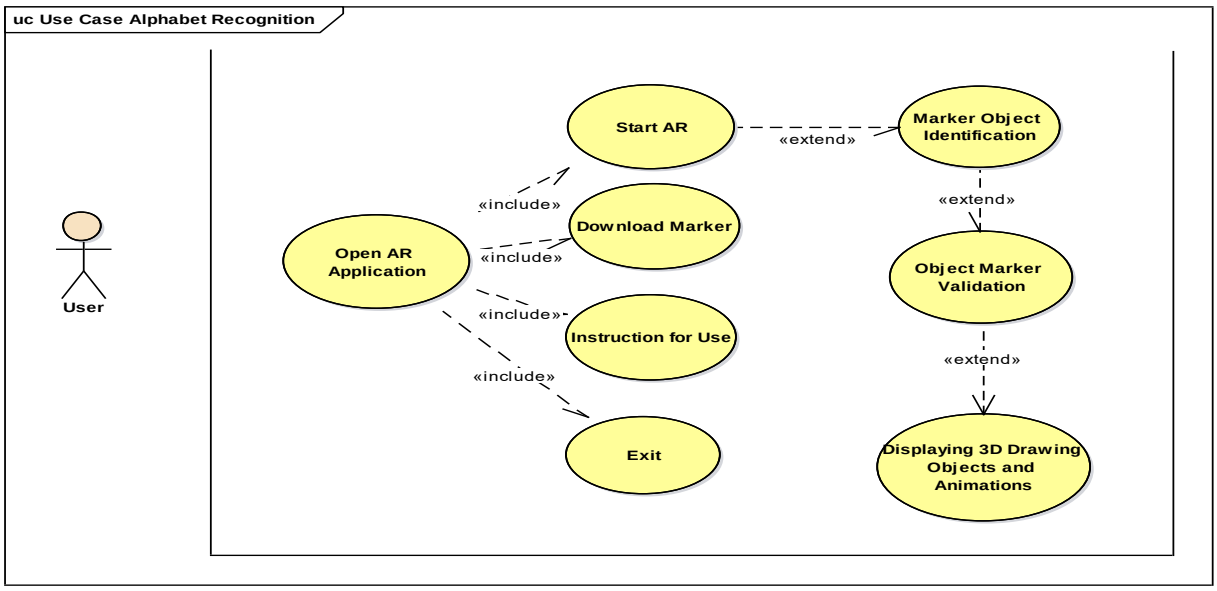

Fig. 3 Use Case Diagram Alphabet Recognition

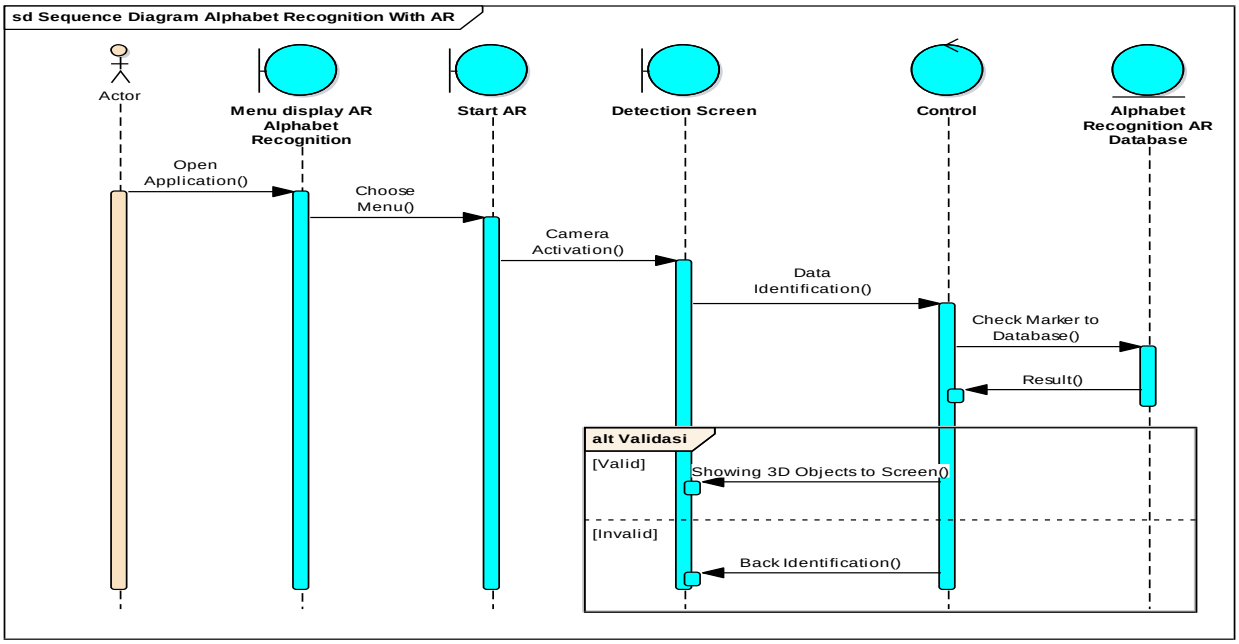

Fig. 4 Sequence Diagram Alphabet Recognition with AR

III. RESULTS AND DISCUSSION

A. Result

The proses of making a marker design is shown in Fig. 5. The design will be used in the Augmented Reality application using the Photoshop application and will then be uploaded to the vuforia database. Besides, Fig. 6 shows the Blender 3D application during the process of creating 3D alphabet objects and then providing animations based on existing target markers and the 3D objects are imported into Unity 3D.

Marker is a medium that will be used to scan or detect 3D objects that will appear in Augmented Reality. The example of the alphabet in Fig. 7 is taken from a-d, while in the vuforia database there are 26 letters of the alphabet from a-z. If you want to use it, it can be printed directly so that it can be scanned by the camera on the alphabet recognition application using augmented reality. Meanwhile, Vuforia is an AR SDK that can be used as a marker storage area for augmented reality as shown in Fig. 8, the stored marker data can then be processed through Unity 3D software, combined with 3D objects and printed markers, and can then be scanned by the user.

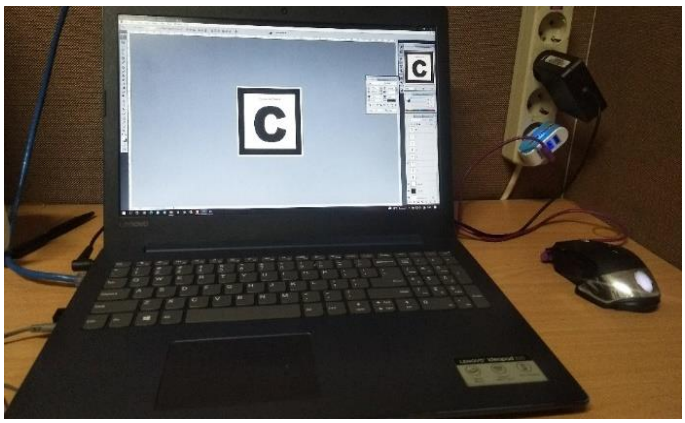

Fig. 5 Make markers using photoshop software

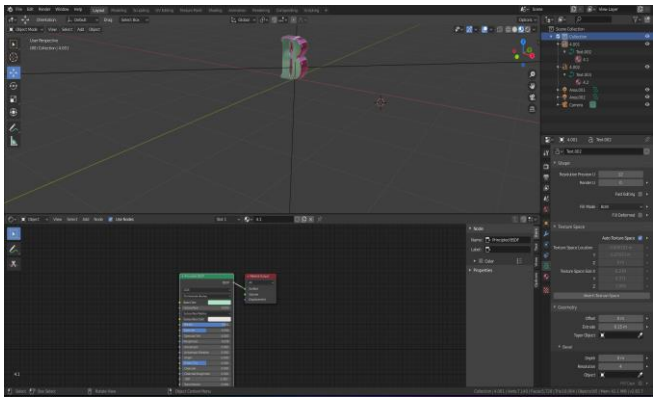

Fig. 6 Create 3D objects using blender software

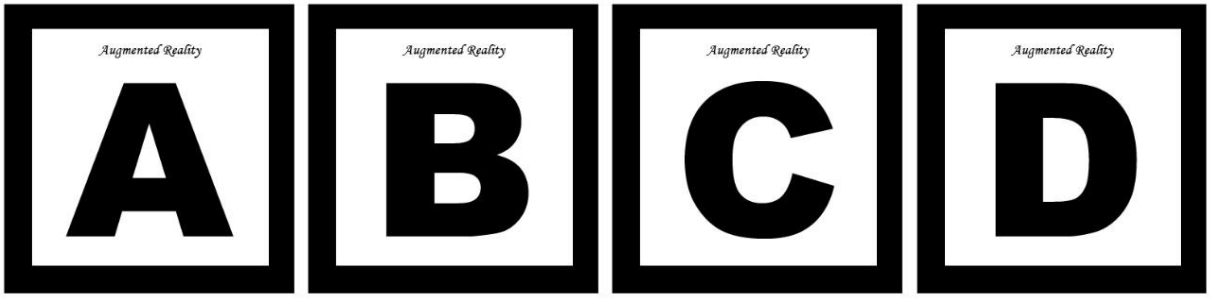

Fig. 7 Sample marker

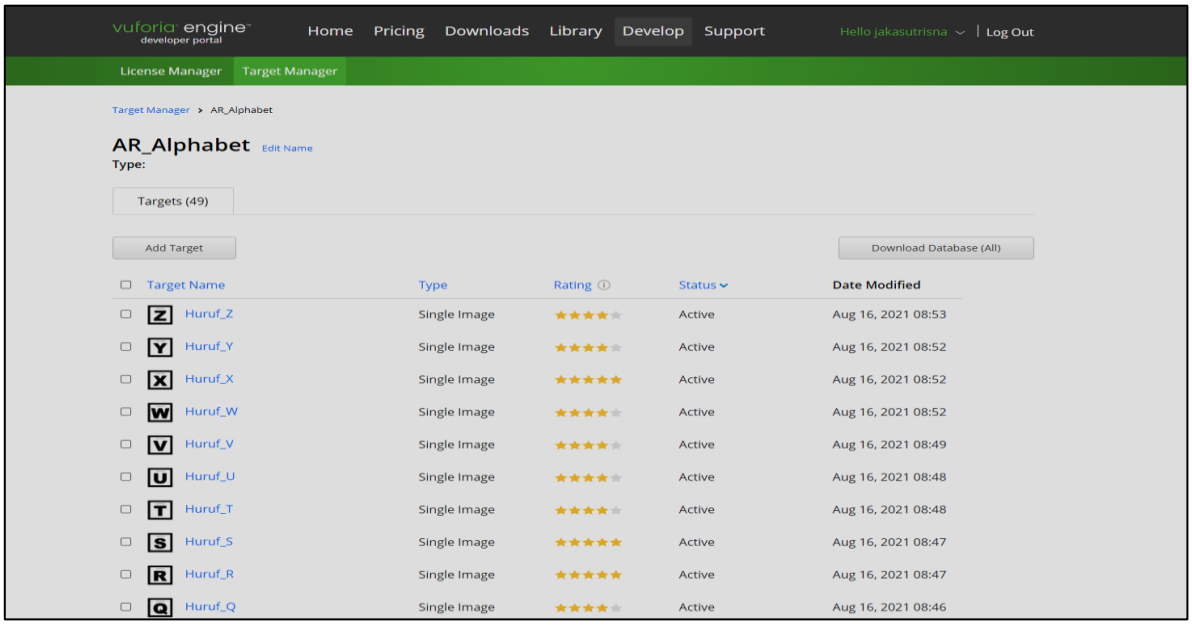

Fig. 8 Vuforia database

Fig. 9 is the Main Menu page that displays the menus that will be operated in the alphabet recognition application using Augmented Reality. The information displayed from the Information for Use menu, in the form of a way to use the alphabet recognition application using Augmented Reality is shown in Fig. 10. Besides, Fig. 11 presents a page that displays information and links to download markers that will be used in an alphabet recognition application using Augmented Reality. This page appears after selecting the download marker button in the main menu. The last figure, Fig. 12 shows the results of a Scan marker that displays 3D objects and animations and sounds that have been created in Unity 3D.

Fig. 9 Main menu display

Fig. 10 Instruction for use

Fig. 11 Download Link

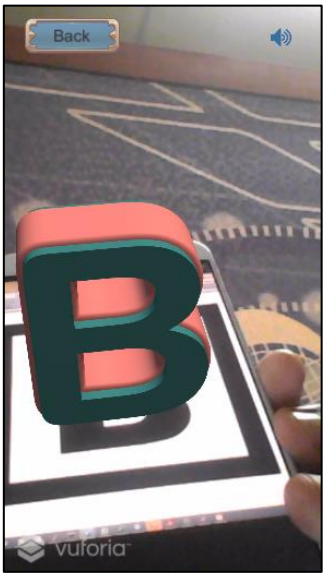

Fig. 12 Marker detection and display 3D alphabet objects

B. Testing

After finishing making an alphabet recognition application using augmented reality, then testing the user and giving about 4 questions, testing was carried out using a user acceptance test model whose aim was to ensure that the application that had been made was in accordance with the user's needs or not, in terms of appearance, ease of operation, as well as the information it conveys. for the UAT test results can be seen in Table I below. From the results obtained from this test, that this application can be quite useful in learning and recognizing the alphabet using augmented reality.

TABLE I
USER ACCEPTANCE TEST (UAT)

No	Observation Element	Response		Percentage
		Yes	No	
1.	In your opinion, is the appearance of the alphabet letter recognition media application using AR interesting?	7	3	70%
2.	In your opinion, does the use of this alphabet letter tracing application make it easy and interactive?	6	4	60%
3.	In your opinion, is this alphabet letter recognition application easy to operate or use?	8	2	80%
4.	In your opinion, is the information displayed clear enough?	8	2	80%

IV. CONCLUSION

Based on the results of the User Acceptance Test (UAT) that Augmented Reality can attract children to learn the letters of the alphabet. By making an android application with an extreme programming method that utilizes Augmented Reality technology that can display 3D, animation and make sounds so that it looks real, it makes early childhood interested and makes it easier for them to learn the letters of the alphabet. There are 2 people in the development and maintenance of the entire software using the extreme programming method to meet the needs of an uncertain system that is ready to accept changes and improvements whenever there is an error. Hopefully the next application development will add some word recognition with AR.

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