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Implementation of Augmented Reality (AR) in the Development of Space Building Modeling Learning Media for Elementary School Students 040481 Juma Raja Village

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ABSTRACT

A geometric shape or also called a geometric shape is a three-dimensional shape that has space and is limited by sides. Spatial structure is a characteristic of concrete objects that we often encounter every day. Rapid technological advances in the world of information technology and computers also have an impact on the world of education, which offers various conveniences and innovations. Augmented Reality or often abbreviated as AR is a technology that is able to combine real and virtual situations at one time which is displayed in real time. With AR technology, it is hoped that it can provide innovation and new learning experiences in recognizing and studying spatial shapes, so that it can attract the interest of students who are studying it.

Keyword : Augmented Reality (AR), Building Space, Learning Media

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1. INTRODUCTION

In mathematics subjects, one of the materials studied is spatial figures. Space construction material has been taught since elementary school, but in reality students' ability to understand space construction is still relatively minimal. Each spatial structure has a different type, shape, formula, area and volume. So many elementary school students don't feel interested in studying spatial structure material because they feel it is difficult and don't understand clearly how each spatial structure looks.

To provide a solution to this problem, a medium is needed to implement material about mathematical spatial structures, one of which is utilizing Augmented Reality (AR) as a learning medium to make it easier for students in the learning process and increase interest in learning.

One of the hardware used in human interaction with computers is a webcam. With a webcam, humans can interact with other humans via computers. However, this interaction model is not natural, as humans interact directly with each other. Humans want a more natural use of hardware as a demand for the development of computer technology itself. Therefore, a technology called Augmented Reality (AR) emerged combining 3D objects into the real world so that humans can interact with computers more naturally. Augmented Reality (AR) is a technology that combines two-dimensional or three-dimensional virtual objects into a real three-dimensional environment and then projects these virtual objects in real time. Augmented Reality (AR) prioritizes reality because this technology is closer to the real environment. Augmented Reality (AR) allows users to interact in more real-time with the system. Augmented Reality (AR) technology is developing very quickly so that its development can be applied in all fields, including education. One of them is learning mathematics material.

Observing the importance of using technology in the field of education, the author is interested in introducing Augmented Reality (AR) technology to students at SDN 040481 Juma Raja Village. In order to help students in learning mathematics, especially in geometric material. So in this research we will try to create a solution to this problem by developing learning media using Augmented Reality (AR) technology, namely technology that combines two-dimensional or three-dimensional virtual objects into a real environment and then projects these virtual objects in real time.

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2. RESEARCH METHOD

According to Ronald T. Azuma (1997) defines Augmented reality as a combination of real and virtual objects in a real environment, running interactively in real time and there is integration and virtuality is possible with appropriate display technology, interactivity is possible through certain input devices, and good integration requires effective explanation. Meanwhile, according to Stephen Coward and Mark Faila in their book entitled Augmented reality a partial guide, they define Augmented reality as a natural way to explore 3D objects and data, AR is a concept that combines visual reality with world reality.

So that with 2-dimensional (2D) AR technology virtual objects, users can see the real world around them with the addition of computer-generated virtual objects. In the book "Hand Book of Augmented reality", Augmented reality aims to simplify the user's life by bringing virtual information that is not only for the surrounding environment , but also for any direct viewing of real-world environments, such as live streaming video. AR improves the user's perception and interaction with the real world. According to the explanation of Haller, Billinghurst and Thomas (2007), Augment Reality research aims to develop technology that allows real-time integration of computer-generated digital content with the real world. Augmented reality allows users to see two-dimensional or three-dimensional virtual objects projected onto the real world. (Emerging Technologies of Augmented reality).

In making this research I used the Multimedia Development Methodology. One of them is according to Sutopo (2003), who believes that the multimedia development methodology consists of 6 stages, namely concept, design, material collecting, assembly, testing and distribution as in the picture below:

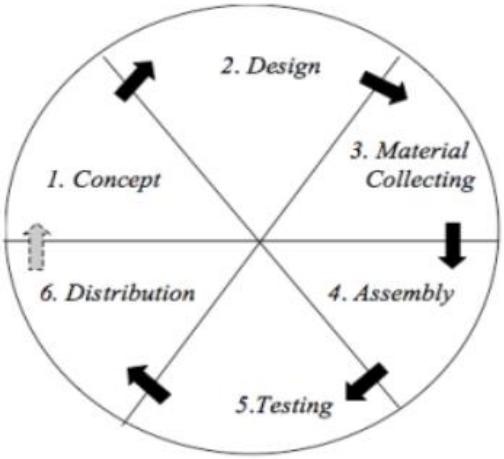


Fig 1. Multimedia Development Methodology

1. Concept. The concept stage is the stage for determining the objectives and who the users of the program are (audience identification). Apart from that, determine the type of application (presentation, interactive, etc.) and the purpose of the application (entertainment, training, learning, etc.).
2. Design. Design (design) is the stage of making specifications regarding program architecture, style, appearance and material requirements for the program.
3. Material. Collecting Material Collecting is the stage where materials are collected according to needs. This stage can be carried out in parallel with the assembly stage. In some cases, the Material Collecting stage and the Assembly stage will be carried out in a linear, non-parallel manner.
4. Assembly. The assembly (manufacturing) stage is the stage where all objects or multimedia materials are created. Application creation is based on the design stage.
5. Testing. This is done after completing the assembly stage by running the application/program and seeing whether there are errors or not. This stage is also known as the alpha testing stage (alpha test) where testing is carried out by the manufacturer or the manufacturer's own environment.

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6. Distribution. This stage is where the application is stored on a storage medium. At this stage, if the storage media is not sufficient to accommodate the application, compression of the application is carried out.

The stages of the research method used in this research are:

1. Identification.
   Problem identification is a research process which can be said to be the most important among other processes. In this stage, the author tries to identify existing problems. This stage is the initial stage in preparing this research. The results of this identification become the background for formulating the problem that will become the object of research. The problem identified is how to design a 3-dimensional spatial modeling learning media for elementary school students by utilizing augmented reality technology.
2. Literature Study
   A literature review was carried out to obtain the basic theories needed. The author packages the existing material into an application scheme which will later be made into an interesting learning media application.
3. System Requirements Specification Analysis
   After the data is collected, then this analysis is carried out to find out what is needed in designing a learning media application about 3-dimensional spatial modeling. for elementary school students using augmented reality technology, so that the designed application can create a more interesting and interactive learning method.
4. PPL Method (Software Development)
   a. Concept
      This application is an interactive application, namely the user is controlled by the teacher and the audience is elementary school students starting from grade IV and the purpose of this application is as a learning media application in the mathematics subject of modeling building a 3-dimensional space.
   b. Design
      The specifications and appearance in making this application are designed according to the special learning needs of elementary schools, which includes first discussing with one of the elementary school teachers about what material is presented in modeling the 3-dimensional space and the appearance in it. This application is full color and in general children of elementary school age enjoy playing with colors.
   c. Material Collecting
      The collection of materials in making this application was by discussion with the mathematics teacher at the Babakanjawa I state elementary school. Mathematics teaching materials about 3-dimensional spatial modeling for class IV which can later be used as a learning medium up to class VI.
   d. Assembly All materials and objects Multimedia materials for making this application were created using several software, including: Google SketchUp 8, OpenSpace 3D Editor, Ogre Scene and Scol Voy@ager. And making the application is based on the design stage.
   e. Testing. Testing for this application is by distributing questionnaires to the elementary school environment.
   f. Distribution. This stage of the application that has been created is stored in storage media. And this application is stored on a CD as a learning media application

3. RESULTS AND DISCUSSION

Creating 3D objects using blender software. There are many choices of objects that can be created and modified according to your needs.

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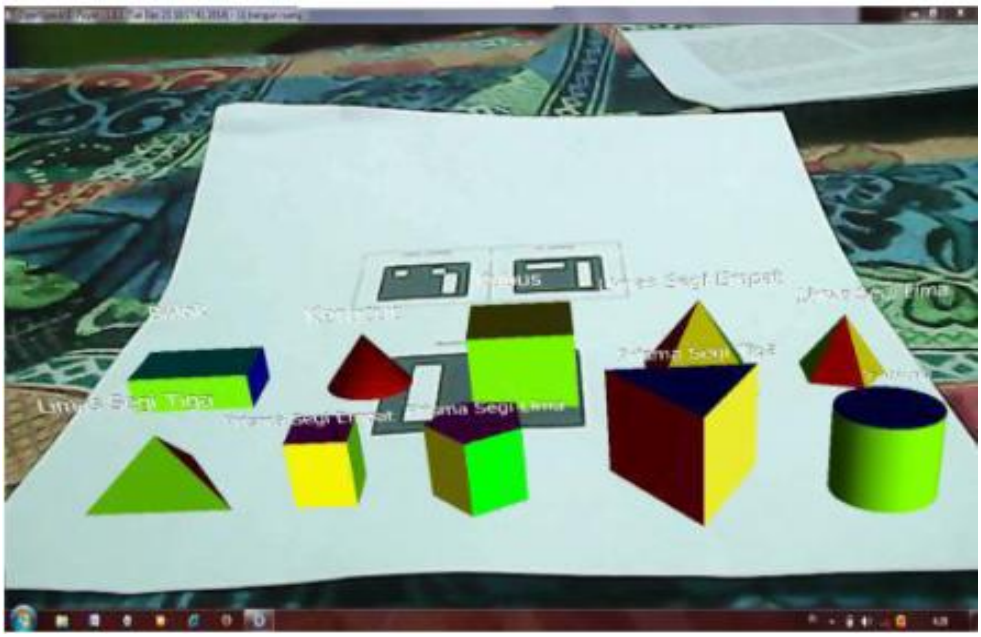


Fig 2. AR display of 10 spatial shapes

The image above shows the ten spatial shapes. AR 10 View of this spatial structure, for an initial introduction to understanding 3-dimensional spatial modeling. There are Zoom In and Zoom Out markers.



Fig 3. AR display of a cone shape

The AR display above is the appearance of a cone shape, where there is a statement "t" which means the height of the cone along with a formula for finding the area and volume. There are Zoom In and Zoom Out markers.

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Fig 4. AR display of the triangular pyramid shape

The AR display above is the appearance of the triangular pyramid shape, where there is a statement "t" which means the height of the triangular pyramid along with a formula for finding the area and volume. There are Zoom In and Zoom Out markers.



Fig 5. AR View of Building a Cube Room

The AR display above is a grid of cube space structures which consists of 3 stages, the first stage is a pattern, the second stage is a semi-finished pattern and the third is a finished space structure. There are Zoom In and Zoom Out markers.

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Fig 6. AR display of building a pentagon prism space

The AR display above is a grid of building a pentagonal prism space which consists of 3 stages, the first stage is a pattern, the second stage is a half-finished pattern and the third is a finished space. So. There are Zoom In and Zoom Out markers.

4. CONCLUSION

Augmented reality (AR) as a learning medium can be used as a teaching aid for geometric modeling of spatial shapes that are displayed visually in 3 dimensions. Due to the ability to process data quickly and in real time, as well as a display that is easy for users to understand and is interactive in 3 Dimensional mode. The material regarding special spatial modeling at elementary school level is designed with 3 Dimensional visuals that utilize the sophistication of Augmented Reality (AR) technology which is able to provide a contribution. to the world of education, namely that it can be used as a learning medium. The Augmented Reality-based 3D spatial modeling model which is used as a learning medium is able to create a new, more interactive atmosphere in mathematics learning which usually seems boring for elementary school students.

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