

Augmented Reality 3D Heart as Learning Media at Midwifery Lab University of 'Aisyiyah Surakarta

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Abstract— Utilization of Information Technology (IT) in the process of delivering information has been developed rapidly. Currently, the latest technology used in the delivery of information is Augmented Reality (AR) technology.. Pada teknologi Augmented Reality (AR), pengguna dapat memvisualisasikan objek atau benda bersejarah dalam bentuk 3 dimensi. Augmented Reality (AR) has the advantage of being interactive and real time so Augmented Reality (AR) is widely implemented in the field of education as a medium to introduce historical objects which are cultural heritage or objects related to a science. Augmented Reality (AR) has the advantage of being interactive and real time, so Augmented Reality (AR) is widely implemented in various fields. Based on the explanation of the study, researchers are interested in conducting research using information technology in the health sector, by making Augmented Reality (AR) modeling to facilitate the community and midwifery students in providing learning about human organs, especially the heart which can be used digitally without having to dissect human organs and bringing him a modeling of the heart with the presence of a 3D heart organ provides convenience in learning to the public about the function and structure of the heart digitally. Based on a survey conducted 77.2% of this application is very easy to understand, this makes this application very useful and easy to use

Keywords : 3D, Augmented Reality, Heart 3D Design.

I. INTRODUCTION

The way Augmented Reality works is using the camera from a device that has been calibrated or previously set. Then the next stage is the process when the camera will recognize and mark the detected marker pattern, if the marker does not match the database, the information from the marker will not be processed. However, if the marker information matches the database, it will be used to render and display objects in three dimensions in real time.

Ronald T. Azuma (2008) defines augmented reality as combining real and virtual objects in a real environment, running interactively in real time, and there is integration between objects in three dimensions, namely virtual objects integrated in the real world. Merging of real and virtual objects is possible with appropriate display technologies, interactivity is possible through certain input devices, and good integration requires effective tracking.

Augmented Reality Applications Over time, Augmented Reality is growing very rapidly, allowing the development of these applications in various fields, for example, as follows:

a. Mobile Phone Navigation

In the last 1 year, many Augmented Reality integrations have been used on mobile phones. Currently there are 3 major mobile phone operating systems that directly support Augmented reality technology through their respective application programming interfaces. To be able to use the camera as a source of visual data stream, the operating system must support the use of the camera in preview mode. Augmented reality is a basic presentation of navigation applications. By using GPS, the application on mobile phones can find out the whereabouts of 29 users at any time. Especially for iPhone and Android Operating Systems, there are 2 big players (Screen and Wikitude) in the world of Augmented reality..

b. Form of Entertainment

Augmented reality has been used in the entertainment and news fields for quite a long time. television where journalists

are shown standing in front of a changing weather map In the studio, the reporter is actually standing in front of a blue or green screen. The original image is combined with a computer-generated map using a technique called chroma-keying. Princeton Electronic Billboard has developed an Augmented reality system that allows broadcasters to insert advertisements into certain areas of the broadcast image. For example, when broadcasting a football match, this system can place an advertisement so that it is visible on the outside wall of the stadium.

c. Medicine

Imaging technology is very much needed in the medical world, for example, for operating simulations, simulating the manufacture of viral vaccines, and so on. For this reason, the medical field applies augmented reality to the visualization of their research.

d. Engineering Design

An engineering design requires augmented reality to display the results of their design in real to the client. With augmented reality 3D clients can find out about the more detailed specifications of their designs.

e. Robotics dan Telerobotics

In the field of robotics, a robot operator uses visual imaging controllers to control the robot. So, the application of augmented reality is needed in the robot world.

II. RESEARCH METHODS

Borg & Gall (1983), stated that experimental research is the most reliable scientific research (most valid), because it is done by strictly controlling the confounding variables outside the experiment.

Experimental Research Characteristics:

In the following, some characteristics of experimental research are presented, which distinguish it from other positivistic research, that is:

1. The experimental method is the only research method that is considered the most able to test the causal relationship hypothesis, or can best fulfill internal validity.
2. The experimental method is a research design that provides the most rigorous hypothesis testing compared to other types of research
3. The experimental method is a research used to find the effect of certain treatments on their effects under controlled conditions.
4. Characteristics that distinguish experimental research from other research:
 - a. One or more independent variables are manipulated (the conditions are made different, for example: treatment and non-treatment).
 - b. All other variables, except the treatment variable (independent variable), were controlled (maintained constant).
 - c. The effect of manipulation of the independent variable (treatment) on the dependent variable is observed, with the assumption that because it is given different treatment, it will have a different impact.
 - d. There is a comparison, so it is necessary to make equalization between the group to be treated and the group not to be treated (the two groups to be compared must be comparable).

B. Method of collecting data

Data collection method is a technique or method used to collect data. The method designates a way so that its use can be shown through questionnaires, interviews, observations, tests, documentation and so on. The data collection that the research uses are :

1. library method

This method serves to find and study theories, theories, concepts that are related to research problems. These theories and concepts are the basis for compiling this research report. Sources derived from the literature can be divided into two, namely general references and specific references. Common sources can be found in Textbooks, internet.

2. Observation Method

The observation method is one way that can be used to collect data. In this study, researchers observed the heart model and re-applied it to display it digitally.

C. Data analysis method

Data analysis is the process of organizing and sorting data into patterns, categories, and basic description links so that themes can be found and working hypotheses can be formulated as suggested by the data. The data obtained from data collection is then analyzed, to determine which data is used and if there is a lack of data, additions can be made. in this study the data analysis is as follows:

1. formulation of the problem from the results of data collection.
2. Collect data from various literature sources related to the heart and its function..
3. Sketch the heart for 3D..
4. Heart modeling for display in Augmented Reality.
5. Giving Markers and Materials to the heart model
6. Publish learning media.

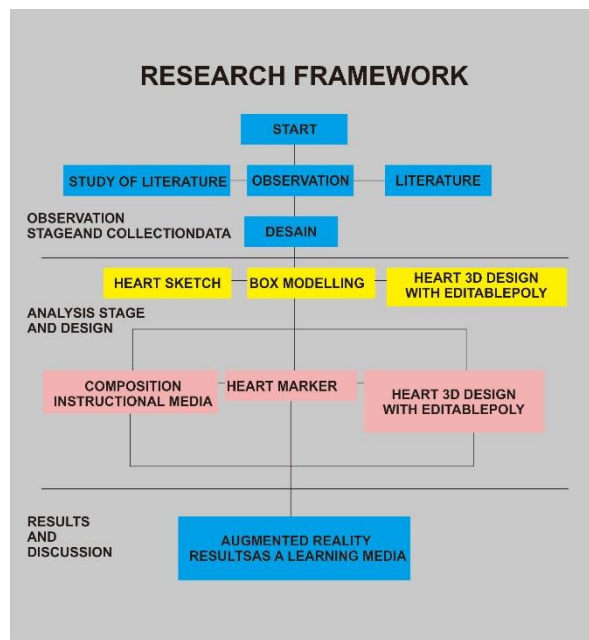


Figure 1. Framework of thinking

1. Data collection

The data collection process consists of two methods, namely Literature Study and observation. Literature study was conducted by searching scientific data in libraries and internet media. The data taken is about the heart organs and heart function. Observations were made to make a 3D model of the heart.

2. Design and Design Stage

In this stage the researchers made a 3D model of the heart. Researchers make sketches of heart images that can be mapped for 3D modeling. This 2-dimensional sketch image cannot be implemented in augmented reality, so researchers need to make 3d modeling using box models in 3d. The box model can be in the form of a heart by using Poly Editable poly contained in the 3d application.

3 Testing Stage

At this stage the 3D application of the heart can be used by students and the public to learn about the heart organs and their functions.

III. RESULT AND ANALYSIS

Discussion of the implementation of learning media will focus on the following:

3.1 Desain 3D Jantung

In the 3d design of the heart, the modeling process uses the 3Ds Max application as a 3D learning media material and is inserted into the assemblr application to run the 3D heart learning media.

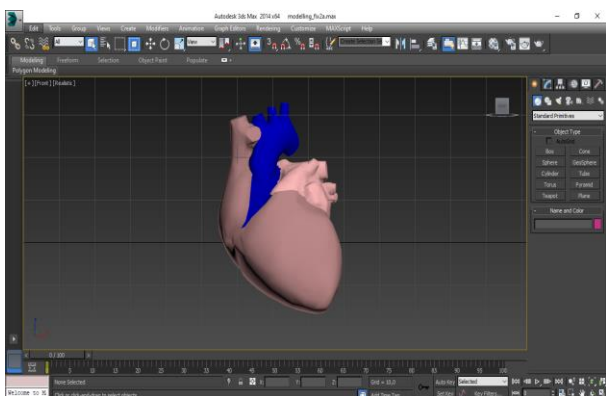


Figure2. Heart 3D Design Pictures

After the 3d heart design process, the next step is cutting the object so that later the internal organs of the heart can be described. Next is the mapping process as a texture in the heart so that the heart is more real.

3.2 Application Concept Design

Using 3D Friendly Heart Design to Design and create learning media. This 3D heart design will later be marked for providing material about the function of the heart organ as a learning medium.



Figure 3. research procedure framework

In this learning media application, there are numbers on the front and back of the heart, when clicked, the organs and functions of the heart will appear.

3.3 Learning Media Application Design

At this stage is the process of importing the 3D Heart Design into the android application, namely Assemblr. In this process there is a setting of the location of the heart so that the heart can look real 3D. The placement of this view must be valid between the x and z axes so that it looks more realistic in 3D. And the placement must be visible between the front heart and the back heart because the application will provide material about the function and introduction of the heart organ so that all parts of the heart must be visible.

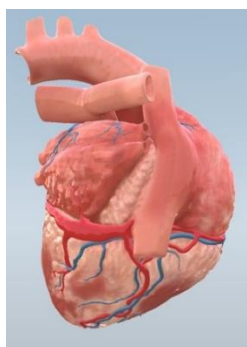


Figure 4. 3D Heart Design Pictures

After the process of setting the layout and point of view, the next step is setting the heart that will be given the material.

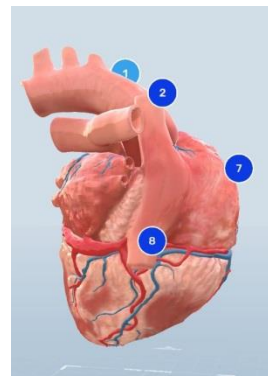


Figure 5. Giving a Marker to the 3D Heart

Giving markers to explain the function of the heart organ in the 3D design of the heart, there are 10 parts of the organ that are introduced to the name and function of the organ.

3.4 Application Testing

In this stage is testing the application of 3D cardiac learning media. The researcher tests whether all markers can be used and their use can be used on smartphones or on PCs.

3.5.1 Application Testing on PC

In this stage is testing using a PC. This application runs with a browser. The following is the application test table in the Chrome browser:


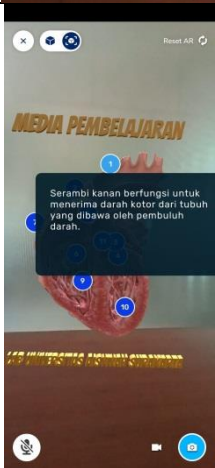
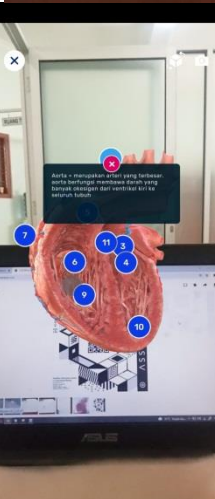
Table 1. application on android smartphone

Application	description
	The user presses the number 10 so that the application displays the papillary function of the heart.
	The user presses the number 10 so that the application displays the function of the aorta in the heart.
	The user presses the number 4 so that the application displays the function of the right atrium of the heart.

3.5.2 Application Testing on a smart phone

The following are the stages of testing learning media applications on Android smartphones:

Table 2. computer application

Application	description
	The application when opened on an Android smartphone will display a 3d heart model and a marker that serves to provide material about the introduction of the heart organ.
	The user presses the number 4 on the smartphone application so that the application displays the function of the right atrium on the heart.
	The user presses on his smartphone so that the number is 10 so that the application displays the aortic function of the heart.

2. 7 People answer M (can understand)

3. 5 People answer K (not enough)

The following is a table of questionnaire weights:

Table 3. percentage

Code	Value
SM	15
M	8
K	7

Value Percentage Table:

Table 4. percentage

Percentage	Description
50 %	SM
30%	M
20%	K

From the results of the above calculations, the next stage is data processing by multiplying each answer point with a predetermined weight with a table of weight values. The following are the results of the calculation of respondents' answers:

$$SM : 15 \times 18 = 270$$

$$M : 7 \times 8 = 43$$

$$K : 7 \times 5 = 35$$

.....(1)

$$\text{Total Score} = 270 + 43 + 35 = 348$$

To obtain the results of interpretation, the highest score must be sought first (X) and the lowest score is: (Y) the following is the calculation formula:

Y = highest score likert x number of respondents (highest score 15) It is necessary to research for the weight of the value X = the lowest score likert x the number of respondents (lowest number 2). Note Weight Score The highest total score for the item Very Can Understand is $15 \times 18 = 270$, while the item is still lacking is $7 \times 5 = 35$. So, if the total score of the respondents is 348, then the assessment of the respondent's interpretation of the learning media is the result of the value generated by using the % Index formula.

$$\text{Index formula } \% = \text{Total Score} / Y \times 100$$

Then the final solution of the case example:

$$= \text{Total Score} / Y \times 100$$

$$= 270/350 \times 100$$

$$= 77.2\% = 77.2\% \text{ Very understandable} \dots\dots\dots(2)$$

From these figures, it is known that this learning media is very understandable

VI. CONCLUSION

From the implementation of research that carried out can be concluded as following :

1. Learning media regarding the introduction of the heart organ has been successfully created with a 3D modeling design, this learning media is integrated with the android application
2. Cardiac augmented reality learning media can run on Android smartphones and can be run on PCs using a web browser.

3.5 Questionnaire

From the survey results regarding augmented reality learning media The researcher conducted a survey whether this learning media was very helpful in recognizing the heart or not. From a survey conducted to 30 people, the following results can be given :

From 30 people it can be concluded as follows:

1. 18 People answer SM (Very understandable)

3. Based on a survey conducted 77.2% of this application is very easy to understand, this makes this application very useful and easy to use.

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