

IMPLEMENTATION OF AUGMENTED REALITY

by Nuril Lutvi A

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IMPLEMENTATION OF AUGMENTED REALITY AS A HAIR MODEL VISUALIZATION MEDIA BASED ON ANDROID

Fatahillah Aji Maulana¹⁾, Suprianto²⁾, Nuril Lutvi Azizah³⁾

^{1,2,3}Program Studi Informatika, Universitas Muhammadiyah Sidoarjo

^{1,2,3}Jl. Raya Gelam No.250, Pagerwaja, Kabupaten Sidoarjo

Email: ¹mooqueque@gmail.com, ²suprianto@umsida.ac.id, ³nurillutviiazizah@umsida.ac.id

Abstract

Humans place a high value on physical appearance. An attractive appearance can increase a person's self-confidence. Hairstyles are one of several ways to achieve an attractive appearance. This implies that there is always a demand for barbershops. However, some traditional barbershops, like Mr. Abdi, use outdated techniques like hanging flyers for haircut models that are no longer relevant in this era. This has an effect on the very low level of interest among young people who use services provided by roadside barbershops. The objective of this study is to create applications that have a way of delivering information that is interactive and different from other modern barbershops using augmented reality (AR), which will be used as a medium for visualizing hairstyles. In this study, the markerless tracking method is used to display three-dimensional objects in various types of fields. This application was developed with Unity and Vuforia because the development process can be done quickly. Based on the results, the overall quality of the software is 84%, so it is feasible for mass use.

Keyword: Augmente Reality, Hairstyle Visualization, Markerless, ISO 25010.

1. INTRODUCING

Various kinds of new technologies continue to emerge from day to day that can advance the way humans interact with the world [1]. Augmented reality is one technology that is rapidly gaining popularity [2]. Augmented reality has grown so popular because it has the ability to transform the future and give people a sense of living in sci-fi movies that were before impractical to apply to real-world situations. Another reason that augmented reality has grown so popular is the low cost of mobile devices, which have the advantage of being easy to use and can be used anywhere. In comparison to 2015, when just 28.6% of Indonesians used mobile devices, the percentage of mobile device users now is over 95.4%. [3]. Literally, augmented reality is defined as a process that creates a combination of real-world elements derived from the environment and virtual elements generated by software [4][5]. Augmented Reality is viewed as a way to use technology that provides advantages in the interaction between humans and computers through the appearance of attractive objects that resemble real [6].

Humans place a high value on physical appearance. An attractive appearance can increase a person's self-confidence [7]. Hairstyles are one of several way to achieve an attractive appearance. This implies that there is always a demand for barbershop. However, some traditional barbershops like Mr. Abdi, which is located in Kedung Kendo Village, Sidoarjo Regency, use outdated techniques like hanging flyers for haircut models that are no longer relevant in this era. This has an affect on the very low level of interest among young people who use services provided by roadside barbeshop. Another problem is the growing number of modern barbershops in the area of Sidoarjo, which offer a more comprehensive and current assurance of service, causing traditional barbershops to gradually disappear [8].

One of the solutions offered to overcome these problems is by developing applications that have a way of delivering information that is interactive and different from other modern barbershops. This is augmented reality (AR), which will be used as a medium for visualizing hairstyles with various styles such as undercut, pompadour, caesar cut, fringe crop, french crop, textured crop, messy crop, bleached crop, tight crop, taper cut, wavy crop, fade, military crop, mohawk, faux hawk, slick back, comb over, side part, buzz cut, relaxed quif, comma hair, and mullet. This application works by moving the camera closer to a flat item that serves as a reference for the look of an object used as a hair model (virtual). Additionally, the model may be rotated so that clients can view more of the hair as a whole.

Research related to augmented reality is "Interactive Augmented Reality Application for Home Sales Catalog" by Husniah, which implements augmented reality to be used as a home sales catalog [9]. In addition, another research is "Augmented and Virtual Reality for Promotional Media" by Zuli, who developed an augmented reality application to perform 3-dimensional visualization in the Satya Negara University environment [10]. The comparison of this research



with previous research is based on the type of object created, where this application uses objects with various contemporary hairstyles.

In this study, the markerless tracking method is used to display three-dimensional objects in various types of fields. This application was developed with Unity and Vuforia because the development process can be done quickly. This application is expected to be useful for bringing in customers, especially young people, in the barbershop business.

2. RESEARCH METHODS

The research method consists of a number of stages that will be used to facilitate the development of augmented reality applications as a medium for visualizing hairstyles. Several steps in the research method include the following:

2.1 Markerless Based Tracking

Markerless is a tracking technique that eliminates the requirement for users to print marker in order to show digital objects. In this case, the recognized markers are in the form of device position, direction, or location [11]. Based on Figure 1, the application no longer requires a marker. The application will only detect the angle of the object to display the hairstyle model on it.

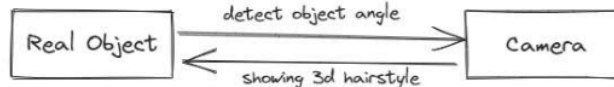


Figure 1. Markerless Based Tracking

2.2 Research Framework

The research framework is a design idea used to make research more structured and methodical before it is actually conducted. Based on Figure 2, observations and interviews were done to gather data about the barbershop. The outcome is then transformed into a design form, and code is executed using the created design. The program is tested using the blackbox approach when coding is complete.

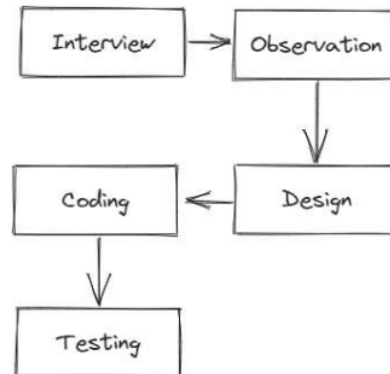


Figure 2. Research Framework

2.3 Data collection

Data collection is a technique used to collect various data and information that will later be useful as supporting evidence for the explanation of research studies [12]. The data for this study was taken from direct interviews with the owner of Mr. Abdi's barbershop located in Kedung Kendo Village, Sidoarjo Regency.



2.3 Design

The design stage is where a clear picture of what must be done and how the system functions is provided. Flowchart and wireframes are used in this design stage [13].

- a. Flowchart are diagrams with a sequence that outlines the processes in solving an problem [14]. The purpose of using flowcharts is to provide a simple, neat, and clear picture with the help of standard symbols. Based on Flowchart in Figure 3, The program will launch immediately to the main menu when the user opens it. When the AR option is selected, the camera switches on automatically and analyzes nearby real objects to project a 3D hairstyle.

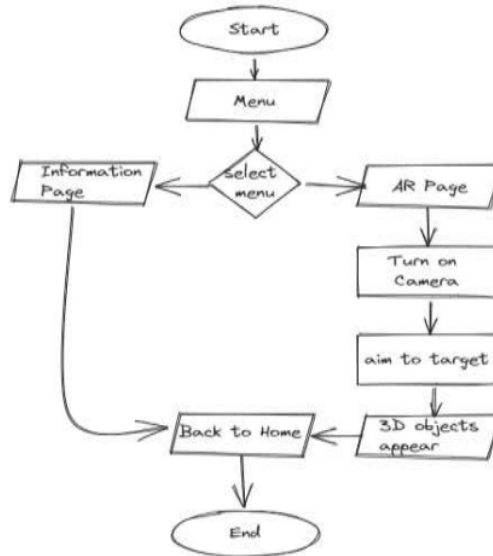


Figure 3. Flowchart

- b. Wireframe is a step in creating an application form to describe the features and content of the application that will be created [15]. The wireframe of this AR application are shown in Figure 4, 5, 6, 7.



Figure 4. Start Page

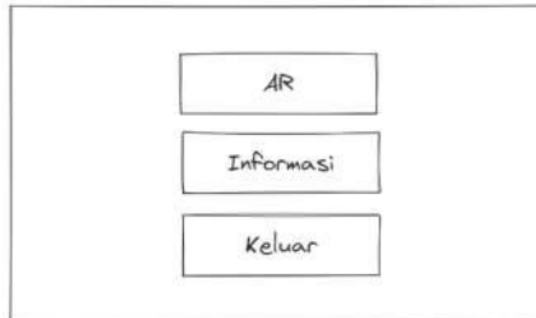


Figure 5. Wireframe Menu

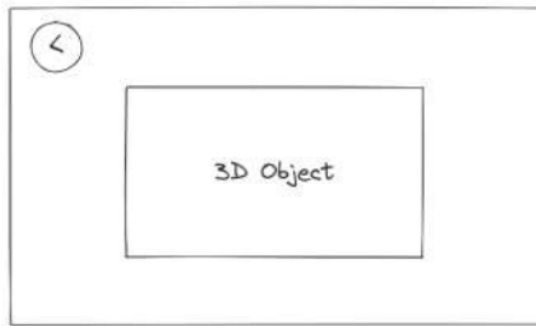


Figure 6. Wireframe AR



Figure 7. Wireframe About

2.4 Implementation

Implementation is the process of converting the design into an AR application that can visualize the hairstyle. Unity and Vuforia will be used as tools to develop this application. The Unity game engine was created by Unity Technologies and is cross-platform, allowing users to create and publish games on a variety of well-known platforms, including Windows, Linux, Mac OS, Android, iOS, PS3, PS4, PS5, and Xbox One, and others. Unity can also be used to create augmented reality [16].



2.4 Testing

Testing is a stage in the development process that is used to determine whether the application can run according to plan. ISO 25010 will be used at this stage by looking at two aspects, namely functionality and usability. The formula for determining the percentage of testing can be seen in Equation 1.

$$Testing = \frac{Actual\ Score}{Perfect\ Score} \times 100 \quad (1)$$

The actual score is obtained from the sum of all users' responses to the questionnaire. Meanwhile, the ideal score is obtained from the total maximum value that can be obtained from the questionnaire. The criteria that will be used to determine the value of the participant's input are depicted in Table 1.

Table 1. Criteria

Range (%)	Assessment
0-20	Very Poor
21-40	Poor
41-60	Neutral
61-80	Good
81-100	Very Good

3. RESULT AND DISCUSSIONS

3.1 AR Application

The following is the display result of the AR application development:

- a. The menu screen is the screen that will appear when the application is first opened. The menu screen contains several menu buttons, such as AR Scan, about, and exit. The menu screen display can be seen in Figure 8.



Figure 8. Menu Screen

- b. The AR screen is a screen that displays a camera that will be used to scan flat objects around the user by showing a honeycomb animation indicating that a flat object has been found. The AR screen display can be seen in Figure 9.

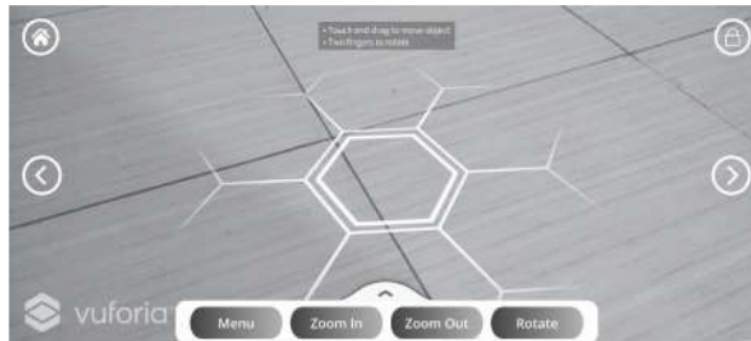


Figure 9. AR Screen

- c. The hair selection screen is a screen that displays different types of hairstyle when the arrow keys on the AR screen are pressed. There are 24 hairstyles available in this application. The hair selection screen display can be seen in Figure 10 and 11.

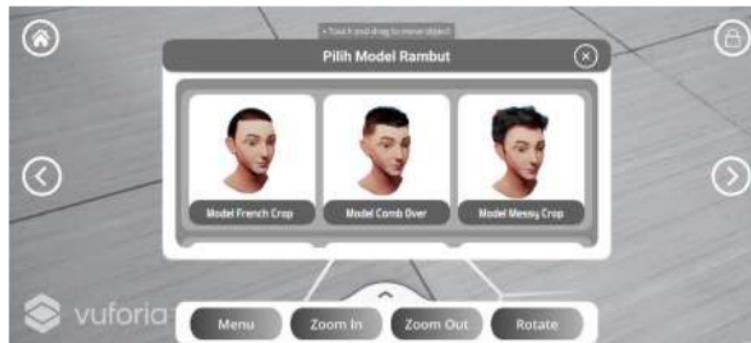


Figure 10. Hair Selection Screen

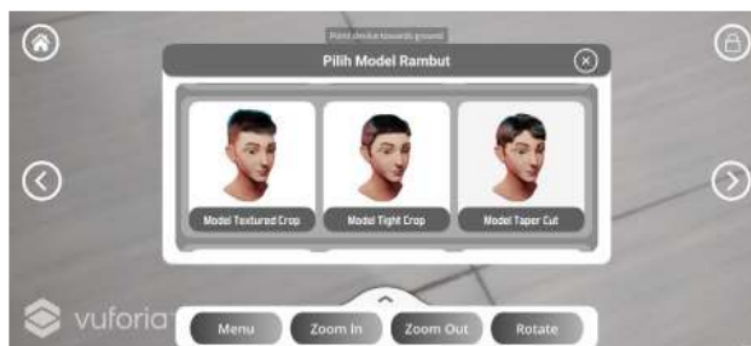


Figure 11. Hair Selection Screen

- d. The 3D object screen is a screen that shows a virtual representation of the user's chosen hairstyle. This object will appear on a flat item that has been scanned by the camera. The 3D object screen display can be seen in Figure 12.

**Figure 12.** 3D Object Screen

3.2 ISO 25010 Testing

Testing is carried out to find out whether the application is running well by asking the user to fill out a questionnaire. Questions were distributed via URL links, involving a total of twenty (20) participants. Here are the test results:

- a. Functional Suitability is a test used to verify whether the AR application's functionality has been functioning as expected. The following is the result of determining the weight value of each response to the functionality questions.

$$Testing = \frac{1700}{1750} \times 100 = 100\%$$

2 Based on the results of functionality testing, the percentage of success is 97%. The obtained value is then transformed in accordance with the standards in Table 1. It can be concluded that the percentage number achieved indicates that the software functionality is of a "Very Good" grade.

- b. Usability testing is a test verify whether the AR application's workflow is acceptable to the user. The following is the result of determining the weight value of each response to the usability questions.

$$Testing = \frac{4000}{5000} \times 100 = 80\%$$

2 Based on the results of usability testing, the percentage of success is 80%. The obtained value is then transformed in accordance with the standards in Table 1. It can be concluded that the percentage number achieved indicates that the software usability is of a "Good" grade.

After calculating two aspects, the two aspects will be combined to determine the overall value of the AR application.

$$Testing = \frac{5700}{6750} \times 100 = 84\%$$

2 Based on the results of ISO 25010 testing on 20 participants, the overall percentage is 84%. It can be concluded that AR applications can provide users a new experience. This application can also be implemented according to the needs, especially for customers of Mr. Abdi barbershop.

4. CONCLUSION

6 Based on the results and analysis presented in the previous chapter, it can be concluded that this research was successful in creating an Augmented Reality application that can be used as a hair model visualization medium that can help visualize hairstyles and increase the interest of young people. In this AR application, customers may view a variety of hairstyles in 3D. Customers may also rotate the hairstyle to see the entire scene and change the hairstyle size.



Applications are made using the markerless method, which is used to display three-dimensional objects in various types of flat areas. The application is made using Unity and the Vuforia library to implement Augmented Reality. At the testing stage, the ISO 25010 method is used, which includes functional suitability and usability. Based on the results of ISO 25010 testing that has been carried out involving 20 respondents, the AR application as a hair visualization medium can be implemented for users. This is evidenced by the test results, with an overall percentage of 84%.

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