Augmented Reality at Cafe Narawita Yogyakarta: Introduction to Manual Brew Coffee Beans

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ABSTRACT

In today's industrial world, the development of Augmented Reality Technology is indispensable. Therefore we conduct research specifically on the manufacture of manual brew coffee beans which will be used as a research object in the design of Augmented Reality applications. The method of making coffee beans will be displayed virtually 3D by determining the water temperature, level of bitterness and taste, so that users can find out the desired level of taste information that will be made through the process of modeling and visualization of attractive and effective designs. Based on research on Augmented Reality that has been presented by the author, it can be concluded that the application created can display virtual 3D objects of manually brewed coffee beans and can display detailed information from these 3D objects. ZeroBean application can also be used as a learning media for baristas and new customers that are more optimal.

General Terms

Android, Unity 3D, Vuforia, Blender

Keywords

Augmented Reality, Coffee, Markerless, Manual Brew V60

1. INTRODUCTION

Coffee is one of the most popular and widely consumed beverages around the world. Many people habitually drink coffee for the purpose of mental alertness, better concentration, or to overcome fatigue [1]. As coffee drinking has become a culture, the way coffee is drunk has changed according to local lifestyles. Most of the trials were successful in increasing productivity, but not the quality of the coffee beans [2]. Therefore, the design of this application displays the virtual making of coffee beans by specifying water temperature, acidity and flavor, so that users know the desired flavor information.

The development of Augmented Reality Technology, especially in the world of coffee, can help design AR applications as a medium for introducing coffee beans, especially manual brew coffee beans by displaying an attractive and effective modeling and visualization design process. This application will be developed using Unity Hub and Vuforia as software to develop hybrid applications for mobile devices. In unity3D, I achieved many interactive functions such as interface jump, output control with the development language C# [3]. Vuforia is a free software development kit for implementing mobile augmented reality [4]. By using this software, this AR implementation will make it easier for us to perfect the application we want to make. The action is taking place in the real world, enhanced with a virtual space often expanded through the use of augmented reality technology [5]. However, the application of Augmented Reality media in the world of education as a learning medium is still rarely used [6].

Modern virtual reality systems aim to mitigate motion sickness and prioritize user safety [7]. Throughout the last years, AR apps became transportable and generally available on various devices [8], especially on the use of smartphones in many circles, so mobile devices play an important role in the design of this AR coffee application. Features that are presented interactively and a large menu will also enhance the experience for users. We define mobile application usability as the extent to which a mobile application can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use [9]. Some studies argued that effectiveness, efficiency, and satisfaction were constituent assessments of mobile application usability instead of being an outcome of overall mobile application usability [10].

2. RESEARCH METHOD

The proposed system analysis in designing the AR Coffee application system can be visualized in Figure 1 below.
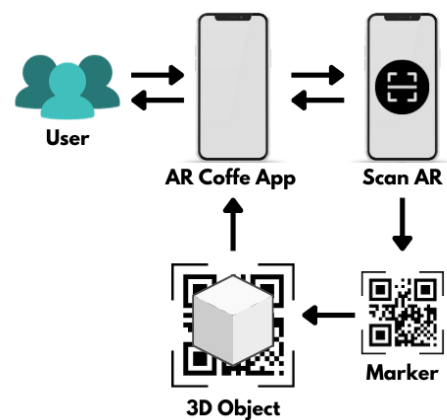

Fig 1: Architecture Model

3D object recognition has several advantages over 2D detection methods, as more accurate information about the environment is obtained for better detection [11]. It can be seen that AR Coffee application users can run the system by detecting objects through the camera sensor on the smartphone to detect markers. Then the 3D object will appear on the smartphone screen and provide information and description of the scanned 3D object.

2.1 Data Collection Procedure

The data collection procedure is carried out through 3 stages, including the following.

2.1.1 Observation

Observation is done directly at Café Narawita. We observe and record every activity in the field which aims to describe everything related to research to help design AR Coffee applications.

2.1.2 Interview

At this stage, complete data is obtained from direct interviews with employees at Cafe Narawita. We asked questions related to the research in order to get complete and accurate information. Materials or materials regarding 3d objects, especially augmented reality, are also obtained through journals and books on the internet as references to support the application design process.

2.1.3 Data Collection Time

The time we need in conducting research on augmented reality mobile applications is about 1 week after obtaining permission from Cafe Narawita which is then presented in the form of a complete report which is used as a guide in designing the application.

2.2 System Design Logic

System logic design is used to provide a clear and complete picture of the system to be built. In this case we use UML (Unified Modeling Language) as a visual modeling method used to design and model software systems. UML uses visual modeling tools to enable developers to obtain an accurate and complete understanding of the target system through the integrated engineering definition, analysis, design, production, testing and maintenance process of the structural and behavioral characteristics of system requirements [12]. A key purpose of UML diagrams is to share knowledge about the system among developers [13]. For this research, we used Use Case Diagram and Activity Diagram as visual modeling methods for AR Coffee design.

2.2.1 Use Case Diagram

Use case diagram is a description of the scenario used as an interaction between users and the functions of the system being built. Use case diagrams commonly contain the use cases, the actors, the generalization relationship between actors, the precede relationships between use cases and the association relationships between actor and use cases [14].
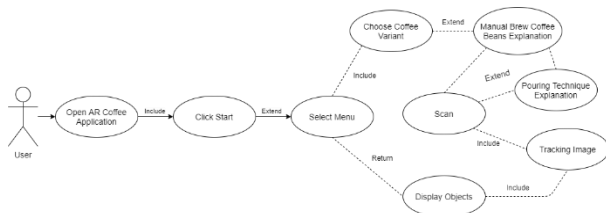

Fig 2: Use Case Diagram

In Figure 2, it is explained that when the user opens the application, the main menu will appear, the user can select the instructions menu, about the application, and the 3D menu. The instruction menu displays instructions for using the application, the about application menu displays information about the application, and the 3D menu displays some coffee bean packaging. Then the user will select one of the manual brew coffee bean packaging and scan the marker to display the manual brew coffee bean packaging in 3D.

2.2.2 Activity Diagram

UML activity diagrams are flowcharts that model sequential and concurrent behavior [15]. In a UML activity diagram, it is required to cognize all feasible start-to-end paths with all associated control entities for testing a use-case sufficiently [16]. This system activity diagram describes the user's actions in running the application when displaying 3D objects.
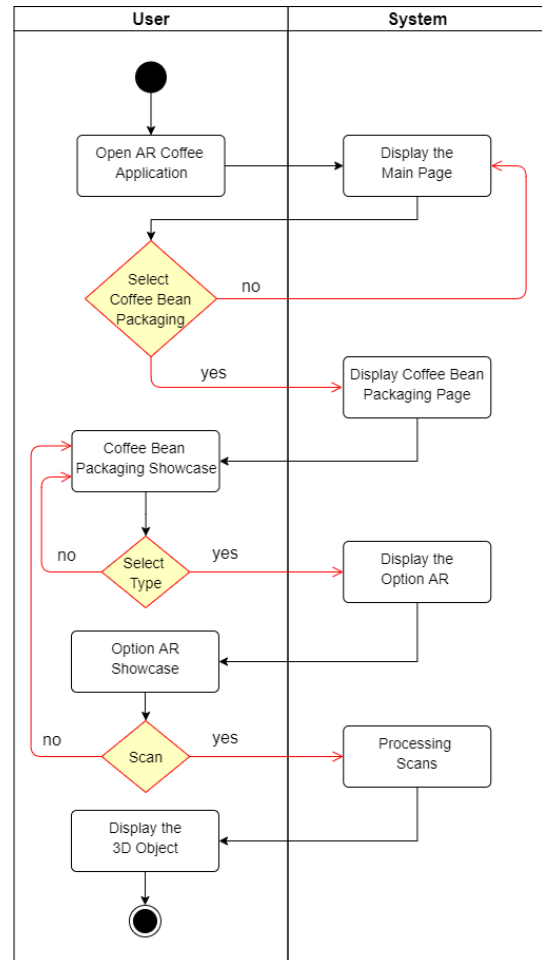

Fig 3: Activity Diagram

2.3 Interface Design

Interface design is the implementation process of the application wireframe design using Whimsical and Figma for high-fidelity design. Wireframes are a conceptual tool at the start of the design process, but later on the fidelity can be high enough to be the basis for implementation [17]. The wireframe display includes the menu structure contained in the AR Coffee application as a medium for introducing manual brew coffee beans.

2.3.1 Loading and Home Page

Loading Page is the process of displaying animation before loading the main content in a system. Then the Home Page displays the main explanation for using the application.
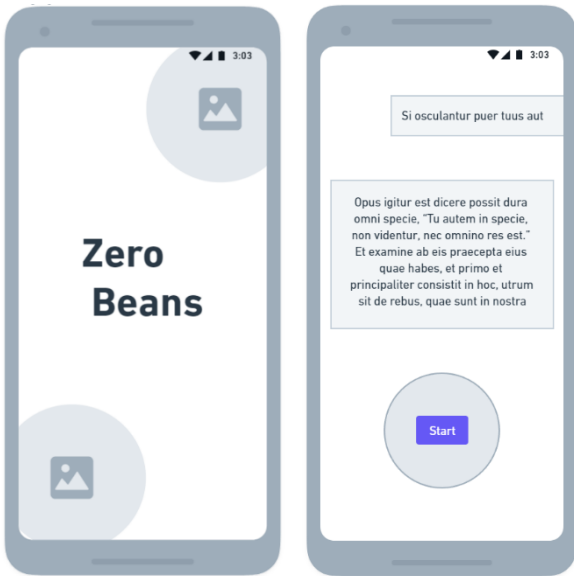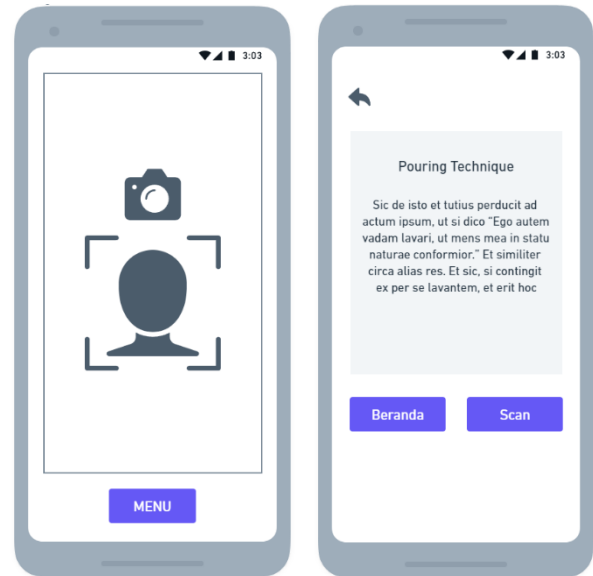
Fig 4: Loading and Home Page

2.3.2 *Menu and Product Detail Page*

The Menu page is a display that contains information on several types of products in the application. Then the Product Detail Page displays in full about one of the products that have been clicked before.
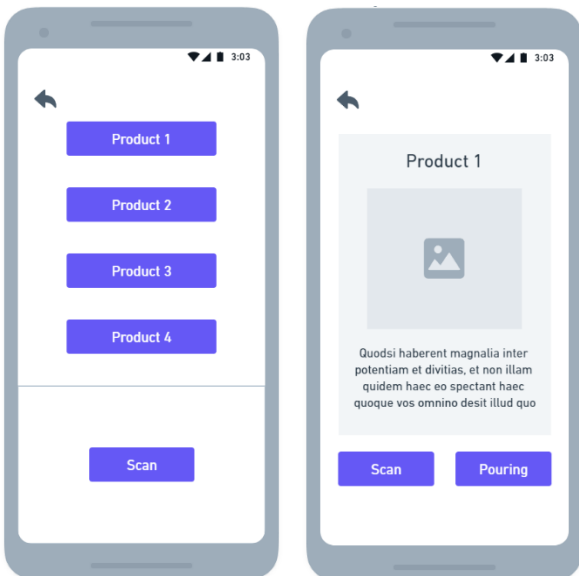

Fig 5: Menu and Product Detail Page

2.3.3 *Scan and Pouring Technique Page*

The Scan page is a display used by the application to scan markers which then displays 3d objects. Then the Pouring Technique Page displays briefly how to perform the pouring technique.

Fig 6: Scan and Pouring Technique Page

3. RESULT AND DISCUSSION

3.1 Assumptions

The assumption in the AR Coffee application states that application users can use smartphones to operate each function optimally. users can directly scan the marker and 3D objects that describe the product will appear.

3.2 Hypothesis

PThis hypothesis is based on assumptions obtained and proven in the research stage. The hypothesis of this research is "Mobile Augmented Reality Application as a medium for introducing manual brew coffee beans can improve the quality of education for baristas and coffee lovers".

3.3 Run an Experiment

Prototyping and program development is done using Unity and Vuforia database with C# programming language. Each concept of application design and development will be explained regarding the basic design of the application output followed by the application display, database, and each function of the menu used.

3.3.1 *Markers in Vuforia*

Marker creation is done by uploading an image taken from the image of the manaual brew coffee bean packaging in the form of a ".jpg" extension. The image will be uploaded to the vuforia website to be converted into a marker that can be tracked and detected by an android camera. Then the image that has been converted into a marker is downloaded in the form of a ".unitypackage" extension and imported into Unity 3D and processed with existing 3D objects.
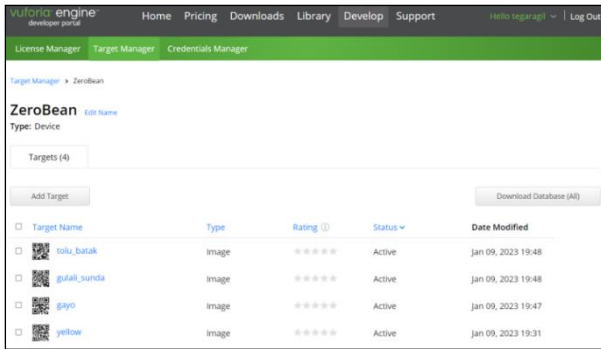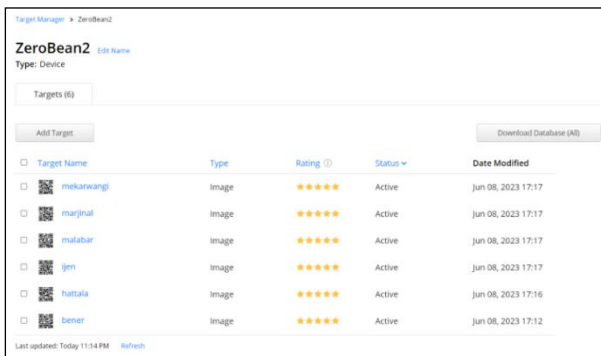
Fig 7: Markers in Vuforia 1

Fig 8: Markers in Vuforia 2

3.3.2 Loading and Home Page
The Loading page is the initial display when the user opens the AR Coffee application. The display is an animation that shows the name of the application, namely "Zero Beans" before entering the Home Page.
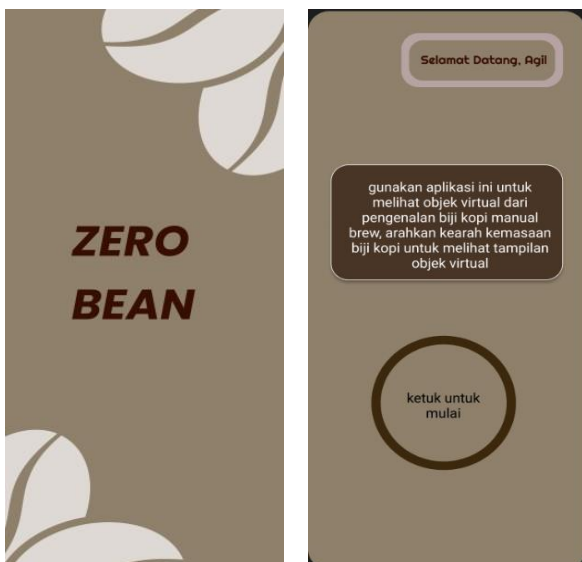

Fig 9: Loading and Home Page

The Home page is the main view of the app. This page displays the user name, application usage guide, and a button to start the application. The application usage guide is something that must be considered before starting the application.

3.3.3 Menu and Product Detail Page
The Menu page displays a selection of manual brew coffee bean products such as Putung Yellow Bourbon, West Java Gulali Sunda, Tolu Batak, Gayo Takengon Ulunowiuh, Gayo Bener Meriah, etc. There is also a scan button at the bottom.
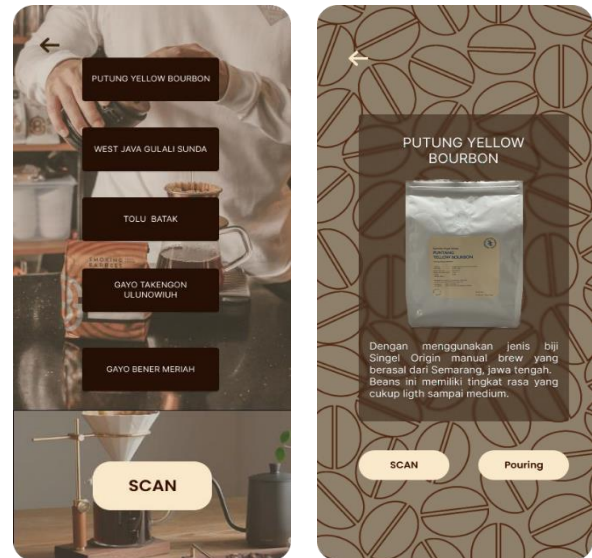

Fig 10: Menu and Product Detail Page

The Product Detail page displays a complete product description. When the user clicks on one of the products, the page will appear then there are also scan and pour buttons.

3.3.4 Scan and Pouring Technique Page
The Scan page is the main function of this application. On this page the user can scan the marker using the smartphone camera. There is a menu button for users if they want to return to the main menu.
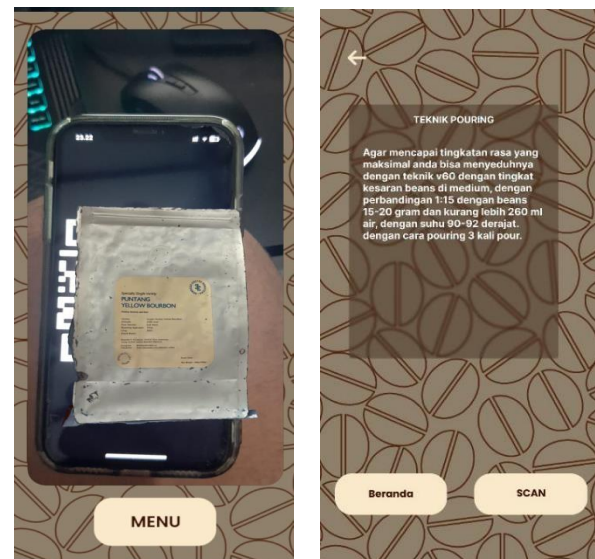

Fig 11: Scan and Pouring Technique Page

The Pouring Technique page is a page that displays a brief pouring technique. There are pouring rules that must be observed to get good results. There is also a scan button and homepage.

3.4 Discussion of Result

The After the implementation of the application program is complete, the next process is to test the program to find out whether there are errors or not. Testing is essential for ensuring the reliability of software systems [18]. Measurement of a test process is a required competence for an effective software test manager for designing and evaluating a cost effective test strategy [19]. By paying attention to quality in testing, of course, to meet the needs of the application. High or excellent quality is achieved if those inherent characteristics meet all requirements [20]. Software developers put more effort to develop and test the quality of the software and verify its reliability before it is released [21].

Table 1. Application Functionality Testing

No	Testing Items	Testing Method	Testing Details	Status
1	Loading Page	Open the Application	Display the Loading Page	Success
2	Home Page	Click on Loading Page	Display the Home Page	Success
3	Menu Page	Click on Start Button	Display the Menu Page	Success
4	Product Detail Page	Click on Product	Display the Product Detail Page	Success
5	Scan Page	Click on Scan Button	Display the Scan Page	Success
6	Pouring Technique Page	Click on Pouring Button	Display the Pouring Technique Page	Success
7	Button Start	Tap the button	Display the Menu Page	Success
8	Button Product	Tap the button	Display the Product Detail Page	Success
9	Button Scan	Tap the button	Display the Scan Page	Success
10	Button Pouring	Tap the button	Display the Pouring Technique Page	Success
11	Button Menu	Tap the button	Display the Menu Page	Success
12	Button Home Page	Tap the button	Display the Home Page	Success

Table 2. App Scanning Distance Test

Testing Items	Distance		
	5 cm	10 – 35 cm	> 35 cm
Putung Yellow	Successfully Detected	Successfully Detected	Undetected
Gulai Sunda	Successfully Detected	Successfully Detected	Undetected
Tolu Batak	Successfully Detected	Successfully Detected	Undetected
Gayo Takengon	Successfully Detected	Successfully Detected	Undetected
Gayo Bener	Successfully Detected	Successfully Detected	Undetected
Malabar	Successfully Detected	Successfully Detected	Undetected
Ijen	Successfully Detected	Successfully Detected	Undetected
Hattala	Successfully Detected	Successfully Detected	Undetected
Mekarwangi	Successfully Detected	Successfully Detected	Undetected
Marjinal	Successfully Detected	Successfully Detected	Undetected

In Table 1, functionality testing has been successfully carried out and runs optimally. This test is to ensure all functions run correctly and ensure the consistency of the system as expected. In Table 2, testing the scanning distance on the marker has been successfully carried out and runs optimally. This test is to ensure that scanning markers at a certain distance is successful and displays 3D objects.

4. CONCLUSION

Based on the research described by the author, it can be concluded that the application created can display a virtual 3-dimensional manual brew coffee bean object and detailed information from the 3-dimensional object. Therefore, the Zero Bean application can be used as a learning media solution for new Baristas and coffee shop customers.

Implementation and testing of applications carried out have also been optimized. Software is becoming a very important need and the demand of the community is increasing every day in various fields. Therefore, the design of the AR Coffee application is well done as the features presented are highly interactive to enhance the experience for the user.

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