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The Implementation of Augmented Reality and First Person Method of Promotional Media in Kemang Pratama Housing Bekasi

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ABSTRACT

The promotional media used in the Kemang Pratama Bekasi housing complex uses brochures with 2D images, causing a lack of promotion of the housing. And if you want to see the condition or appearance of the house, you have to come to the location of the house in the Kemang Pratama Bekasi housing complex as a clear picture. But by using the implementation model of Augmented Reality and First Person Mode as a media for promoting housing in Kemang Pratama, Bekasi, it makes it easier for buyers to see the condition and appearance of the house in terms of home specifications, because it can display a 3D-shaped house using a smartphone camera as an initial image before seeing the house to the location. So with this technology it becomes more effective and efficient in terms of time. Augmented Reality is used to view the exterior with a brochure (as a marker) which is scanned using a camera and First person mode to see the interior of the house.

1. Introduction

Many companies promote their products simply by providing 2D image brochures. In providing solutions or innovations to Kemang Pratama Bekasi housing which is a residence with total comfort in a beautiful, clean, and friendly environment. Located in the center of Bekasi city center with complete facilities and infrastructure. Kemang Pratama has been inhabited by more than 25,000 residents, and has proven itself as the best neighborhood in east Jakarta by winning the Environmental and Settlement Award repeatedly, so that the marketing of the company's Kemang Pratama Bekasi products can promote its products more attractively. The promotional media uses Augmented Reality and First Person Mode applications with the help of unity3D software as a promotional tool that converts 2D images into 3D images in real time, but this application uses brochures as a medium to identify markers that have been set to bring up the products to be promoted. in 3D images with the addition of the First Person Mode feature.

Augmented Reality (AR) is a technology that combines 2 dimensions with 3 dimensions in realtime. [1] [2] Augmented Reality is a technique that combines two-dimensional and three-dimensional virtual objects into a three-dimensional real sphere and then projects these virtual objects in real time. In everyday life, AR has been used as a means of doing business and promoting a product. [3] Marker Based Tracking has long been developed since 1980 and in the early 1990s began to be developed for the use of Augmented Reality. [4] Companies in the automotive and property sectors are competing to market their products. Manufacturers do ways to get consumers interested in their products. Manufacturers market their products with brochures because they are cheap, but brochures are only a two-dimensional image display, this makes consumers who see brochures dissatisfied because of the limited brochure display. Marketing method for product brochures with 3D images [5]. so that consumers are interested in seeing the product and in more detail in seeing how it looks. To introduce product marketing methods using Android-based Augmented Reality.[6] [7] To support product marketing, it can help producers to market their products by displaying their products in the form of 3D images using Augmented Reality. [8] First Person Mode is a First Person Shooter (FPS) feature that is used in one type of game and has a characteristic that is the use of a first-person perspective with a

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smartphone screen display that displays a view that can be seen through the eyes of the main character or player. In Unity there is an FPS control UFPS feature which has complete and practical features. [9] [10]

The implementation of Augmented Reality and First Person Mode of Promotional Media at the Kemang Pratama Bekasi Housing is expected to be implemented for promotional purposes, thus the brochures owned at the Kemang Pratama Bekasi housing which were originally in the form of 2D objects became 3D objects to become more attractive with the application of Augmented Reality (AR).

2. Methodology

The method used in the development of Augmented Reality is the Marker Based Tracking method. The method consists of virtual coordinates, tracking, contours extraction and corner detection, Pattern Normalization and Template Matching, pose and position estimation. The following are the stages of the Marker Based Tracking method. [11] Virtual coordinate point stage is the stage to determine the position of the virtual object which will later be added to the real or original environment. Position the virtual object perpendicular to the marker. The virtual object will stand in line with the Z-axis and perpendicular to the X-axis (right or left) and Y-axis (front or back) of the virtual marker's coordinates.[12] The tracking stage is the processor stage in processing video in real time frame per frame. The next stage is image thresholding, at this stage each video frame undergoes a thresholding process to produce a black and white image. This stage aims to recognize the rectangular shape and marker pattern from the captured video. [11] The contours extraction and corner detection stages are contours extraction and corner detection processes using black and white images obtained in the second stage to get the coordinates of the four sides and four corner points of the marker. [11] The pattern normalization and template matching stages aim to normalize the marker shape so that the template matching process can be carried out correctly. [11] The last stage is pose and position estimation which is responsible for placing virtual objects on top of the marker. The relationship between the three coordinates plays an important role, namely the coordinates of the observed screen coordinates. [11] [12]

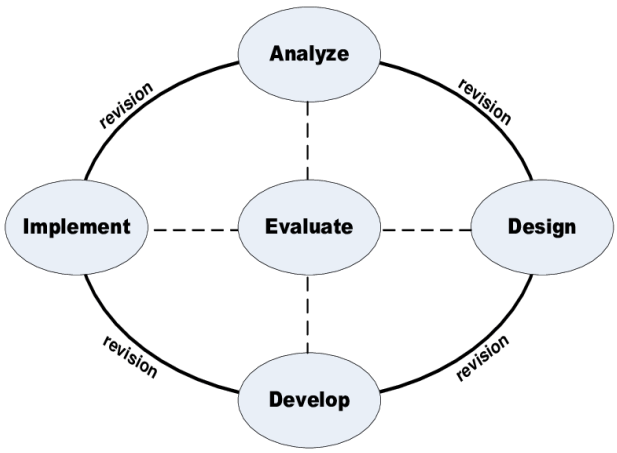

Fig 1. ADDIE Development Model

To use the marker based tracking method in making Augmented Reality and First Person Mode applications, an ADDIE (Analyze, Design, Develop, Implement, Evaluate) development model is needed. [13] [14] The analysis stage is the stage of analyzing the identified needs such as determining what needs are needed in making applications including the hardware and software requirements needed to build applications according to user needs. [14] The design stage is the stage of determining component specifications in system design which includes the design of UML (Unified Modeling Language) and interface design. [15] The development stage is the stage in the development of Augmented Reality and First Person Mode as housing promotion media. At the manufacturing stage, it refers to the software used such as Sketchup, Vuforia, Unity 3D, and Visual Studio to realize it into an application. [15] The implementation stage is the stage of developing which eventually becomes an application and is tested using a smartphone. The trials carried out function to test the functionality of the application development that has been carried

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out whether it is in accordance with user needs. [15] Test method with blackbox testing which is the method used in testing applications or software that is built. [16]

3. Result and Discussion

In the development of appropriate Augmented Reality and First Person Mode applications using a development model according to the stages in ADDIE and marker based tracking methods in Augmented Reality (AR).

3.1. Analyze

The analysis stage is the stage of analyzing the needs needed in building Augmented Reality and First Person Mode applications as promotional media which includes hardware and software requirements. The following is an explanation of the hardware and software requirements.

a. Hardware Requirements

The hardware requirements used to build Augmented Reality and First Person Mode applications can be seen in the following table.

Table 1.
Hardware Requirement

Hardware Requirement	Description
PC or Laptop	PC or laptop used with a processor speed of 3.30 GHz, RAM min 4 GB, Hard disk space min 500 GB used to create applications.
Webcam	Tool used to scan markers.
Marker	Used as a medium to bring up 3D objects.
Smartphone Android	To run the application when it is finished.

b. Software Requirements

The sofware requirements used to build Augmented Reality and First Person Mode applications can be seen in the following table.

Table 2.
Software Requirement

Software Requirement	Description
Microsoft *Windows* 10	The operating system used to run the Unity application.
Adobe XD	Adobe XD application is used to create User Interface designs.
Photoshop CS6	Photoshop application is used to design the appearance of the application from the shape of the button and the background.
SketchUp ver 2020	Sketchup application is used to create 3d house objects.
Unity 3d ver 2019.1.14	Unity application is used to create Augmented Reality and First person Mode applications.
Vuforia *database*	Vuforia is used to store residential brochure markers.
Visual Studio 2017	Visual Studio is used to provide functionality for Augmented Reality and First person Mode applications.

3.2. Design

Design is the stage used to design applications that will be made to suit user needs. The system design includes the design of UML (Unified Modeling Language) and the design of the User Interface.

a. UML (Unified Modeling Language) Design

The stages of the UML (Unified Modeling Language) design consist of designing (Use Case Diagrams, Activity Diagrams, Sequence Diagrams and Class Diagrams). The following image is a Use Case Diagram, Class Diagram of the application that was built.

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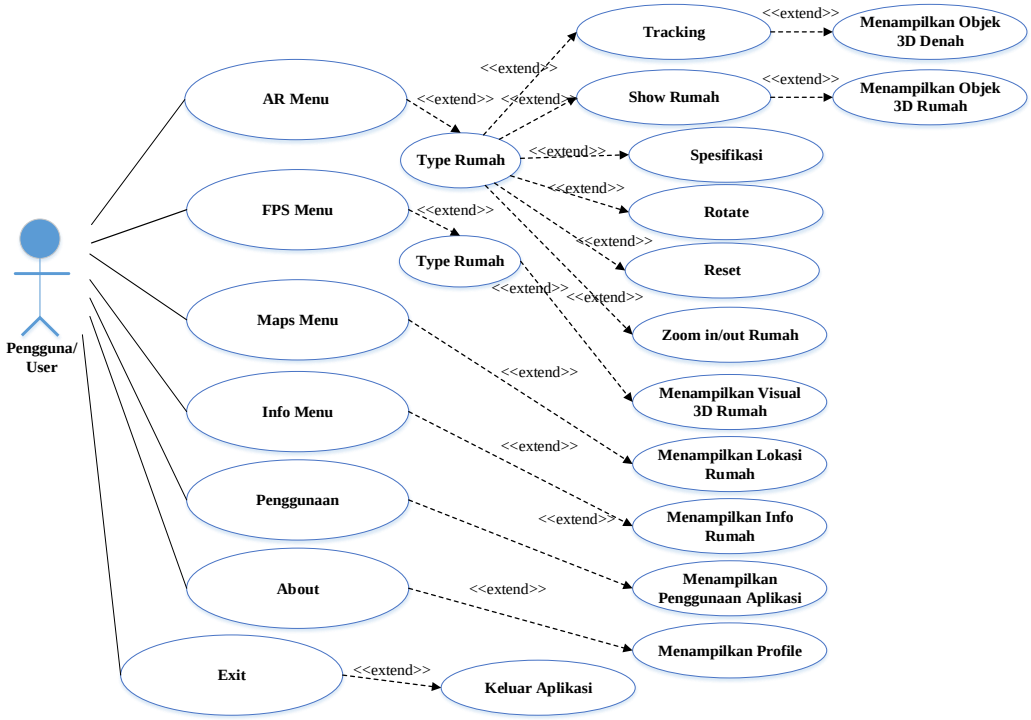

Fig 2. Use Case Diagram of AR System and First Person Mode of Housing

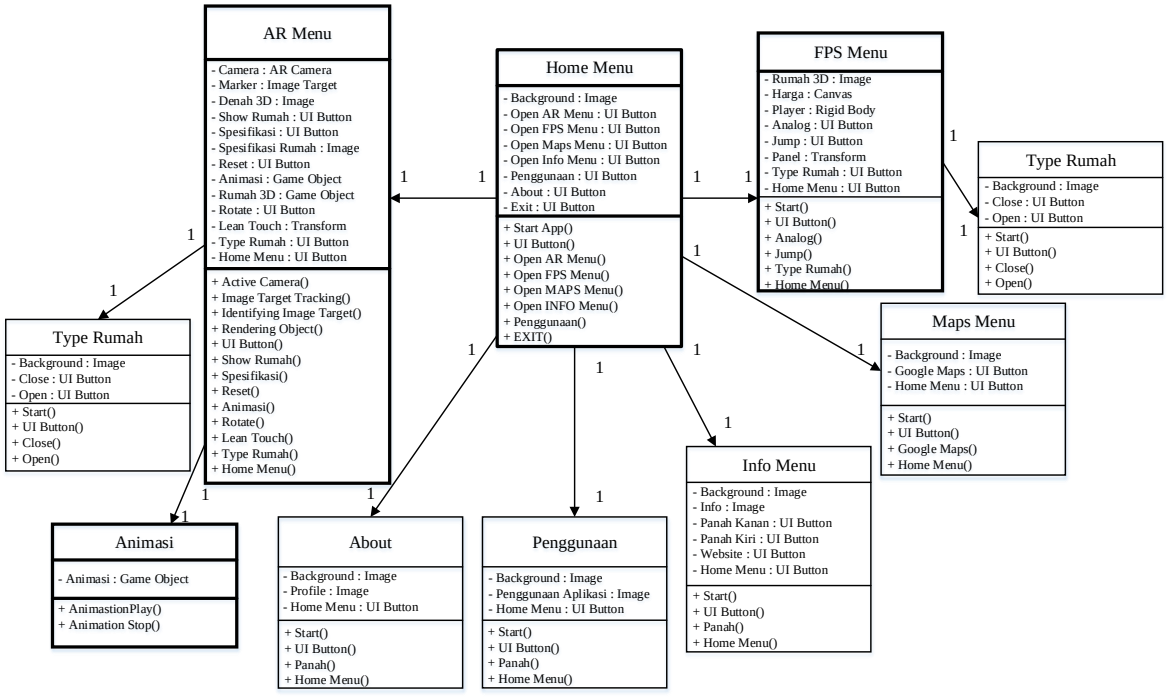

Fig 3. Class Diagram of AR System and First Person Mode of Housing

b. User Interface Design

User Interface Design Stages are stages that are commonly used to create software or application designs using Adobe XD graphic design applications. The design is needed to make it easier to make

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applications because it is an initial description of the application to suit user needs. The user interface in the Augmented Reality and First Person Mode applications has several menus, namely (Home Menu, Home Type Menu, AR Menu, FPS Menu, Maps Menu, Info Menu, Usage, and About).
User Interface Design Home Menu on Augmented Reality and First Person Mode applications as the main menu that serves to provide convenience to users in accessing and selecting the features available in these applications such as Augmented Reality, First Person Mode, and other supporting features.

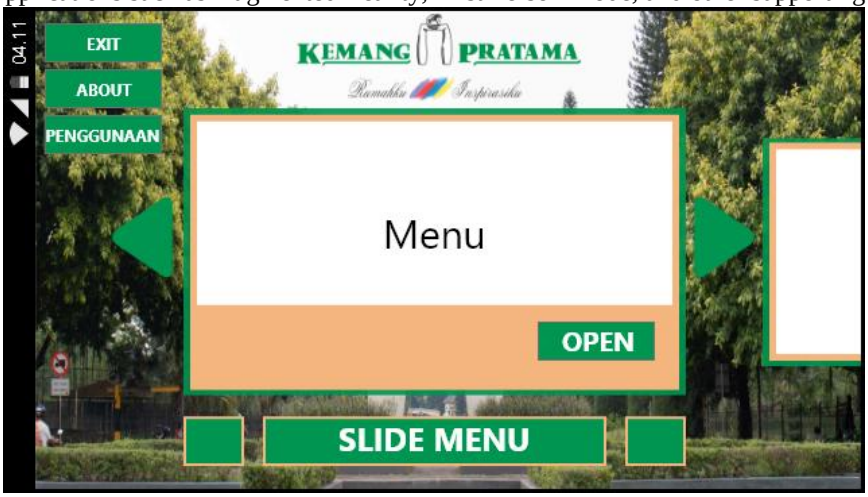

Fig 4. Design User Interface Home Menu

Based on the results of the AR Menu User Interface Design that has been made, it explains that the AR Menu in the Augmented Reality and First Person Mode application will later have a marker tracking feature with a smartphone camera that will issue a 3D floor plan image from the brochure marker when pointing the camera at the brochure marker and there are several buttons such as (Show Home, Specifications, Rotate, Reset, Type Home and Home Menu) whose position is easy to use.

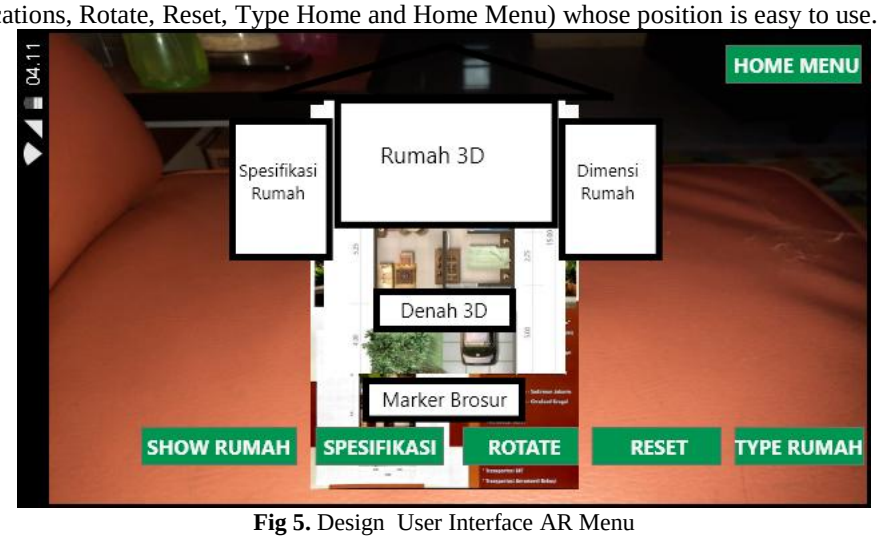

Fig 5. Design User Interface AR Menu

Based on the results of the FPS Menu User Interface Design that has been made, it explains that the FPS Menu will be used as an FPS menu in the Augmented Reality and First Person Mode applications which will have the First Person Mode feature to view the interior and exterior of the house with the help of the First Person camera. The FPS Menu has several buttons such as (Analog, Type Home, Jump, and Home Menu) whose positions are easy to use such as the Analog button in the lower left position to move the player, the Type Home button and Jump in the bottom right position and the Home button position is in the top position so it is easy to use.

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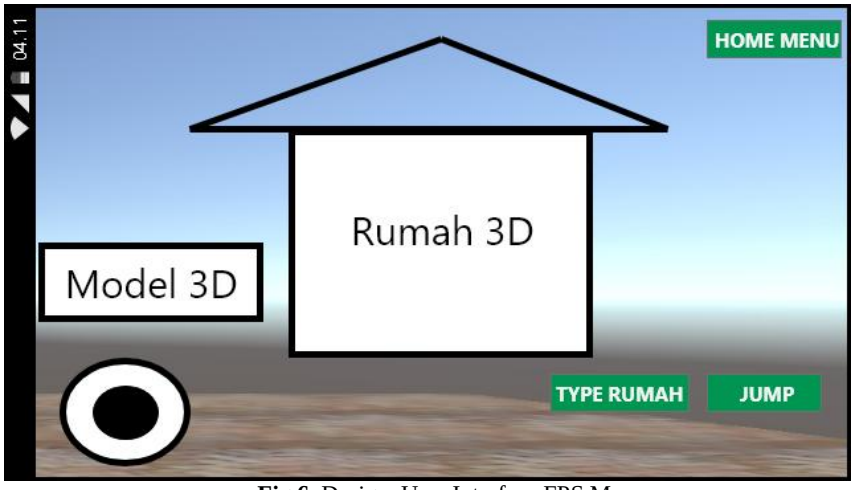

Fig 6. Design User Interface FPS Menu

3.2. Develop

Development is the stage used to make applications that are made to suit user needs. The development of Augmented Reality and First Person Mode application systems uses the marker based tracking method as a method to bring up objects with the help of a marker in the form of a brochure.

a. 3D Object Development

Development of 3D Objects in Augmented Reality and First Person Mode applications as the creation of 3D objects in the form of houses using sketchup software. Sketchup serves to create a 3D model of a house where the model is made according to the original size or based on the size of the house plan. The model used for making the 3D object uses a floor plan from a brochure using 4 models or 4 types of houses, namely the Vanda and Crosandra types with 1 floor, Ascideira type and Airidies with 2 floors whose shape is adjusted to the brochure and its original shape.

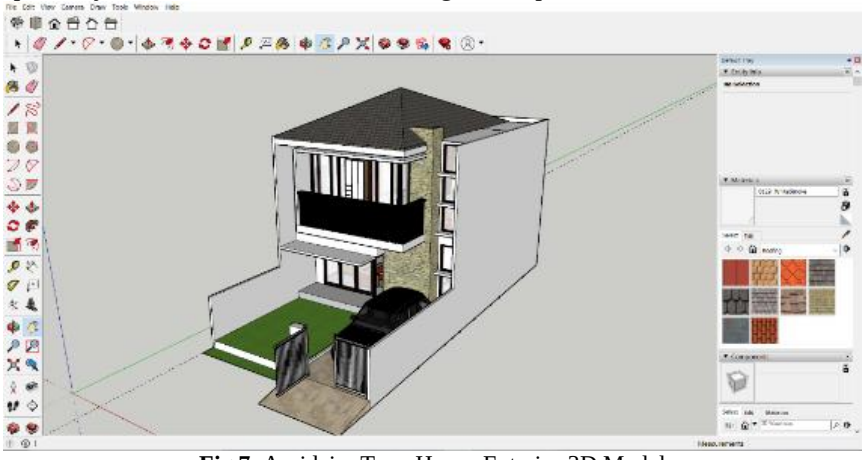

Fig 7. Ascideira Type House Exterior 3D Model

Based on the results of the K Type Ascideira Home Interior 3D Model that has been created, it explains that the Home Interior 3D Model is used as a 3D object in Augmented Reality and First Person Housing applications. The 3D Home Interior model is made using sketchup software to make it easier to make the object like the original using the size of the house plan and using additional materials such as sofas, tv, tables, beds to complete the interior of the house which will later be exported into a sketchup file.

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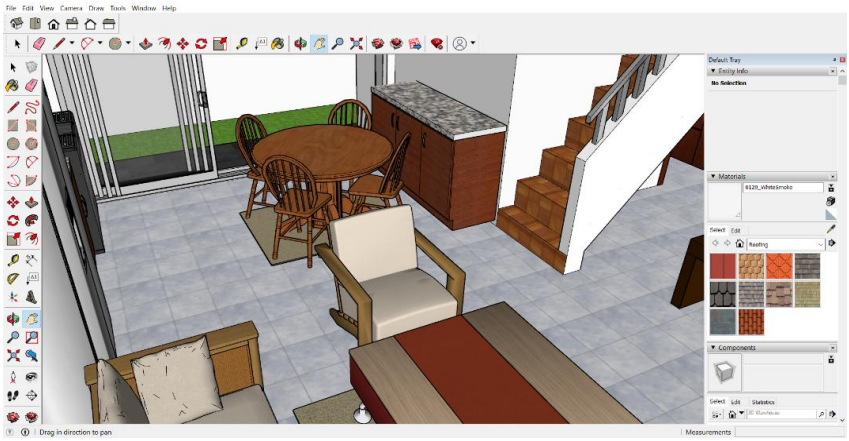

Fig 8. Model Home Interior Type Airidies

b. Marker Development

Marker development in Augmented Reality and First Person Mode applications as marker making in the form of home brochures using Vuforia software as a marker database and Unity 3D software to display 3D objects on markers with Unity 3D using a marker based tracking method consisting of (virtual coordinate points, tracking, contours extraction and corner detection, Pattern Normalization and Template Matching, pose and position estimation).

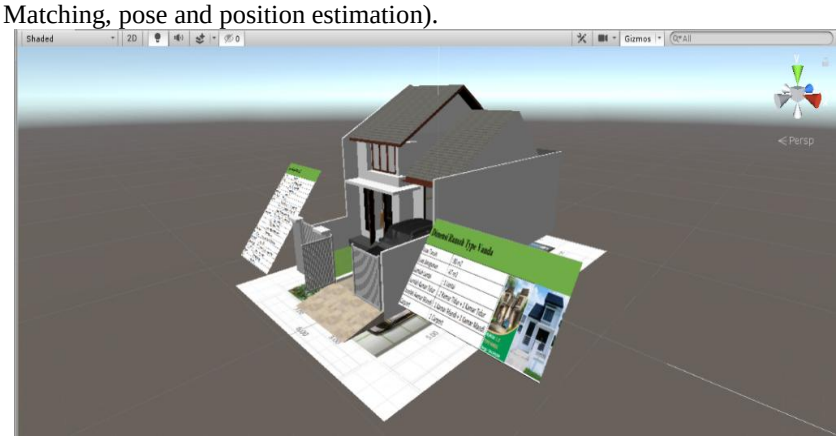

Fig 9. Display Pose and Position Estimation

c. Development of AR and First Person Mode

Development of AR and First Person Mode on Augmented Reality and First Person Mode applications as application creation in terms of menu display such as (Home Menu, AR Menu Type Home Menu, FPS Menu, Menu, Map, Info Menu, Usage, and About) which is based on User Interface design into several scenes in Unity 3D software. The button material is designed using Photoshop CS6.

d. Application Testing

Stages of Testing AR Applications and First Person Mode Housing as a promotional media are stages in testing the application using the BlackBox method, which includes testing functionality. The following are the test results using the black box method. The following is an example of testing the AR Menu.

Table 3.
Testing the AR Menu

Testing Scenario	Test Case	Expected Result	Result
Tracking Marker Brochure	The user points the camera on the AR menu to the brochure marker	3D housing plans appear according to the type of house	Valid
3D House Show	The user presses the Show Home button	A 3D house will appear from the house according to the type	Valid
Show house	The user presses the	The specification display appears	Valid

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Testing Scenario	Test Case	Expected Result	Result
specifications	Specification button tombol	from the Kemang Pratama house according to the type of house	
Changing Side View	he user presses the Rotate button	The side view of the house changes with rotating objects according to the type of house	Valid
Zoom In/Out	User pinches smartphone screen on AR Menu	Display objects to be large and can be small	Valid
Reset AR Menu	The user presses the Reset button	The AR Menu display will be reset, that is, changing the display as it was when you entered the menu	Valid
Navigasi Home Menu	The user presses the Home Menu button	Back to Home Menu page	Valid

3.4. Implement

Implementation is a stage that is carried out after carrying out the development or develop stages, which at this stage explains the results of the Augmented Reality and First Person Mode Housing applications as promotional media that have been tested in the previous stage on each menu in the application**.**

Fig 10. AR Menu Display

Fig 11. FPS Menu Display

4. Conclusion

The conclusions that can be drawn from the results of the Augmented Reality (AR) application development are as follows:

a. The media used for promotion of housing in Kemang Pratama Bekasi uses Augmented Reality and First Person Mode technology as housing promotion media by changing the appearance of brochures that were previously in 2D form to 3D by displaying 3D House objects on brochures scanned with

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Augmented Reality technology, this application can also be used to see 3D visuals of houses to see the interior and exterior of the house with First Person Mode technology, with this technology being able to attract buyers or consumers by providing a clear picture of the shape of the house and its specifications.

b. Augmented Reality and First Person Mode technology can be implemented properly on smartphones that are used as media to scan brochures using a smartphone camera. The brochure used has 4 types of houses, namely the type of vanda, ascideira, crosandra, and airidies.

c. Testing of Augmented Reality and First Person Mode Housing applications as housing promotion media using the blackbox method to test each menu on the application so that it can display functions that match each menu has been successfully carried out. This application can be used as a new promotional media or as a complement to existing promotional media in promoting housing.

d. The results of making Augmented Reality and First Person Mode applications as promotional media for Kemang Pratama Bekasi housing are in accordance with the needs of consumers or buyers.

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