

3D Visualization of Furniture in A Room with Augmented Reality

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Abstrak

Penelitian ini bertujuan untuk memudahkan orang yang ingin menata perabot dengan lebih baik dan efektif. Tidak perlu mengeluarkan biaya atau tenaga, hanya dengan memindai kamera di dalam ruangan, objek furnitur akan muncul. Dengan teknologi augmented reality, masalah ini dapat diatasi dengan menerapkan aplikasi yang dapat memvisualisasikan objek 3D di dunia nyata secara bersamaan. Metode yang digunakan dalam penelitian adalah metode MDLC (Multimedia Development Life Cycle). Permasalahan sebelumnya adalah penataan furnitur yang masih menggunakan cara manual dengan menggeser objek nyata dari sudut ke sudut akan memakan waktu yang lama. Hasilnya adalah aplikasi layak digunakan oleh masyarakat untuk menata ruangan secara virtual dengan menggeser objek melalui layar ponsel yang lebih efektif. Angka uji keberhasilan pada aplikasi ini adalah 88,75%.

Kata Kunci: Furnitur; Augmented Reality; Visuualisasi 3D.

Abstract

This research aims to make it easier for people who want to organize furniture better and more effectively. No need to spend money or effort; just by scanning the camera in the room, furniture objects will appear. With augmented reality technology, this problem can be solved by implementing an application that can visualize 3D objects in the real world simultaneously. The method used in the research is the MDLC (Multimedia Development Life Cycle) method. The previous problem was the arrangement of furniture, which still uses manual methods. Shifting real objects from corner to corner will take a long time. The result is that the application is feasible to be used by the community to organize the room virtually by shifting objects through a more effective cellphone screen. The success test rate in this application is 88.75%.

Keyword: Furniture; Augmented Reality; 3D Visualization.

1. Introduction

Information technology is progressing very rapidly, especially now that augmented reality technology is being discussed. Augmented reality is a field of computer science that combines real-world conditions with computational results from computers in three-dimensional form [1]. Along with the development of augmented reality technology, this has encouraged the application of augmented reality technology in various fields as an innovation, especially in the field of furniture [2]. Furniture is a product that is always in the house or office. Furniture that is often found comes from materials such as wood, metal, plastic, etc. [3]. Decorating furniture is something people need and has existed since a long time ago. According to (Aidil No. 2 of 2020), decorating furniture in the room can be a trend at this time to hone skills in arranging a beautiful room [4].

But at this time, to decorate the furniture itself, people still use a manual way, such as imagining their imagination by arranging furniture in the room, or it can also be by arranging objects directly. To arrange objects directly, people must buy furniture first to be arranged in the room. This is ineffective because it takes time and drains energy, moreover, it must spend money, and if it is felt that the furniture is not suitable, it will be in vain [5]. Previous research conducted (Qadriyatno No. 3 of 2018), found that furniture is one part of the beauty that provides its own aura of comfort in the room [6]. In the research that has been done (Fernando No. 1 of 2021), augmented reality can be a breakthrough technology that can be a problem solver in the current era by utilizing three-dimensional objects that look real [7]. by utilizing augmented reality technology, the furniture displayed is not just a picture, but can also be in 3D [8]. In the research conducted (Atmanto No. 6 of 2021), the utilization of technology at this time can present a visualization of the shape of three-dimensional furniture using augmented reality technology through mobile applications [9]. With augmented reality, the combination of showing virtual objects in the real-world merges at the same time.

From the above problem, a solution is obtained to create a furniture visualization application in the room using the markerless method. The markerless method will make it easier for users who want to decorate furniture in the room without the need for 2D images to display 3D objects, they only need to choose one of the furniture options that will be visualized three-dimensionally in the room. According to research conducted (Alamsyah No. 2 of 2023), the use of markerless will be more effective, simple, and not complicated to display furniture in three dimensions because you only need to point the camera in the room where the scanned furniture will appear in three dimensions [10]. With this application, people who want to decorate the room can do it effectively because the overall shape of the furniture displayed looks like real, and 3D objects that have been displayed can also be enlarged and reduced or can also be shifted according to the desired position.

2. Research Method

The method used in the research is the MDLC (Multimedia Development Life Cycle) method. This research has six stages: concept, interface design, material or object collection, creation, testing, and distribution. The first stage of this research must be done, but the next stages do not always have to be sequential.

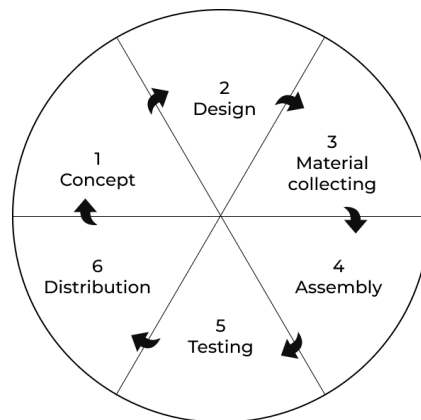


Figure 1. Multimedia Development Life Cycle method

- 1) Concept
This application is designed for people who want to organize a beautiful room more effectively and aesthetically. The objects that will be displayed in this application are also interactive to facilitate and add satisfaction to people who want to organize the room.
- 2) Design
At this stage, the application interface design is made as attractive as possible, and the interface is easy to understand to give an impression to users so that they are interested, not bored, and not bored when using this application.
- 3) Material collecting
This stage is carried out by collecting data related to furniture and augmented reality. This data is qualitative, such as images and 3D objects. Images that have been obtained from the internet are modified as needed to create 3D objects in the Blender application.
- 4) Assembly
The assembly stage is a stage where all objects and other materials that have been collected are then made into a customized application based on the design that has been prepared in the previous stage.
- 5) Testing
Testing this application is done by the researcher himself to see if the system has run smoothly. Testing is done by trying each menu that is made to see whether it can function, and the most important thing is whether the 3D objects in the room are successfully displayed or not.
- 6) Distribution
After all of the five processes above are successfully carried out, enter the last stage, namely distribution. After all systems run smoothly and the application is declared suitable for use, the application is stored in storage in .apk format, then the application can be built on a smartphone and is ready to be used by people to decorate the room as a medium of inspiration so that people who decorate the room get a new experience that is effective and more efficient.

3. Results and Discussion

3.1 Interface & scan marker

Before designing and providing each element in the application, it is necessary to first create a display framework using wireframes as a sketch to create a display and analyze the experience gained by users when using this application. The interface design has a display that includes catalog options, descriptions, and a scan AR button that, when clicked, will go to a new page, namely the camera AR page to display furniture. The interface, besides having an attractive design, also needs contrasting colors so that users who use the application feel comfortable when looking.

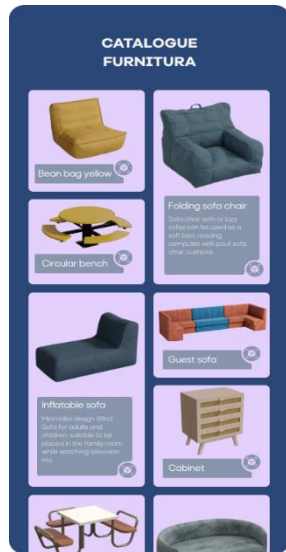


Figure 2. Interface catalog



Figure 3. Scan object

Figure 3 is the camera page, where the main function of augmented reality is to test whether the object successfully appears or not by pointing the camera at an empty room without any objects, because if there are other objects, it will interfere with the marker scanning process. When the marker has been detected, just click on the screen, and the object will appear as shown below.

3.2 Testing results

1) Blackbox testing

The author conducts testing with the blackbox testing method, which aims to determine whether the object successfully appears or not. If the object successfully appears, then the application is suitable for distribution. The test carried out is to detect objects in a room with a certain distance when scanning markers and light conditions in rooms ranging from dark, dim, to bright.

Table 1. Blackbox testing method.

No.	Testing	results
1	Objects appear in dark light	Failed
2	Objects appear in dim light	Success
3	Objects appear in bright light	Success
4	Objects appear at an angle of 0-35 degrees	Failed
5	Objects appear at an angle of 36-65 degrees	Success
6	Objects appear at an angle of 65-90 degrees	Success

Based on table 1, when the camera is directed at dark light, the object does not appear, and in medium to bright light, the object successfully appears. then when the camera is directed at an angle of 0-35 degrees, it does not appear because the area captured by the camera is too small or narrow so that the object does not appear, while at an angle of 36-90 degrees, it successfully raises the object, which means that this application is ready to be used for people who want to arrange furniture in three dimensions.

2) Questionnaire testing

The second is done objectively by distributing questionnaires to users directly who try to use this application, which will include four questions, and people who give scores only answer with two choices, namely yes or no. There are 20 people who will fill out this questionnaire, and this calculation has a scale of 1-5, which includes 0%-20% = very bad, 21%-40% = bad, 41%-60% = enough,

61%–80% = good, and 81%–100% = very good. so that the author can draw easy conclusions from the results of the questionnaire. Questions include:

- a) Does the application display objects properly?
- b) Does the application have a comfortable appearance?
- c) Is the application easy to use?
- d) Does the application help visualize the furniture in the room?

Table 2. Question one

Question	Scale	Skor	Frequency	Skor * Frequency
1	Very good	5	10	50
	Good	4	10	40
	Enough	3	0	0
	Bad	2	0	0
	Very bad	1	0	0
			20	90

From the above presentation, calculated by the formula $P = 90/100 * 100\% = 90\%$, where P is the percentage value sought, 90 is obtained from the score multiplied by the frequency, and 100 is obtained from the number of frequencies multiplied by the score. So, from question one, it is concluded that the application can display objects properly.

Table 3. Question two

Question	Scale	Skor	Frequency	Skor * Frequency
2	Very good	5	8	40
	Good	4	10	40
	Enough	3	2	6
	Bad	2	0	0
	Very bad	1	0	0
			20	86

From the percentage above, it is calculated that $P = 86/100 * 100\% = 86\%$. The results obtained from the percentage of question two indicate that the application has very good comfort to use.

Table 4. Question three

Question	Scale	Skor	Frequency	Skor * Frequency
3	Very good	5	7	35
	Good	4	12	48
	Enough	3	1	3
	Bad	2	0	0
	Very bad	1	0	0
			20	86

The percentage above is obtained as $P = 86/100 * 100\% = 86\%$, which means that this application is easy to use with a very good scale.

Table 5. Question four

Question	Scale	Skor	Frequency	Skor * Frequency
4	Very good	5	14	70
	Good	4	5	20
	Enough	3	1	3
	Bad	2	0	0
	Very bad	1	0	0
			20	93

The percentage of question four is obtained as $P = 93/100 * 100\% = 93\%$, which means that the application can help people organize a more effective room. This question has a high percentage value with a very good scale. After the four questions are fulfilled, it can be concluded by finding the average by adding up all the percentage results and then dividing by the number of questions given through the questionnaire. The average percentage result obtained is 88.75%; this figure has a very good scale, indicating that this application is feasible to use and can help people organize a better and more effective room.

4. Conclusion

Based on this research, it can be concluded that this research produces a feasible application as a form of 3D visualization of furniture in the room by utilizing augmented reality technology. By scanning objects without 2D markers, people or society will be easier and can add experience. With the convenience provided through this application, this application runs well, with a usable success percentage of 88.75%. I hope this research can benefit many people, especially in the field of augmented reality.

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