

Interactive Digital Catalog for Canopy Workshop Using Augmented Reality

Rohman Dijaya¹, Rizky Bayu Wardana², Suprianto³

^{1,2,3}Department of Informatics, Faculty of Science and Technology, University of Muhammadiyah Sidoarjo, Indonesia

Article Info

Article history:

Received June 10, 2021
Revised August 01, 2021
Accepted August 18, 2021
Published December 26, 2021

Keywords:

Augmented Reality
Blackbox
Canopy
Promotion

ABSTRACT

This research study develops a product promotion method for a canopy roofs. The development of this method is to apply a 3-dimensional (3D) catalog using Augmented Reality (AR) technology. By utilizing Augmented Reality technology, sellers do not need to create markets or miniature products that are commonly used to provide examples to consumers to save costs, attract consumer interest, and display objects that appear natural. Based on the tests that have been done, it is concluded that implementing Augmented Reality in the canopy sales promotion media using the Luther development method with the stages of analysis, design, implementation, testing, and maintenance. Implementation of Augmented Reality in canopy sales promotion media uses concept data from the types of canopies included in the Augmented Reality-based application, namely stainless and hollow types made using a 3D blender program. A marker as a sign to bring up 3D objects in the application. Markers are created using Photoshop and entered the database so that they can be stored online. System testing uses the BlackBox testing method where the program's functionality is running as desired.

Corresponding Author:

Rohman Dijaya,
Department of Informatics,
University of Muhammadiyah Sidoarjo,
Jl. Raya Gelam 250, Candi, Sidoarjo, Jawa Timur, Indonesia
Email: rohman.dijaya@umsida.ac.id

1. INTRODUCTION

This paper develops an estimating sample construction procedure "pseudo repeat sale" (Ps-RS). Ps-RS method matches two very similar new sales occurring at different times within a single building (or within a single phase but possibly across different buildings, or within a single complex but possibly across different phases and buildings, depending on which of our three alternative different definitions of the matching space is being tested) to construct a price index that controls quality more reliable and less bias for newly built homes [1]. After-sales services (ASS) are activities that take place after the purchase of the product by customers and are devoted to supporting customers in the use and disposal of goods that could make to continual relationship among clients and increase significantly to customer satisfaction [2]. The multivariate findings appear that house business is related with a high up proportion in online sales, which support the sight of house business as an online business [3]. Online business sales in the property sector, especially selling canopy roofs, have developed quite well.

Developing a marketable product based on exclusive technology is the primary key to success in many companies, but it still has substantial challenge. The specific characteristics of exclusive technolog, i.e. their nature as breakthrough technologies and their generality - which can be considered as suitable predictors of new product introduction (NPI). Specifically, we study if and how these characteristics affect the likelihood of NPI [4]. This research suggests landscape product analysis to determine product area (i.e., potential technological opportunities) in several domains that can be entered by companies based on capabilities of technology contained on their existing products [5]. When making products, companies should consider their design specifications and select the manufacturing technology that best suits them in terms of product quality, time, and cost of production [6]. Augmented Reality application about medicinal plants can display 3D objects of these medicinal plants by applying Augmented Reality technology [7]. Marker-less Virtual Reality possible for every object or entire room can be used as an object. Marker-less in Virtual Reality is a technology that is

more sophisticated than Virtual Reality or Virtual Reality that uses markers. Without a marker, the user can easily use a room without being bound to the markers that have been made on the application [8].

Augmented Reality is an interactive design area that is developing rapidly that possible to have visual content that is seamlessly integrated with the landscape of the world [9]. Augmented Reality is an interactive technology that can help users interact easily with the system [10]. Augmented Reality (AR) has developed from a research project to a significant application covering variety areas, such as entertainment, health, business, tourism, and educations [11]. Augmented Reality (AR) is nowadays a widespread technology, and it can enter and fill digital and virtual information into the real world [12]. Even though AR is popular, entrepreneurs in the property sector, especially those selling canopy roofs, do not take advantage of this technology.

Based on the issues identified, the aim of the research is to introduce the product "Canopy Roof" look interactively based on Augmented Reality technology for promotion to consumers. The development of this application is expected to provide a more detailed description of the product. Another benefit that can be felt by the seller is the more attractive consumers are to buy the product. This Augmented Reality technology adoption will make product promotion that usually only uses 2-dimensional (2D) brochures or pamphlets become more accurate, attract attention and appear different. This is because when using Augmented Reality, 3D objects will appear above the 2D marker image on the brochure displayed on the web. By utilizing Augmented Reality's technology, these sellers do not need to create markets or miniature products commonly used to provide examples to consumers. It is because it has been replaced by product models are displayed virtually using Augmented Reality technology. So that sellers can save expenses.

2. RELATED WORK

This section will discuss the review of Augmented Reality as a promotional medium in 3D models and further explore of mobile applications.

2.1. Promotion

Augmented Reality is a media that combines 3D projects with natural environments. Including in the property business such as apartment buildings. Build 3D image visualization in apartment brochures as a more informative and communicative promotional media to help users get information about apartments virtually [13]. Augmented Reality can be used in various needs, one of which is promotional media in the Honda Genio brochure. This study aims to develop a new interactive media to help promotional media at Astra Motor Majenang with Android-based Augmented Reality technology [14]. Brochure promotion media cannot to provide clear and complete information because it is less interactive, so Augmented Reality technology is built on Android-based housing brochures [15]. Then an Augmented Reality application was made for the promotion media of the Puri Melodi Mangkubumi Housing, which can display natural 3D objects using the marker base tracking method. This application provides much information about housing, including company profiles, building specifications, 3D house objects offered, and object rendering. So with the help of this application, the task of the marketing department will become lighter and more accessible in providing information about the housing offered [16]. While the Food And Beverages Business is a business that is currently showing rapid development, but promotional media still use uniforms by using brochures displays only 2D objects and lack of differentiation in promotion, therefore take the initiative to design and make the application of Augmented Reality that can make it easier buyers and increase the power consumption of tastes to see the visual form of the menu and as an interactive promotional media using Android-based Augmented Reality technology tailored to their needs [17]. In the electronics field, The use of Augmented Reality technology as a support for mobile phone sales media will certainly provide innovation in the field of marketing or marketing by its interactivity [18]. Based on the research above, it can be concluded that Augmented Reality is very effectively used as a promotion media.

2.2. Augmented Reality

Augmented Reality (AR) interfaces have been studied extensively over the last few decades, with a growing number of user-based experiments. Since the early 1960's, more sophisticated and portable hardware has become available, with registration accuracy, graphics quality, and device size primarily aimed at satisfactory levels, which has led to rapid growth in the adoption of AR technology [19]. Results show that immersive new brand experiences enabled by AR positively influence consumer responses. These findings suggest that practitioners should consider combining AR marketing tools with existing marketing approaches to facilitate shared social experience (i.e., unpaid brand endorsement) and increase purchase intentions. Doing so could help marketing campaigns stand out, particularly during competitive holiday marketing periods [20].

3. METHOD

The flow of the research method used in this research consists of several stages, data collection, needs analysis, multimedia product design, and evaluation. The step of multimedia product design using System

modeling of the Luther method. Luther's method consists of concept, design, material collection, making, testing, and distribution. Luther's method is considered the most suitable for AR-based research because this research develops interactive digital product promotions that can attract consumer interest. The methodology used can be seen in Figure 1.

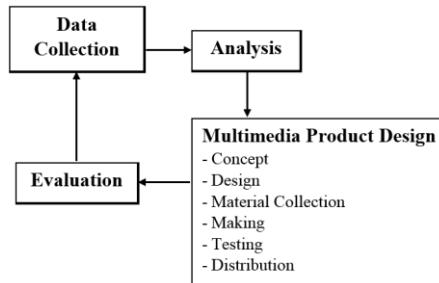


Figure 1. Research Methods

3.1. Data Collection

This data collection collects data, materials, and what information will support the inside making of this application.

1. Literature study

A literature study is carried out to support the process research, and literature study is carried out from several references such as the web, journals, and books relevant to this research. To read and study studies or research theory to add a reference to this research.

2. Observation

Observations were made by interview and questionnaire to find out what the prospect is concerned about in order to can be drawn a problem and its solution.

3.2. Needs Analysis

At this stage, the system developer understands software expected by users and limitations of the software. In this stage, the author uses the device to solve problems faced by users. Needs analysis in making this application includes the data that has been collected, then the system is carried out as well as what specifications the system must have to make it.

3.3. Product Design

1. The concept, at this stage targets, will be determined users, the purpose of the application to be built, along specifications to be made.
2. Planning, at this planning stage, is determined program specifications, appearance, and all other materials for the program.
3. Materials collection, at this stage of data collection, is to collect all data, information, and objects to design and build applications and collect other materials as needed application to be made.
4. Making, at this stage of making all objects and multimedia materials that the application will need made.
5. Testing, at this testing stage, DOing testing on the application by running that program done by makers and teammates and can see.
6. Distribution, the distribution stage will be carried out if the program created has met the concerns of the candidate buyers, and the appropriate target that has been determined at the concept stage, and the application is fit for use by a user.

3.4. Evaluation

The evaluation, stage is carried out after all the manufacturing flow application is successful. At this stage, the author can get conclusions and develop ideas.

4. RESULTS AND DISCUSSION

This application was implemented to canopy roof design in 3D with various types of materials, namely, hollow material with a textured glass roof, 201 stainless material, hollow frame, and a polycarbonate roof, frame with type 304 stainless material. The testing system uses the BlackBox method.

4.1. Business Process Systems

1. Canopy design catalogs are provided to prospective buyers.
2. Prospective buyers choose a canopy design.
3. The design selected by the prospective buyer will be scanned on markers contained in brochures, and markers that are detected will display the selected 3D model prospective buyers.
4. Prospective buyers can see the selected canopy design with 3D model.
5. Feels satisfied and fits the model desired, then the buyer will ask for information furthermore.

4.2. Use Case Diagram

The use case diagram illustrates its functions in the system. This diagram focuses more on the system features from an outside point of view, which is in terms of application user, can be appear in Figure 2.

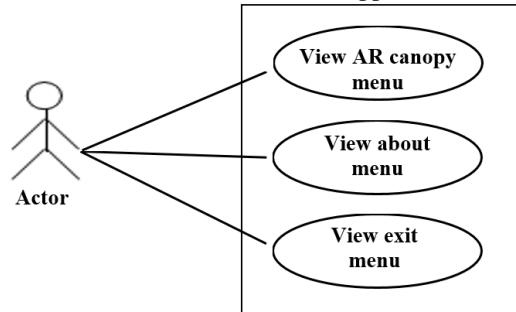


Figure 2. Use case Diagram

Figure 2 illustrates the features that can be accessed by the user. User can access all menus contained in this application, namely, the AR Canopy menu, and about.

4.3. Flowchart Diagram

It serves to explain the flow of the application, the process of starting until the marker detects the object. Flow chart the diagram that is formed. Can be seen in Figure 3.

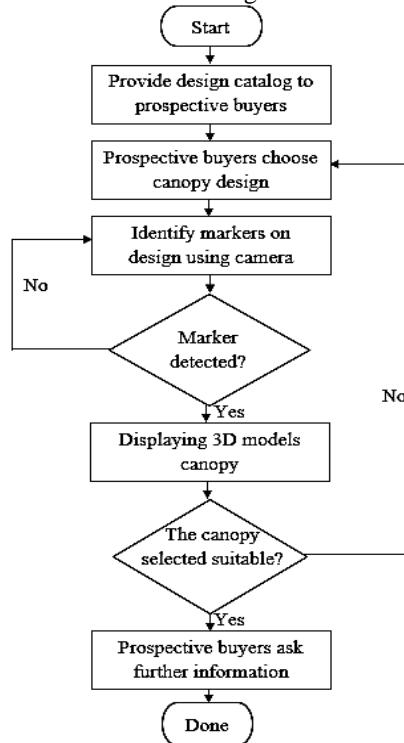


Figure 3. Flowchart Diagram

4.4. Activity Diagram

This diagram describes user activity upon login into the AR catalog menu. Users can log in to this system by pressing the AR menu button found in the main menu, which as shown in Figure 4.

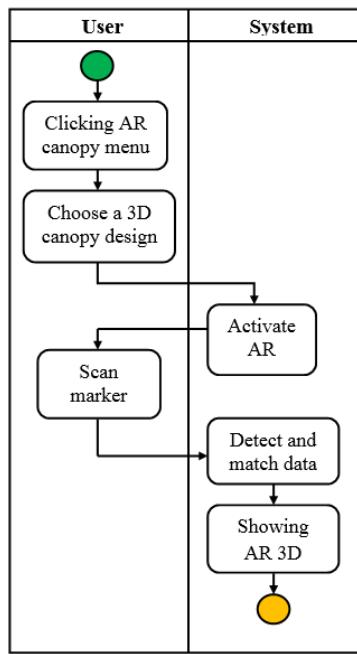


Figure 4. Activity Diagram

4.5. Marker

This research uses Photoshop software to make the desired image file. The limit of the size of this marker to be made is 25px x 25px, which is the size of the box marker made is an image that has a color black and white only, while images are made size 900px x 600px contains design images, can be seen in Figure 5.

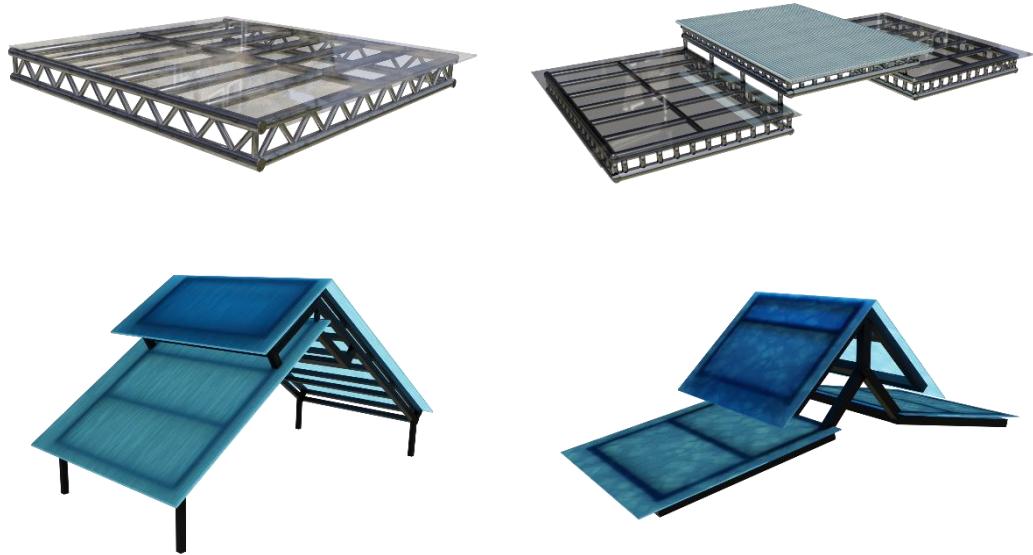


Figure 5. Marker

4.6. Implementation

1. Main Menu Page.

At the beginning of running the Augmented Reality application user can see the main menu page, as shown in Figure 6.

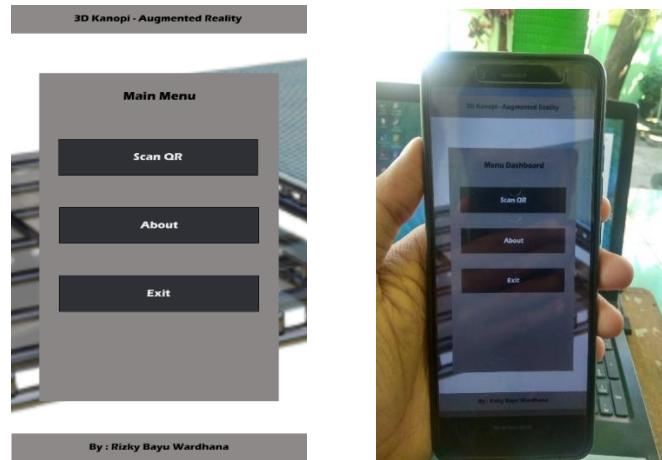


Figure 6. Main Menu

Figure 6 is a display containing the main menu regarding the features contained in the application, name, Scan QR, About, and Exit.

2. About display.

About display contained in the application can be seen in Figure 7.

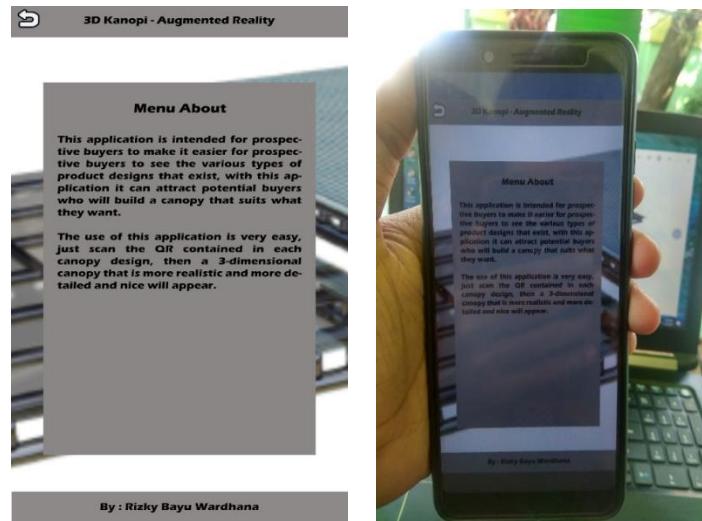


Figure 7. About

Figure 7 is a display containing the about menu regarding the explanation of the application and how to use its application.

3. AR Display.

In this view, the user can see the canopy design in 3D with various types of materials. The ingredients are the first is a hollow frame and a roof made of material textured glass. Which can be seen in Figure 8.



Figure 8. Frame Material Hollow and Textured Glass Roof

Figure 8 shows the canopy design with a frame made of hollow material with a textured glass roof thick one. In addition to hollow materials and textured glass, a frame with type 201 stainless material. Which can be seen in Figure 9.



Figure 9. 201 Stainless Material

Figure 9 shows the canopy design with a frame which is made of stainless 201, although classified as stainless the bottom version, however, this type can help withstand corrosion up to many years, and has its mica roof thick, mica material is very safe in the event of an impact of foreign objects. In addition to 201 stainless material, a hollow frame and a polycarbonate roof. Which can be seen in Figure 10.

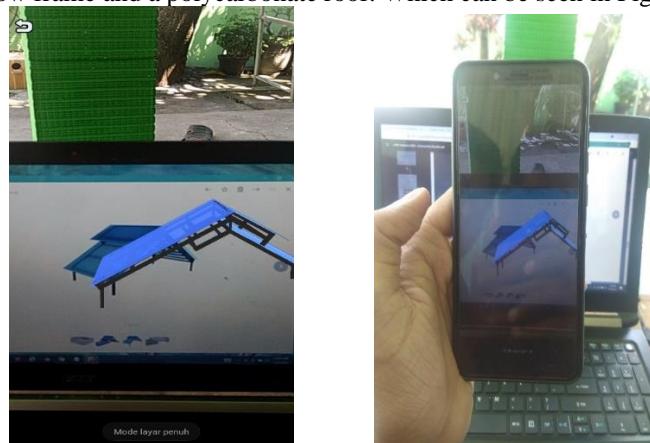


Figure 10. Hollow Material Frame and Polycarbonate Roof

Figure 10 shows the canopy design with a hollow frame and roof made of polycarbonate. Polycarbonate is material from plastic, so it is safe if only for home design minimalism. In addition to the hollow frame and roof made of polycarbonate, there is also a frame with type 304 stainless material. Which can be seen in Figure 11.

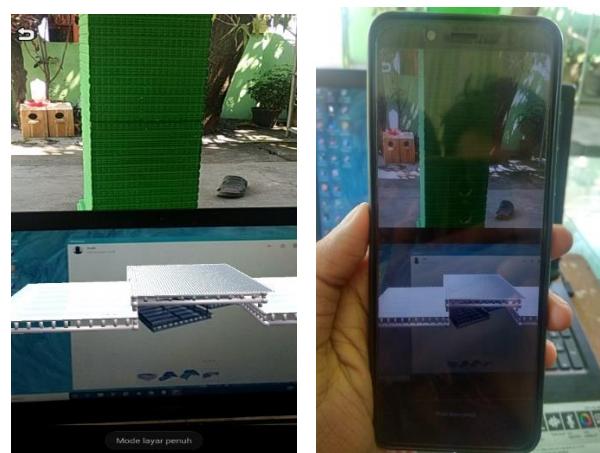


Figure 11. 304 Stainless Material

Figure 11 shows that the canopy design has luxury with a frame made from stainless 304. Stainless type 304 has a resistance of corrosion that is better than stainless type 201. This design has a roof with a blend of the mica material thick and polycarbonate.

4.7. Testing

The advantages of using the Blackbox Testing methods are that the examiner did not need to know a specific programming language. Testing is done from user's point of view, and it helps to express ambiguity or inconsistency in requirements specifications. BlackBox Testing is carried out based on application details such as the application's appearance, the functions that exist in the application, and the suitability of the function flow with the business processes desired by the customer. Black-box testing is more testing to the outer appearance (Interface) of an application to be easy to use by users. Stages testing all menus have gone well, and each menu shows a good performance. As shown in Table 1.

Table 1. Blackbox Testing

Number	Pages	Process	Result	Status	Reference
1	Main Menu's Page	Marker detected.	The application displays 3D objects from database "AR Canopy".	OK	Figure 12
2	Main Menu's Page	Push-button "Scan AR".	The application headed scanner page 3D object "Scan AR".	OK	Figure 13
4	Main Menu's Page	Push-button "About".	The application headed the "About Application".	OK	Figure 14
6	Scanner/ AR's Page	Push-button "Back".	The application displays main menu page.	OK	Figure 15

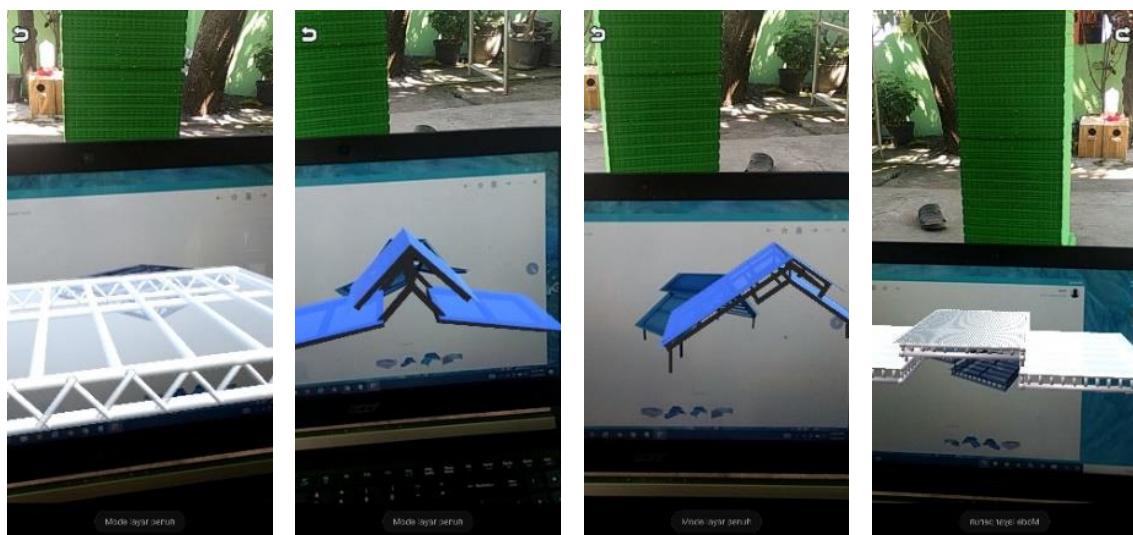


Figure 12. Results of Marker Detected

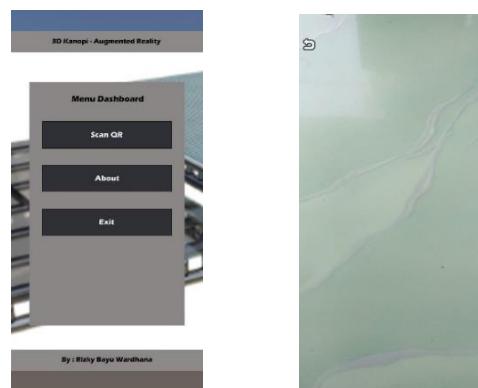


Figure 13. Results of Push Button "Scan AR"

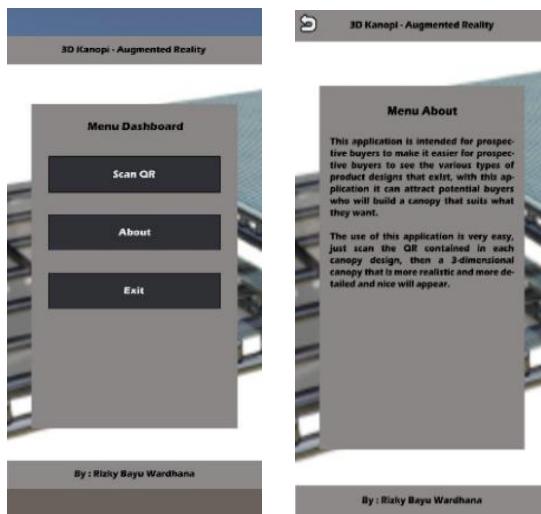


Figure 14. Results of Push Button "About"

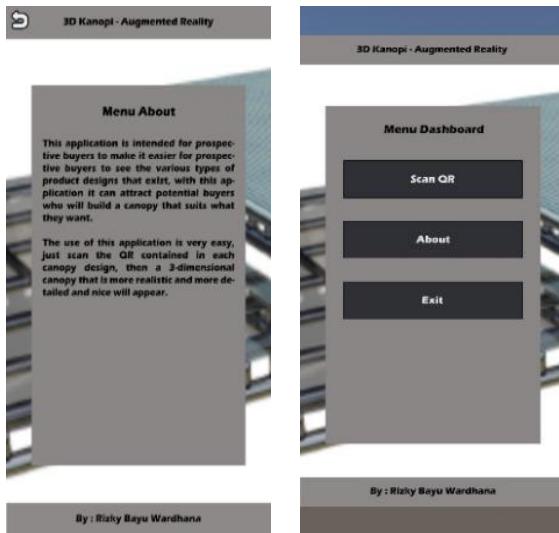


Figure 15. Results of Push button "Back"

5. CONCLUSION

Based on the research results on the "Interactive Digital Catalog for Canopy Workshop using Augmented Reality" using the Luther method, it shows that the marker detection results use the Photoshop application. The markers that have been created are entered in the database so that they are stored online. For the creation of 3D objects using the Blender 3D application and at the testing stage using BlackBox, the results of the program functionality are running well.

6. REFERENCES

- [1] X. Guo, S. Zheng, D. Geltner, and H. Liu, "A new approach for constructing home price indices: The pseudo repeat sales model and its application in China," *J. Hous. Econ.*, vol. 25, pp. 20–38, 2014, DOI: 10.1016/j.jhe.2014.01.005.
- [2] S. Murali, S. Pugazhendhi, and C. Muralidharan, "Modelling and Investigating the relationship of after-sales service quality with customer satisfaction, retention, and loyalty - A case study of home appliances business," *J. Retail. Consum. Serv.*, vol. 30, pp. 67–83, 2016, DOI: 10.1016/j.jretconser.2016.01.001.
- [3] D. Reuschke and C. Mason, "The engagement of home-based businesses in the digital economy," *Futures*, no. March, p. 102542, 2020, DOI: 10.1016/j.futures.2020.102542.
- [4] L. Ardito, H. Ernst, and A. Messeni Petruzzelli, "The interplay between technology characteristics, R&D internationalization, and new product introduction: Empirical evidence from the energy conservation sector," *Technovation*, vol. 96–97, no. October 2017, p. 102144, 2020, DOI: 10.1016/j.technovation.2020.102144.
- [5] C. Lee, D. Jeon, J. M. Ahn, and O. Kwon, "Navigating a product landscape for technology opportunity analysis: A word2vec approach using an integrated patent-product database," *Technovation*, vol. 96–97, no. March, p. 102140, 2020, DOI: 10.1016/j.technovation.2020.102140.
- [6] M. Bertolini, G. Esposito, and G. Romagnoli, "A TOPSIS-based approach for the best match between manufacturing

technologies and product specifications,” *Expert Syst. Appl.*, vol. 159, p. 113610, 2020, DOI: 10.1016/j.eswa.2020.113610.

- [7] R. Dijaya, N. M. Maulidah, and D. Abdullah, “Flashcard computer-generated imagery medicinal plant for orthopedagogic education,” *MATEC Web Conf.*, vol. 197, pp. 1–6, 2018, DOI: 10.1051/matecconf/201819715005.
- [8] R. Dijaya, A. N. Fadilah, E. A. Suprayitno, M. Suryawinata, and C. Taurusta, “Virtual reality markerless based on 3D for the representation of the heart and circulatory system,” *J. Adv. Res. Dyn. Control Syst.*, vol. 10, no. 6 Special Issue, pp. 1721–1725, 2018.
- [9] D. Youm, S. Seo, and J. Kim, “Design and development methodologies of Kkongalmon, a location-based Augmented Reality game using mobile geographic information,” vol. 2, pp. 1–11, 2019.
- [10] J. Chahyana and V. Yesmaya, “Virtual Pet Simulator Game Using Augmented Reality on Android Platform,” *J. Phys. Conf. Ser.*, vol. 1566, no. 1, 2020, DOI: 10.1088/1742-6596/1566/1/012088.
- [11] T. H. Laine, “Mobile educational Augmented Reality games: A systematic literature review and two case studies,” *Computers*, vol. 7, no. 1, 2018, DOI: 10.3390/computers7010019.
- [12] W. Luo, “Building An AR Treasure Hunt Game Using Indoor Localization Technology.” 2018, [Online]. Available: <https://aaltodoc.aalto.fi/handle/123456789/34367>.
- [13] F. Lenurra and D. Pratiwi, “Penerapan Teknologi Augmented Reality Sebagai Media Promosi Apartemen Dengan Metode Markerless,” *Semin. Nas. Cendikiawan*, vol. 3, no. October, pp. 77–83, 2017, [Online]. Available: <https://www.trijurnal.lemlit.trisakti.ac.id/semnas/article/view/2167/1849>.
- [14] Y. Cahyaningsih, “Teknologi Augmented Reality pada Promosi Berbasis Android,” *J. Comput. Sci. Eng.*, vol. 1, no. 2, pp. 90–115, 2020, DOI: 10.36596/jcse.v1i2.60.
- [15] L. Leonardi, Adrian; Hermawan, “Penerapan Augmented Reality Pada Brosur Interior Berbasis Multi Markerless Pada Android,” *Semin. Nas. Teknol. Inf. dan Komun. 2019*, vol. 2019, no. Sentika, pp. 13–14, 2019.
- [16] H. Sutisna and A. B. Hikmah, “Jurnal teknik informatika,” *Implementasi Teknol. Augment. Real. Pada Media Promosi Perumah. Puri Melodi Mangkubumi Pt. Mustika Putri Jaya Di Kota Tasikmalaya*, vol. 5, no. 2, pp. 22–30, 2017.
- [17] R. R. Wijayanti, “Implementasi Augmented Reality Sebagai Media Promosi Interaktif Untuk Katalog Food and Beverage Pada Hokcafe,” *JIKA (Jurnal Inform.*, vol. 2, no. 2, pp. 73–83, 2019, DOI: 10.31000/v2i2.1519.
- [18] A. Sanjaya, M. Kom, A. B. Setiawan, and M. Kom, “ARTIKEL IMPLEMENTASI AUGMENTED REALITY SEBAGAI MEDIA PEMASARAN BERBASIS ANDROID PADA BROSUR HANDPHONE Oleh : RIYANS WAHYU EKO AGUNG SETYAWAN Dibimbing oleh : SURAT PERNYATAAN ARTIKEL SKRIPSI TAHUN 2017,” 2018.
- [19] A. Dey, M. Billinghurst, R. W. Lindeman, and J. E. Swan, “A systematic review of 10 Years of Augmented Reality usability studies: 2005 to 2014,” *Front. Robot. AI*, vol. 5, no. APR, 2018, DOI: 10.3389/frobt.2018.00037.
- [20] E. (Christine) Sung, “The effects of Augmented Reality mobile app advertising: Viral marketing via shared social experience,” *J. Bus. Res.*, vol. 122, no. August 2020, pp. 75–87, 2021, DOI: 10.1016/j.jbusres.2020.08.034.