# Implementation of the MDLC Method in the Development of Android-Based Augmented Reality for Traditional House Recognition

[1,3,*]Andri Nofiar. Am, [2]Antoni Pribadi, [3]Nurkholis, [4]M.Alkadri Perdana, [2]Muhammad Rukhshah

| | |
|---|---|
| 1 | D4 Digital Business, Bengkalis State Polytechnic, Indonesia |
| 2 | D3 Informatics Engineering, Kampar Polytechnic, Indonesia |
| 3 | D4 Logistics Engineering Technology, Kampar Polytechnic, Indonesia |
| 4 | D4 International Business Administration, Bengkalis State Polytechnic, Indonesia |
| * | Corresponding Author: andrinofiar90@gmail.com |

**Abstract:** Indonesia has a rich cultural diversity, one of which is traditional houses (rumah adat). However, learning about traditional houses is still largely based on textbooks. With the advancement of information and communication technology, teaching and learning processes can now be supported by interactive learning media. One of the emerging technologies that is widely used in education is Augmented Reality (AR). AR can display 3D animations from all angles, helping to increase public interest in learning more about Indonesia's diverse traditional houses. The purpose of this research is to develop an Android-based Augmented Reality application for introducing traditional houses in Indonesia as a learning medium. This application aims to provide users convenience in learning, and seeing various types of houses there. The method used is the Multimedia Development Life Cycle (MDLC) which consists of a concept, design, collection of materials, assembly process, testing process, and distribution process. The application uses Unity, Blender, and Vuforia SDK. The results of this study will show that the Android-based Augmented Reality (AR) marker application, specifically the traditional houses in Indonesia. 3D assets of traditional houses can be adjusted flexibly, for example, rotated by 360 degrees, accompanied by descriptive information on each traditional house, so that information can be received flexibly and real-like.

## 1. Introduction

Indonesia has a very rich cultural diversity (Fitri Lintang & Ulfatun Najicha, 2022). Various languages and ethnic groups spread from Sabang to Merauke making Indonesia have a very large collection of traditional houses (Abdulghani & Sati, 2020). A traditional house is a building used as a residence by a particular ethnic group. Traditional houses have a very important meaning in the perspective of history, heritage, and community progress in a civilization. The diversity of traditional houses in Indonesia is also very wide, each with distinctive and unique characteristics that distinguish them (Dp Silitonga et al., 2019).

The existence of traditional houses in the development of housing and settlements today tends to be increasingly neglected. This phenomenon not only occurs in urban areas but also in rural areas, where traditional houses are abandoned or no longer used (M. Amin & Hadi, 2022). With the advancement of information and communication technology, learning activities are now easier with the help of technology-based learning media.

Augmented reality is an emerging technology that is increasingly being adopted as a learning tool (Susanto et al., 2022). This technology can serve as a medium to introduce traditional houses by presenting dynamic 3D visualizations from various points of view, to foster greater public interest in understanding the rich diversity of these architectural heritage sites (Wahidin, 2019). As the integration of virtual and physical worlds

supported by computer-generated elements, Augmented Reality (AR) offers a new and interactive way for users to interact with digital content. By overlaying virtual objects onto real environments, AR creates an immersive experience that makes digital interactions feel very real (Nazilah & Ramdhan, 2021). Considering the points that have been discussed, Augmented Reality technology has significant potential in facilitating the introduction of traditional houses in Indonesia.

Research in the field of Augmented Reality can improve skills in the educational process (M. K. Saleh Md Asari., et.al.2024).), and AR continues to be developed with various methods such as CogInfoCom and cVR Conference Insights such as research (B.Berki and A.Sudar. 2024), in addition to education, AR also helps in the process of repairing washing machines such as (research M.Lorenz, et.al. 2025) and Manufacturing Environments as a whole (A.A.A.E.M.A.Khafaga., et.al. 2024), and the development of AR to Edge Computing which is essential today (Z.Qu. 2024).

## 2. Literature Review

### 2.1 Introduction to Virtual Reality (VR)

To support the research conducted, researchers take several examples of research from journals that can be used as a reference and foundation for solving problems. The following are some previous studies that have been done:

Research conducted by (Prayogha & Pratama, 2020) raised the problem of inadequate solar system learning tools in science subjects for elementary school students. Updates are needed, especially on visualizations that must be adapted to the current curriculum. This research aims to develop planetary virtual reality (VR) applications as solar system learning media. The method used is the Luther method. As a result, the planetary VR application was successfully created and runs optimally on Android devices of at least version 4.4 (KitKat) with 2 GB RAM and a Gyroscope sensor.

Research conducted by (Rachman et al., 2020) discusses the development of applications that use 3D objects and virtual reality (VR) technology, with the gyroscope feature on smartphones as a control and interaction system. The goal is to utilize 3D object visualization and gyroscope for interaction in the application. The object used is the building of PT.ADD.Co, which is intended to introduce the company environment to potential investors or new employees. The method used is Luther's multimedia development method. The results showed that VR applications were successfully designed with 3D building objects and gyroscope features used as navigation.

Research conducted by (Dedi Jubaedi et al., 2020) discusses making interesting applications to provide new experiences for museum visitors. The goal is to develop a virtual tour application for the Banten State Museum. The method used is Luther-Sutopo. As a result, the virtual tour application was successfully created as a medium of information and promotion for the Banten State Museum.

Research conducted by (Khairunisa et al., 2022) discusses the problem of the job market at the State Polytechnic which is still done manually. The goal is to develop a virtual reality-based virtual job market information system, with application design using the CodeIgniter framework. The result of this research is the creation of an online job market application that connects companies with job seekers.

Research conducted by (Stefani Yarra Canista, and Dedy Panji Agustino, 2023) discusses the problem of access to distance and time for those who want to see the current condition of the Sacred Heart of Jesus Palasari Church, Bali, which is often renovated. The goal is to develop a website-based virtual tour application using the CodeIgniter framework. As a result, the website-based virtual tour application was successfully created as expected.

Research conducted by (Nurhaliza & Husufa, 2022) discusses the problem of booking a tour package for Pulau Seribu which is still manual, causing the recording of visitor

data, reservations, payments, and reviews to be less than optimal. The goal is to develop a website-based online booking application using the CodeIgniter framework. As a result, the Thousand Island tour package booking application was successfully made.

Research conducted by (Hidayat et al., 2023) discusses the lack of effective delivery of Hajj *manasik* information at the Medan City Hajj Dormitory which is still done manually. The goal is to design an Android-based virtual tour application with virtual joystick features, using UML design. As a result, the Hajj *Manasik* simulation application with a virtual joystick was successfully made.

Research conducted by (Mardainis et al., 2020) discusses the lack of effectiveness of the socialization of new student admissions (PPMB) at STMIK Amik Riau which still uses brochures, banners, and billboards. The goal is to develop promotional media with virtual tours based on 360-degree photography technology and image stitching techniques, using UML design. As a result, a virtual tour was successfully created as promotional media for STMIK Amik Riau.

Research conducted by (Rasim et al., 2022) the problem of conventional visits to the University of Education Indonesia (UPI), where visitors still depend on direct guidance. The goal is to develop a virtual tour system using information and communication technology to facilitate visits to UPI. As a result, a virtual tour system was successfully created which made it easier for the general public to visit UPI.

## 3. Conceptual Framework

### 3.1 Luther Method

The method used in making the Virtual Tour of the SIM Making Flow (Driving License) at Satlantas Polres Kampar is the Luther method.

The stages in the Luther method to complete the research to be carried out are as follows:

*1. Concept*

The concept that will be used in the augmented reality marker introduction to traditional houses in Indonesia based on Android is in the form of an application that contains information about the building assets of traditional houses in Indonesia.

*2. Design*

The design that will be used in making augmented reality markers for the introduction of traditional houses in Indonesia based on Android is a flowchart that will be used as a reference in making this application.

*3. Material Collecting*

At the material collecting stage, data collection is carried out by making direct observations to the Riau Province Tourism Office and the Pekanbaru City Culture and Tourism Office to obtain data in the form of information or photos of traditional houses in Indonesia as a reference basis for making traditional houses. Making augmented reality markers for the introduction of traditional houses in Indonesia is made using Blender 2.80.0 software and user interface (UI) design using the Figma application.
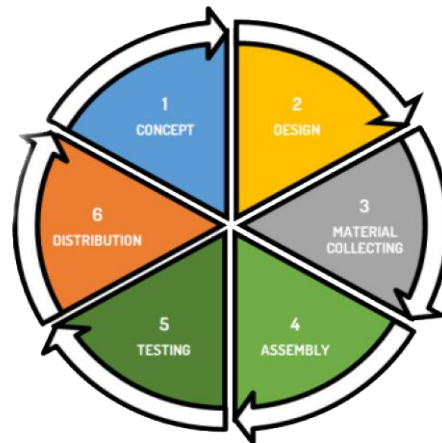
**Figure 1.** Luther Method

*4.    Assembly*
At the assembly stage or making an augmented reality marker application for the introduction of traditional houses in Indonesia based on Android, this can begin after all the images of traditional houses in Indonesia have been successfully made in the form of markers, then they will be inserted into the unity application and Vuforia SDK.

*5.    Testing*
At this testing stage, a trial process will be carried out on the augmented reality marker application for the introduction of traditional houses in Indonesia based on Android that has been made. So that later it will be able to see errors or deficiencies in the results of the augmented reality design that has been made.
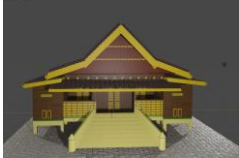
*6.    Distribution*
Augmented reality marker introduction to traditional houses in Indonesia based on Android can be run on Unity software and implementation is made with the help of Vuforia Software Development Kit (SDK) which can be accessed using an Android smartphone.
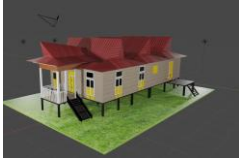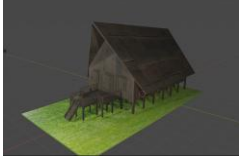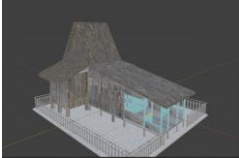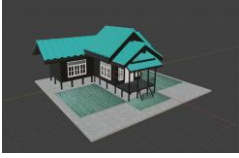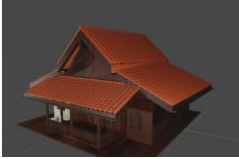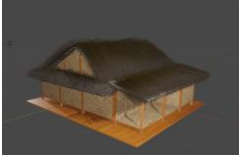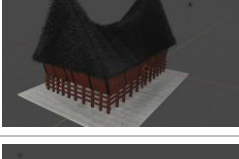
## 4.    Technical Specifications

*4.1  3D Object and Textures*
    The following are the results of making texture assets in the Android-based augmented reality marker application for the introduction of traditional houses in Indonesia, which can be seen in Table 1.
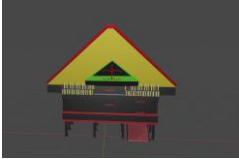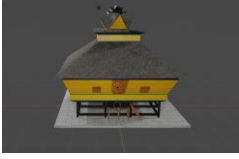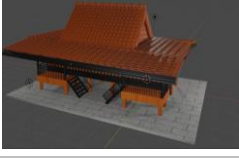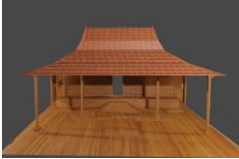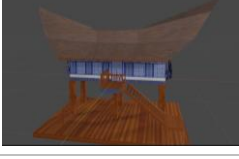
Table 1. 3D Objects and Textures

| Code | Object Name and Province | Design 3D drawing |
|:---:|:---|:---:|
| R1 | Riau |  |

| Code | Object Name and Province | Design 3D drawing |
|------|--------------------------|-------------------|
| R2 | Riau Islands |  |
| R3 | Jambi |  |
| R4 | Lampung |  |
| R5 | Bangka Belitung |  |
| R6 | Central Kalimantan |  |
| R7 | South Kalimantan |  |
| R8 | Kalimantan North |  |
| R9 | Jakarta |  |
| R10 | Banten |  |

| Code | Object Name and Province | Design 3D drawing |
|---|---|---|
| R11 | West Java |  |
| R12 | West Nusa Tenggara |  |
| R13 | North Sulawesi |  |
| R14 | West Sulawesi |  |
| R15 | Central Sulawesi |  |
| R16 | Maluku |  |
| R17 | West Papua |  |
| R18 | Papua |  |
| R19 | Central Papua |  |

| Code | Object Name and Province | Design<br>3D drawing |
|:---:|:---|:---:|
| R20 | Nanggroe Aceh Darussalam |  |
| R21 | North Sumatra |  |
| R22 | South Sumatra |  |
| R23 | West Sumatra |  |
| R24 | Bengkulu |  |
| R25 | East Kalimantan |  |
| R26 | West Kalimantan |  |
| R27 | Central Java |  |
| R28 | East Java |  |

| Code | Object Name and Province | Design 3D drawing |
|------|--------------------------|-------------------|
| R29 | Special Region of Yogyakarta |  |
| R30 | Bali |  |
| R31 | East Nusa Tenggara |  |
| R32 | Gorontalo |  |
| R33 | Southeast Sulawesi |  |
| R34 | South Sulawesi |  |
| R35 | North Maluku |  |
| R36 | South Papua |  |
| R37 | Papua Mountains |  |

| Code | Object Name and Province | Design 3D drawing |
|------|--------------------------|-------------------|
| R38 | Southwest Papua |  |

*4.2 Graphical User Interface*

The following are the results of the process of creating a user interface (UI) on the application of augmented reality marker introduction to traditional houses in Indonesia based on Android is made using the Figma application:

a) Main page display

The main page display used in the application of augmented reality marker introduction to traditional houses in Indonesia based on Android can be seen in Figure 2.



**Figure 2.** Main menu



**Figure 3.** Information menu

b) Information menu page display
The display of the information menu page used in the augmented reality marker application for the introduction of traditional houses in Indonesia based on Android can be seen in Figure 3.

c) Exit menu page display
Moreover, the display of the exit menu page used in the application of augmented reality marker introduction to traditional houses in Indonesia based on Android can be seen in Figure 4.



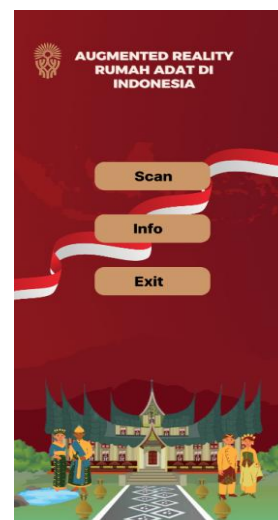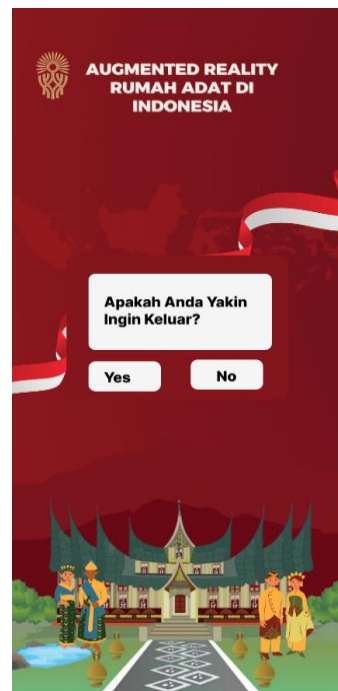**Figure 4.** Exit menu

## 5. Conclusion

In the design of this Android-based augmented reality marker application for the introduction of traditional houses in Indonesia, it can be concluded that the application creation process has been successfully carried out using Blender 2.80.0, Unity 3.4.1, and Vuforia 10-15-4 SDK software. The augmented reality application developed has also been successfully operated on Android-based devices and can be used to help the process of introducing traditional houses in Indonesia. This application is expected to be an interactive and interesting learning media and provide a more real visual experience for users to recognize the cultural diversity of traditional houses in Indonesia.

**Author contributions:** The authors are responsible for building Conceptualization, Methodology, analysis, investigation, data curation, writing—original draft preparation, writing—review and editing, visualization, supervision of project administration, funding acquisition, and have read and agreed to the published version of the manuscript.

# References

[1] Dedi Jubaedi, A., Dwiyatno, S., & Sulistiyono. (2020). Implementasi Teknologi Virtual Tour Pada Museum. JSiI (Jurnal Sistem Informasi), 7(2), 70–77. https://doi.org/10.30656/jsii.v7i2.2469

[2] Dimas Sulistiyo, R., & Shihab, M. R. (2023). Transformasi Digital dalam Pelayanan Surat Izin Mengemudi (SIM): Studi Kasus Korlantas Polri. Technomedia Journal, 8(2SP), 189–204. https://doi.org/10.33050/tmj.v8i2sp.2064

[3] Hidayat, M. A., Ikhwan, A., & Alda, M. (2023). Aplikasi Virtual Tour Manasik Haji Pada Asrama Haji Menggunakan Metode MDLC Berbasis Android. Resolusi: Rekayasa Teknik …, 3(5), 364–371.

[4] Hidayattullah, T. (2015). Simulasi Prosedur Pembuatan Surat Izin Mengemudi (Sim) C Berbasis Virtual Reality Dengan Teknik Collision Detection Dan Biped-Character Rigging (Studi Kasus: Satpas …. Repository.Uinjkt.Ac.Id.

[5] Iqbal, M. M., Firnando, S., Gego, B. E., Ardana, G. I., & Fauzi, A. M. (2020). Pandangan Masyarakat Atas Pembuatan SIM di Surabaya. Jurnal Penelitian Administrasi Publik, 6(2), 185–201.

[6] Khairunisa, Y., Nurhasanah, Y., & Verlaili, R. (2022). Virtual Job Fair Information System Design Based on Augmented Reality/Virtual Reality. Sinkron, 7(4), 2449–2461. https://doi.org/10.33395/sinkron.v7i4.11795

[7] Mardainis, M., Arifin, M., Rahmaddeni, R., & Efendi, Y. (2020). Virtual Tour Interaktif 360 Derajat Menggunakan Teknik Image Stitching Sebagai Media Informasi Kampus STMIK Amik Riau. Digital Zone: Jurnal Teknologi Informasi Dan Komunikasi, 11(2), 209–222. https://doi.org/10.31849/digitalzone.v11i2.4265

[8] ]Nurhaliza, N., & Husufa, N. (2022). Development of Website-Based Thousand Island Tour Package Booking Application Using Waterfall Method. Journal of Information Systems and Informatics, 4(3), 524–537. https://doi.org/10.51519/journalisi.v4i3.279

[9] Prayogha, A. P. D., & Pratama, M. R. (2020). Implementasi Metode Luther untuk Pengembangan Media Pengenalan Tata Surya Berbasis Virtual Reality. BIOS : Jurnal Teknologi Informasi Dan Rekayasa Komputer, 1(1), 1–14. https://doi.org/10.37148/bios.v1i1.3

[10] Rachman, A. N., Khairul Anshary, M. A., & Hakim, I. N. (2020). Pemanfaatan Teknologi Virtual Reality (VR) Pada Aplikasi 3D Bangunan Perusahaan. CESS (Journal of Computer Engineering, System and Science), 5(2), 204. https://doi.org/10.24114/cess.v5i2.18672

[11] Rasim, R., Ardiyanto, T., & Munir, M. (2022). Smart Campus: Tur Virtual pada Kampus Universitas Pendidikan Indonesia Berbasis Virtual Reality dan Kamera 360 Derajat. Information System For Educators And Professionals : Journal of Information System, 6(2), 167. https://doi.org/10.51211/isbi.v6i2.1795

[12] Riyadi, S., Nurhaida, I., Mercubuana, U., Korespondensi, P., & Buana, U. M. (2022). Aplikasi Sistem Virtual Tour E-panorama 360 Derajat Degree System Application Based on Android for Introduction Mercu Buana Campus. 9(1), 17–24. https://doi.org/10.25126/jtiik.202294209

[13] Satria Santi, A. A. (2023). Strategi Polisi Lalu Lintas Polres Sumbawa Dalam Membangun Citra Melalui Program Millenial Road Safety Festival Program Studi Ilmu Komunikasi , Universitas Teknologi Sumbawa Kepolisian menurut Undang- undang RI No . 2 Tahun 2002 tentang Kepolisian Negara. 05, 67–79.

[14] Stefani Yarra Canista, Dedy Panji Agustino, I. K. P. S. (2023). Aplikasi Virtual Tour 360 Degree sebagai Media Pengenalan Objek Wisata Rohani Gereja Hati Kudus Yesus Palasari Berbasis Website. 7, 1503–1514.

[15] Tri Wakhyuni, Syakdiah, R. K. (2020). Kualitas Pelayanan Pembuatan Surat Izin Mengemudi (Sim) Online Di Polres Sleman Tri. Populika, 2(5), 255.

[16] M. K. Shaleh Md Asari, N. M. Suaib, M. H. Abd Razak, M. A. Ahmad and N. M. Shaleh, "Empowering Skill-Based Learning with Augmented Reality and Virtual Reality: A Case Study," 2024 IEEE International Symposium on Consumer Technology (ISCT), Kuta, Bali, Indonesia, 2024, pp. 225-229, doi: 10.1109/ISCT62336.2024.10791270.

[17] B. Berki and A. Sudár, "Virtual and Augmented Reality in Education Based on CogInfoCom and cVR Conference Insights," 2024 IEEE 15th International Conference on Cognitive Infocommunications (CogInfoCom), Hachioji, Tokyo, Japan, 2024, pp. 000115-000120, doi: 10.1109/CogInfoCom63007.2024.10894726.

[18] M. Lorenz, M. Okoniewski, A. Own and S. Knopp, "Industrial Augmented Reality – Concept for an AR-AI-Station for Component Recovery from Washing Machines for Circular Economy," 2025 IEEE Conference on Virtual Reality and 3D User Interfaces Abstracts and Workshops (VRW), Saint Malo, France, 2025, pp. 1384-1385, doi: 10.1109/VRW66409.2025.00338.

[19] A. A. A. E. M. A. Khafaga, B. Horan, L. C. Moreira, M. Kauffman, A. -M. Nienaber and M. Mortimer, "Unlocking Human Potential: Psychological Capital's Influence on Augmented Reality Adoption in Manufacturing Environments," 2024 IEEE International Symposium on Mixed and Augmented Reality Adjunct (ISMAR-Adjunct), Bellevue, WA, USA, 2024, pp. 439-442, doi: 10.1109/ISMAR-Adjunct64951.2024.00128.

[20] Z. Qu, "Attention-Safe Augmented Reality System with Edge Computing," 2024 IEEE International Symposium on Mixed and Augmented Reality Adjunct (ISMAR-Adjunct), Bellevue, WA, USA, 2024, pp. 664-665, doi: 10.1109/ISMAR-Adjunct64951.2024.00201.