

# Design of Virtual Reality for Gonggong Building as a Tourism Information

Nur Ramadhani Safitri  
Electrical Engineering Department  
Universitas Riau  
Pekanbaru, Indonesia  
[nur.ramadhani1565@student.unri.ac.id](mailto:nur.ramadhani1565@student.unri.ac.id)

Rahmat Rizal Andhi\*  
Electrical Engineering Department  
Universitas Riau  
Pekanbaru, Indonesia  
[rahmat.rizal@lecturer.unri.ac.id](mailto:rahmat.rizal@lecturer.unri.ac.id)

\*Corresponding author: [Rahmat RizalAndhi, rahmat.rizal@lecturer.unri.ac.id](mailto:RahmatRizalAndhi,rahmat.rizal@lecturer.unri.ac.id)

**Abstract**— The rapid development of information media in line with the presence of technology increasingly provides convenience for humans so that information or messages can be conveyed properly, quickly, precisely, and usefully. One of the technological developments that support information media is Virtual Reality (VR). Information Media related to Tanjungpinang City Tourism with the object of research in the form of the Gonggong Building as the Tanjungpinang City Tourism Information Center, which has the problem of stopping the function of the Building as a City Tourism Information Center due to damage. The purpose of this research is to implement Virtual Reality on the Gonggong Building with the output of the VR website of the Gonggong Building and the presentation of Tanjungpinang City tourism information content delivered by the Chatbot Tour Guide. The SDLC method used in this research is Prototype. The research results are a VR website for the Gonggong Building, which contains information related to Tanjungpinang City Tourism, namely Typical Culinary Destinations, Nature Tourism, and Melayu Traditional Clothing of the Riau Islands. The result of testing methods with 25010 obtained excellent results with Grade B on performance GTmetrix in testing the efficiency of the system in getting a response time of 5,8s fully loaded time page. From the reliability test results, a summary is obtained in the form of successful session 25964, failed session 0, successful page 25966, failed pages 0, successful hits 51932, failed hits 0, and other errors 0. These results, if expressed in percentage form, amount to 100%.

**Keywords**— Chatbot Prototype, ISO 25010, Virtual Reality

## I. INTRODUCTION

Indonesia possesses a diverse and captivating wealth of natural and cultural treasures worth visiting. As an archipelago nation, Indonesia is abundant with potential tourist attractions and is renowned for its mesmerizing seas and beaches. Several famous Indonesian cultural treasures recognized worldwide include the angklung musical instrument, Pencak silat martial art, and the Saman dance. The archipelago offers a range of tourist destinations that are always favored by travelers, including family-friendly attractions, natural wonders,

cultural sites, educational spots, and culinary delights. Among various regions in Indonesia, Bali remains the top and favorite destination for tourists when visiting the archipelago. Bali province secured the first position with a percentage of 46.72%, which is significantly higher than other destinations. With a considerable distance, the second position is held by DKI Jakarta province with a percentage of 13.03%, followed by Riau Island province in third place with a percentage of 11.81%, attracting a significant number of foreign tourists. Being ranked third as a holiday destination is an achievement and recognition that should be further improved by the Regional Government of Riau Island and its officials. This achievement also presents an opportunity for the Department of Culture and Tourism of Tanjungpinang City, given its strategic geographical location, as Tanjungpinang, the capital city of Riau Island province, is situated close to two developed countries in the Southeast Asian region, which are potential markets.

The capital of Kepulauan Riau Province, known for its numerous tourist destinations, Tanjungpinang attracts local and international tourists with its beautiful beaches, cultural heritage, traditions, culinary delights, and captivating natural scenery. Tanjungpinang is home to one of the famous tourist attractions for residents, the Gonggong Building. This building is located in the Boenda Tepi Laut area, Tanjungpinang City. The Tanjungpinang City Government constructed the Gonggong Building to represent the distinct characteristics of the city. The name "Gonggong" was derived from the Gonggong sea creature found only in the waters of Tanjungpinang and other areas in the Riau Islands [1]. In addition to showcasing the city's uniqueness, the Gonggong Building serves as the Tourism Information Center for Tanjungpinang, managed by the Department of Culture and Tourism of Tanjungpinang City. However, the optimal function of the Gonggong Building as an icon of Tanjungpinang and a tourism information center has been hindered by several challenges, including damage to the building. Issues like roof leaks during rainy weather have posed problems for the Gonggong Building. Furthermore, the

stickers on the outer glass walls are torn and peeling, clearly indicating the neglect of the building. The ceiling is also deteriorated and damaged due to age. The Gonggong Building cannot be visited as a Tourism Information Center now because the repairs are still ongoing. Therefore, the Tanjungpinang Department of Culture and Tourism has temporarily deactivated the TIC visits to the Gonggong Building.

Virtual Reality (VR) presents an alternative solution due to its interactive message delivery and immersive environment, which can attract users. VR also provides a way to offer an immersive virtual environment of the Gonggong Building to users through Tourism Information Media that is designed to be interactive and communicative without physically visiting the building. This research aims to implement Virtual Reality in the Gonggong Building, creating an immersive VR website and presenting tourism information about Tanjungpinang City. This allows the author to showcase and introduce the culture and tourism of Tanjungpinang through the implementation of Virtual Reality based on the Gonggong Building website. Choosing a website platform enables easy and effective access to the entire VR implementation. By utilizing the ChatBot Tour Guide feature, tourists can obtain interesting information about the culture of Tanjungpinang City. The implementation of crowd simulation and the changing sky from morning, noon, afternoon, to evening aims to provide users or potential tourists with a visually immersive experience, as if they were at the Gonggong Building tourist attraction through the built Virtual Reality website.

In the context of tourism, Virtual Tourism offers a risk-free experience without damaging a tourist destination [2]. Furthermore, Virtual Tourism enables all tourists to witness the attractions of a destination. The concept of a Virtual Reality Tour is a form of tourism activity where tourists can enjoy a tourist attraction without physically visiting it [3]. By utilizing Virtual Reality tourism effectively, such as high-interactivity content, can enhance the interest in visiting a tourist destination [4] [5]. Hudson et al. state that behavioral intentions to visit a destination can generate additional revenue for the tourism industry [6]. This belief stems from the effectiveness of Virtual Reality tourism in marketing tourist destinations [7], indicating a positive acceptance of the Virtual Reality technology being used [8].

## II. METHODOLOGY

The author uses the Prototype method as a software development method in this study. Prototype method that represents all the stages needed to implement Virtual Reality Gonggong building until the distribution stage.

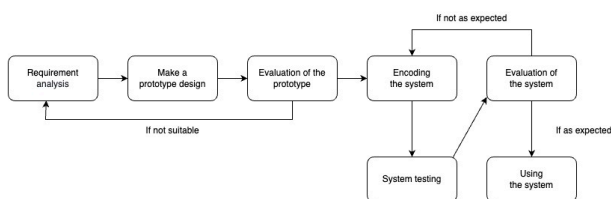


Fig. 1. Prototype Model

The author analyzes system requirements. Requirements analysis serves to decompose the virtualization of the Gonggong Building into components that are evaluated and identified. Analysis of system needs contains information in the form of everything related to building visualization, such as collecting information on what content is presented in VR Gedung Gonggong. Material collection also comes from archives/documentation owned by the Tanjungpinang Culture and Tourism Office [9]. After getting a needs analysis, the author builds a temporary system design to be evaluated later. System design is analyzing the system design to compile the system creation [10]. Virtual Reality technology results from the implementation of visualization media that can explain in absolute terms an object in 3D, which is added with multimedia elements such as images, audio, text, and animation presented as an interactive website. This stage makes a temporary design of the outer and inner pages of the building, the Chatbot UI design, the Chatbot Rule-Based dialog design, etc [11].

TABLE I. PRELIMINARY 3D DESIGN OF SYSTEM REQUIREMENTS

No	Description	Picture
1.	The initial design of the page Gonggong Building	
2.	The initial design of the page Gonggong Building	
3.	The initial design of the page Gonggong Building	
4.	Preliminary design of the area Boenda page	
5.	Preliminary design inside Gonggong Building	
6.	Preliminary design of the 2nd floor Gonggong Building	
7.	Room design meeting room	



Fig. 2. Chatbot Tour Guide Dialog UI Design

Virtual Reality design on the ChatBot feature UI is used to obtain an interactive home page. At this stage, users can choose what options they want to know from the Gonggong Building Virtual Reality website with the help of the ChatBot Tour Guide [12].

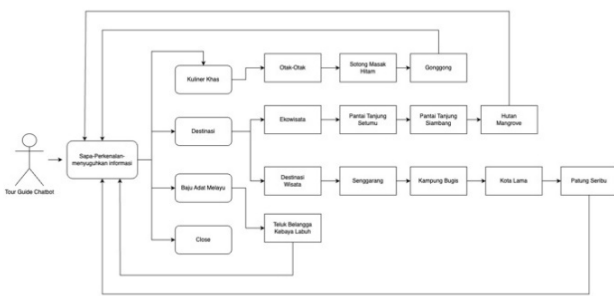


Fig. 3. Design Diagram for Rules-Based Chatbot Tour Guide

The Figure 3 is the information content submitted by the Chatbot Tour Guide feature [13]. The information follows the user's command to choose any information option about Tanjungpinang City Culture. For example, if the user wants to choose typical cuisine, then Chatbot provides this information through images and text containing information about what typical cuisine is in Tanjungpinang. This Chatbot dialog uses Rule-based system rules as a set of if-then. The if-then rule is used to analyze data in a system that has been created and arranged.

- Before starting coding, the collection of design materials is evaluated. If appropriate, the next stage is the creation or coding of the system. The material collection comes from documentation owned by the Tanjungpinang City Culture and Tourism Office. In this case, the author utilizes archives or image data related to Gedung Gonggong as the Tanjungpinang Tourism Information Center.
- The stage of creating or coding the system starts from creating 3D objects or materials needed. Modeled 3D objects include the surrounding environment, outside and inside the Gonggong Building. This 3D modeling uses Blender software. After that, the 3D objects made are exported to the Unity Game Engine application. Then, the creation of the Gonggong Building scene using Unity Software. After that, 3D objects that have been made are set into the scene. Then, implement Virtual Reality by creating a first-person controller script, crowd simulation, day-night cycle, and Chatbot with a rule-based algorithm. After that, Melayu audio songs and cricket sounds are

added to make the atmosphere more lively and not saturated. Finally, the UI implementation for interaction with Chatbot. All elements included support each other against other elements and the application. So that the implementation of web-based Virtual Reality can be accessed effectively and efficiently and can be a good and interactive visualization media, at this stage, the design that has been done before becomes a prototype evaluation, making it easier and faster to create a Virtual Reality website for Gedung Gonggong as a Tourism Information Media for Tanjungpinang City [14].

- The stage before distribution is the testing stage, which is the testing stage before the implementation of Virtual Reality on the Gonggong Building is published. System testing is a stage to find errors or deficiencies in the built system and then test it. Testing is carried out to determine whether the system that has been built meets the requirements, works according to the previously designed functions, and achieves the objectives of the system development. In this study, the author used four characteristics of ISO 25010 testing [15].
- After passing the testing and evaluation stage, the next stage is the distribution of VR Gedung Gonggong. Application dissemination by uploading application files through a web hosting service provider so that users can access the application via an online network via a browser. This application is built into the WebGL platform to be accessed through a browser. It can be accessed through the official website of the Tanjungpinang Culture and Tourism Office.

### III. RESULT AND DISCUSSION

#### A. Manufacturing Stage

The stage of creating or coding the system starts with creating 3D objects or materials needed. Modeled 3D objects include the surrounding environment, outside and inside the Gonggong Building. This 3D modeling uses Blender software. After that, the 3D objects made are exported to the Unity Game Engine application. Then, the creation of the Gonggong Building scene using Unity Software [16]. After that, 3D objects that have been made are set into the scene. Then, implement Virtual Reality by creating a first-person controller script, crowd simulation [17], day-night cycle, and ChatBot with a rule-based algorithm. After that, adding Malay audio songs and cricket sounds makes the atmosphere more lively and not saturated. Finally, the UI implementation for interaction with ChatBot. All elements included support each other against other elements and the application as a whole. So that the implementation of web-based Virtual Reality can be accessed effectively and efficiently and can be a good and interactive visualization media, at this stage, the design that has been done before becomes a prototype evaluation, making it easier and faster to create a Virtual Reality website for Gedung Gonggong as a Tourism Information Media for Tanjungpinang City.

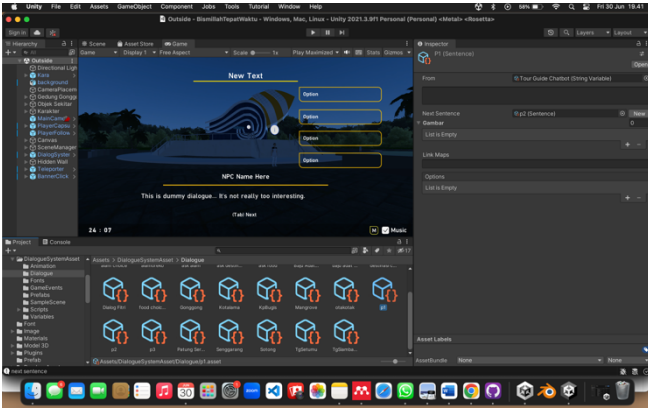


Fig. 4. VR creation of Gonggong building

### B. Testing

The stage before distribution is the testing stage, which is the testing stage before the implementation of Virtual Reality on the Gonggong Building is published. System testing is a stage to find errors or deficiencies in the built system and then test it. Testing is carried out to determine whether the system that has been built meets the requirements, works according to the previously designed functions, and achieves the objectives of the system development. In this study, the author used five characteristics of ISO 25010 testing [18]. Furthermore, an evaluation is carried out to determine whether it is to the system's needs. If it is appropriate, the system is ready for distribution. Functional suitability testing using research instruments such as test cases by the Guttman scale [15]. This type of measurement scale gets a firm answer, namely "Yes" or "No," Yes is worth one, and No is worth 0 on each item. Test cases were given to system experts. The results of the tests carried out by expert validators can be measured by the collected data, which were analyzed using qualitative descriptive analysis techniques expressed in frequency distribution and percentages against the predetermined rating scale categories from the presentation in percentage form.

TABLE III. SCORING CATEGORIES

Answer	Validator Score
Yes	35
No	0
Total	35

The percentages for each assessment are:

$$\text{Yes} = (\sum \text{scores/question items}) \times 100\%$$

Furthermore, if the percentage of feasibility has been obtained, conclusions can be drawn from qualitative data using a conversion Table 3 as follows.

TABLE IIIII. QUALITATIVE CONVERSION OF FEASIBILITY PERCENTAGE

Feasibility Percentage	Criteria
$\geq 50\%$	Acceptable
$< 50\%$	Rejected

The questionnaire was distributed to users by completing the form and assessing 26 questions. There are 40 data responses

with the criteria that the Tanjungpinang people have been to Gedung Gonggong and outside Tanjungpinang who have never been to Gedung Gonggong.

Scale	Mean	Comparison to benchmark	Interpretation
Attractiveness	1,88	Excellent	In the range of the 10% best results
Effort	1,76	Good	10% of results better, 75% of results worse
Efficiency	1,93	Excellent	In the range of the 10% best results
Reliability	1,71	Excellent	In the range of the 10% best results
Stimulation	2,01	Excellent	In the range of the 10% best results
Novelty	1,66	Excellent	In the range of the 10% best results

Fig. 5. UEQ Benchmark Interval results

For Performance Efficiency testing by GTmetrix, Performance efficiency testing is intended to test the performance efficiency level of the developed application. Performance efficiency testing is done with the GTmetrix software application by testing the efficiency of system performance when it is working. The results of the GTmetrix Report must meet the load time of less than 10 seconds. So, the testing of reliability characteristics is said to be high. This research obtained good results with Grade B on performance GTmetrix in testing the system's efficiency in getting a response time of 5,8s fully loaded time page.

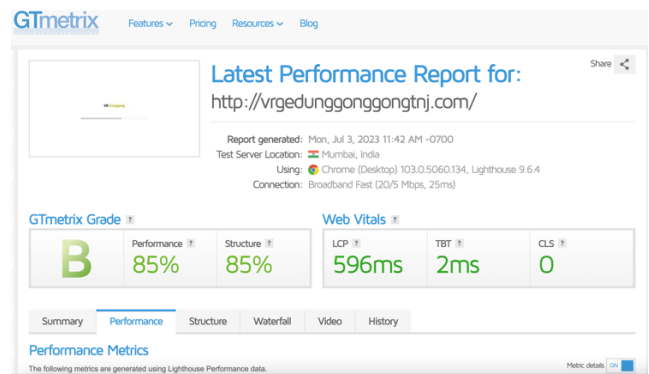


Fig. 6. GTmetrix Performance Report

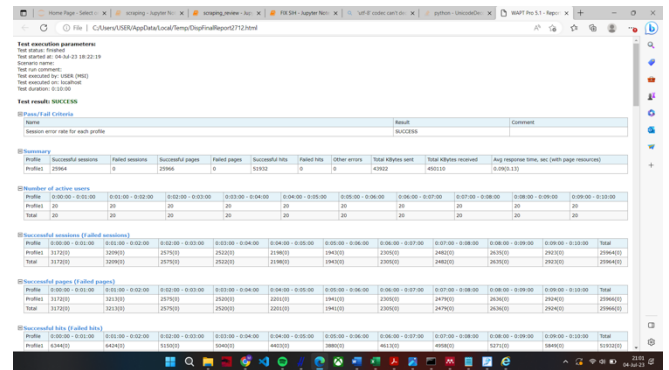


Fig. 7. Reliability test result

The reliability test is intended to test the reliability or trustworthiness of the system. Reliability testing is done with the WAPT tool application by testing system performance while it works. From the reliability test results, a summary is obtained in the form of successful session 25964, failed session 0, successful page 25966, failed pages 0, successful hits 51932, failed hits 0, and other errors 0. These results, if expressed in percentage form, amount to 100%. Compatibility testing tests whether the software can integrate with different systems and browsers quickly and efficiently.

TABLE IVV. COMPATIBILITY TESTING RESULTS

Browser	Results
Chrome	Success
Safari	Success
Bing	Success

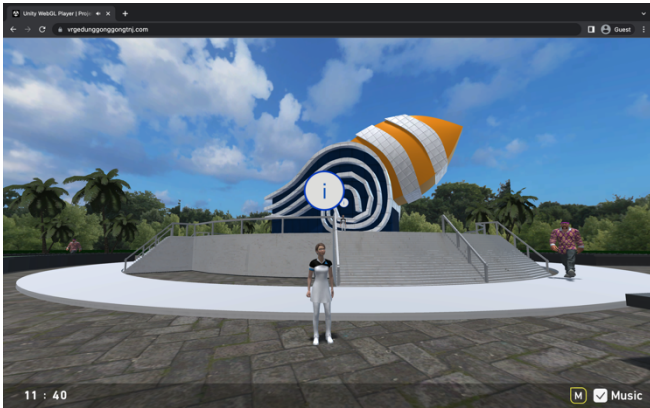


Fig. 8. Exterior view of Gonggong building

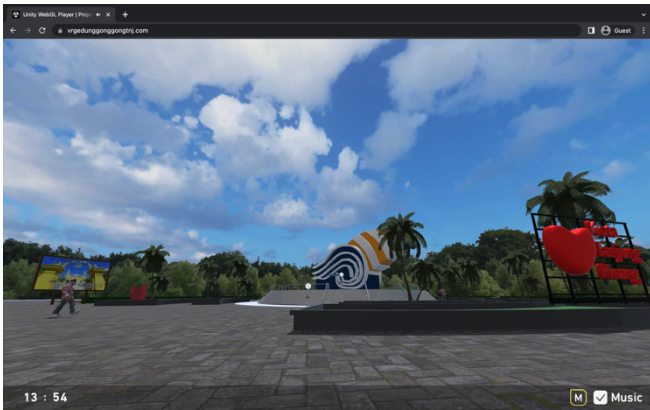


Fig. 9. Gonggong building page view



Fig. 10. Inside view of Gonggong building

Based on the test results using ISO 25010, the Functional suitability testing result is acceptable. For usability testing, use the UEQ questionnaire.

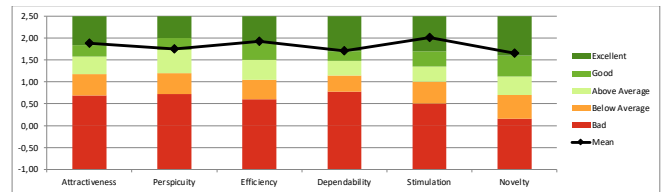


Fig. 11. Comparison of interval results

This research obtained good results with Grade B on performance GTmetrix, in testing the system's efficiency in getting a response time of 5,8s fully loaded time page. From the reliability test results, a summary is obtained in the form of successful session 25964, failed session 0, successful page 25966, failed pages 0, successful hits 51932, failed hits 0, and other errors 0. These results, if expressed in percentage form, amount to 100%. The compatibility results are successful in Chrome, Safari, and Bing browsers.

#### IV. CONCLUSION

The conclusion of the research results achieved is creating a Virtual Reality website of Gedung Gonggong, which can become a medium of Tourism information for Tanjungpinang City. The Gonggong Building Virtual Reality Website can provide information on building images from outside and inside the Gonggong Building as well as the presentation of Tourism information by the Chatbot Tour Guide. Based on tests that have been carried out, the Gonggong Building Virtual Reality Website can answer existing problems. Virtual Reality helps users who cannot visit the building but can still feel as if they are in the Gonggong building. Visitors can also see a preview of the Gonggong Building without having to go to the building and learn what tourist destinations are in Tanjungpinang City.

#### V. REFERENCES

- [1] Kemdikbud, "Webste Kemdikbud Kebudayaan," 19 December 2022.
- [2] R. M. D. & D. J. Muhammad, "Virtual Tourism Sebagai Alternatif Wisata Saat Pandemi," Journal Of Indonesian Tourism, Hospitality And Recreation, vol. 4, no. 1, pp. 53-60, 2021.
- [3] Gedung Gonggong Bangunan Ikonik Di Kota Tanjungpinang - Kisah, Ulasan, Dan Catatan Perjalanan, December 2022.
- [4] P. M. S. & D. B. Vishwakarma, "Antecedents Of Adoption Of Virtual Reality In Experiencing Destination: A Study On The Indian Consumers," Tourism Recreation Research, vol. 45, no. 1, pp. 42-56, 2020.
- [5] H. Kang, "Impact Of Vr On Impulsive Desire For A Destination," Journal Of Hospitality And Tourism Management, vol. 42, pp. 244-255, 2020.
- [6] S. M.-B. S. P. N. & J. G. Hudson, "With Or Without You? Interaction And Immersion In A Virtual Reality Experience," Journal Of Business Research, pp. 459-468, 2019.
- [7] E. M. Gegung, "International Tourism And The Covid-19 Pandemic: The Use Of Virtual Reality To Increase Tourism Destination Sustainability And How Users Perceive The Authenticity Of Vr Experiences," Jurnal Kepariwisata Indonesia: Jurnal Penelitian Dan Pengembangan Kepariwisata Indonesia, vol. 15, no. 1, pp. 9-15, 2021.
- [8] W. Q. R. & Z. L. Wei, "Effects Of Virtual Reality On Theme Park Visitors' Experience And Behaviors: A Presence Perspective," Tourism Management, vol. 71, pp. 282-293, 2019.

- [9] H. M. Antoni Musril H, "Implementasi Teknologi Virtual Reality Pada Media Pembelajaran Perakitan Komputer", Jurnal Virtual Reality, vol. 9, no. 1, 2019.
- [10] E. K. S. & K. M. Febriliyan Samopa, "Development Of 3d Interactive Map On Central Library Of Institut Teknologi Sepuluh Nopember Surabaya With Unreal Engine Mazza Fitroni Nrp 5208 100 016 Supervisor", Surabaya, 2020.
- [11] F. A. Arita. A, "Pembangunan Chatbot Untuk Menampilkan Berita Hoax Pada Platform Line Menggunakan Metode Rule Based," 2019.
- [12] A. Dawis Mutia, "Virtual Reality Tour Sebagai Media Informasi Pengenalan Gedung Kampus 2 Universitas 'Aisyiyah Surakarta", Satesi: Jurnal Sains Teknologi Dan Sistem Informasi, vol. 2, no. 2, 2022.
- [13] Y. E. & S. Hugo Maur, "Designing Augmented Reality And Chatbot As Tourist Assistants: Case Study West Manggarai", in 2021 International Conference On Electrical, Control And Instrumentation Engineering, Conference Proceedings, 2021.
- [14] T. & H. N. T. T. Baum, "Hospitality, Tourism, Human Rights And The Impact Of Covid-19", International Journal Of Contemporary Hospitality Management, vol. 32, no. 7, pp. 2397-2407, 2020.
- [15] M. S. S. M. A. & A. R. Lamada, "Pengujian Aplikasi Sistem Monitoring Perkuliahan Menggunakan Standar Iso 25010", 2020.
- [16] A. A, Pengembangan Media Pembelajaran Berbasis Blender 3d Pada Mata Pelajaran Instalasi Motor Listrik Di Sekolah Menengah Kejuruan, 2019.
- [17] M. H. A. M. M. S. & N. S. Fachri, "Crowd Simulation Using Multiagen Navigation Based On Reciprocal Velocity Obstacles With Leader-Follower Relation", 2020.
- [18] "ISO 25010," ISO, 3 June 2023.
- [19] A. S, "Pengembangan Aplikasi Teknik Pergerakan Kamera Sinematografi Berbasis 3d Augmented Reality Sebagai Media Pembelajaran Teknik Pengambilan Gambar Bergerak Untuk Kelas Xi Multimedia Di Smk N 7 Yogyakarta", Yogyakarta, 2018.
- [20] E. D, & R. L. Handoyo, Pemrograman Berorientasi Objek, Informatika, 2011.
- [21] N. L. F. H. B. & K. J. L. Ma, "Virtual Conservation And Interaction With Our Cultural Heritage: Framework For Multi-Dimension Model Based Interface", in Proceedings Of The Digitalheritage 2013 - Federating The 19th Int'l Vsmm, 10th Eurographics Gch, And 2nd Unesco Memory Of The World Conferences, Plus Special Sessions Fromcaa, Arqueologica 2.0, 1, 323-330, 2013.
- [22] M. Z. A. & W. R. Muzahar, "Profil Hemolim Siput Gonggong, Laevistrombus Turturella Asal Perairan Pesisir Pulau Bintan Provinsi Kepulauan Riau Sebagai Kandidat Biota Budidaya", Jurnal Riset Akuakultur, vol. 16, no. 3, p. 195, 2022.
- [23] L. P. Voronkova, "Virtual Tourism: On The Way To The Digital Economy", in Iop Conference Series: Materials Science And Engineering, 2018.
- [24] S. P. F. T. V. & S. A. A. E. Waraney, "Pengembangan Virtual Tour Potensi Wisata Baru Di Sulawesi Utara Menggunakan Teknologi Video 360 Derajat", Journal Teknik Informatika, vol. 12, no. 1, 2017.

## BIOGRAPHIES OF AUTHORS



**NUR RAMADHANI SAFITRI** was born in Tanjungpinang. She is a student at Universitas Riau, Faculty of Engineering, majoring in Electrical Engineering, Program Study Informatics Engineering 2019.



**RAHMAT RIZAL ANDHI** received an undergraduate degree in 2013 from Universitas Pasundan. Then, he received Master degree in 2016 from Institut Teknologi Bandung. He is so keen on Augmented and Virtual Reality Technology. Currently, Rahmat Rizal Andhi is a lecturer at Universitas Riau.