

# Tourism Empowerment In Society 5.0 Era: Virtual Reality For Covid-19

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## Abstract

*Medan is the third-largest city in Indonesia, so Medan has various kinds of relics used as tourist attractions. The COVID-19 pandemic has caused a fall in the number of tourist visits and the lack of promotional facilities for potential tourists who will visit. The important circumstances of the conditions that encourage the development of City Tourism Empowerment in the Era of Society 5.0 based on Virtual Reality as one of the researchers' efforts in developing new tourism concepts during a pandemic by using the research method used are the combination method. The survey was conducted by distributing questionnaires to determine the public's perception of VR technology for tourism, especially designing Virtual Reality 3600, using the 6-stage MDCL design model in building VR applications. It was determining the correct hotspot, switching interfaces, and display flow that made it easy. The application results were then tested as VR-based tourism content in Medan city tourism to get a response time value of <1 second and a UAT value of 94% from 20 users from 18-50 years of age.*

**Keywords:** Virtual Reality, Medan, Covid-19, Tourism, VR 360<sup>0</sup>

## 1. Introduction

Virtual reality is a technology that can interact in an artificial environment in a virtual world designed using a computer, in Virtual Reality or commonly called virtual reality. Virtual reality can be described as 3-dimensional digital media [1] such as multi-sensor, immersive and interactive environments that will trigger people's imagination as a future technology that controls various fields, education, and recreation [2]. Progress in virtual tours with the 360<sup>0</sup> panoramic technique (VRP) [3] is still very minimal in its application in the city of Medan.

The tourism industry can generate Gross Domestic Product (GDP) revenues of up to 7.8 billion US dollars and create 278,000 jobs. This is in contrast to current conditions. Currently, tourism has the potential for losses due to the COVID-19 pandemic ranging from 2.69 trillion to 6.94 trillion rupiah. This data mentions that around 96.43% of events in 17 provinces had to be postponed, and another 84.20% had to be canceled. Furthermore, impact on 90,000 workers [4]. The presence of innovation in the tourism field in the form of a virtual application that can accommodate virtual tourism activities has many pros and cons because exhibitions held virtually are still considered taboo and challenging to implement.

On a national scale, there are already several websites that provide this virtual tour to introduce and promote a location. Websites and social media are some of the most accessible and widely used media for promotional activities [5] and the introduction of Medan city tourist attractions. In Medan, with the decrease in the number of tourist visitors, both local and foreign, this decline in regional income is due to the inhibition of business activities in terms of merchant sales, lodging, and culinary. They have to survive to continue to struggle in running the tourism industry, both those that have a role in upstream and downstream.

Many studies have been carried out both by academics and governments from various countries [6][7], how they rise from disasters and rebuild their tourism. Like Iceland, which was hit by the 2010 volcanic eruption, they were blocked from neighboring European countries. They got up and re-promoted their tourism by developing Virtual Reality-based tourism to

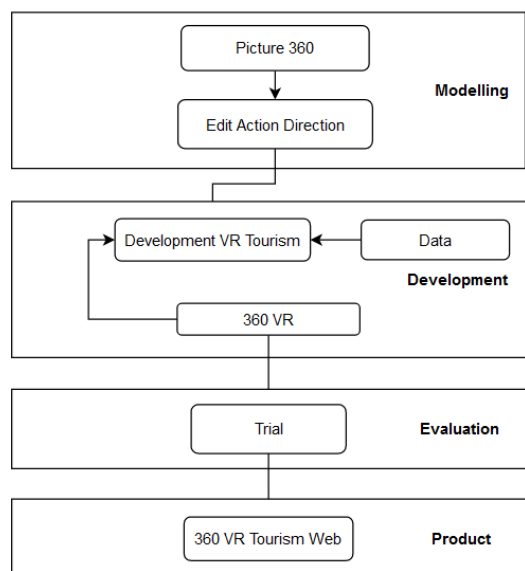
attract foreign tourists. Until now, they can rise in the tourism industry in their respective countries and become a favorite tourist destination in Europe and the world. [8].

By using Virtual Reality as well, the public and tourism industry players can be encouraged [9] to participate in preserving heritage and recognition through the media of images and videos [10] as well as the traditional culture of the Medan city community in managing tourism that they have from generation to generation. This Virtual Reality model can also foster interest in the creative economy, designed for Medan tourism business actors to build new tourism models in Medan City using Virtual Reality. This is useful for generating tourism potential affected by Covid-19 [11].

The author tries to design and develop web-based virtual reality applications for easy access by introducing elements of Medan city tourism into the website. The absence of a website that can be accessed for field tourism based on virtual reality is state of the art in this research. It becomes a starting point for gap analysis for further research so that it becomes a tool for cultural preservation through virtual reality 360° technology, even though this technology has already been developed [12]. Popular in several countries in the introduction of tourism in various countries [13]. Therefore, the author develops web-based virtual reality technology by introducing Medan city tourism so that the wider community and the world [14] can get to know Medan city tourism and attract tourists to visit Medan.

## 2. Research Method

The research flow begins with taking a 360° photo of a tourist attraction. Masjid al-mashun has several points such as gates, mosque doors, monuments, and others, and the Maimun palace at several points. The 360° image data was collected by observing the building and taking 360° images. From the results of the image, then do the editing modeling using software to combine separate images. In the next stage, the image file is exported to produce objects applied to the VR media. Feasibility trials were conducted to determine the VR world view, gyroscope interaction, and information content placement for tourist attractions. The trial was carried out on a computer and android device. The research method carried out is made accordingly to research needs.



**Figure 1.** Research Method

The stages of research on Medan city tourism start from a literature study which shows that the decline in the number of tourists to the Medan city is a result of the Covid-19 pandemic and the observation that there is no use of virtual reality in the Medan city for tourism

needs. Then proceed with conducting data analysis and retrieval of research data to tourist objects virtual reality design. After the design is complete, user testing is carried out on the virtual reality results to the user.

The architecture of the tourist attraction information system, where objects can be seen in this system, is taken using a 360° camera. Then go through a Virtual reality geography process that users can later access via mobile or computer via the internet[15]. In the implementation phase, the author applies the design results made using the PHP and HTML languages. In the testing phase, the authors conducted UAT testing and conducted trials on several tourist attraction visitors[16]. In the implementation phase, the author takes 360 photo data to create Virtual reality, as for the steps for making Virtual Reality from the beginning to producing Virtual Reality products.

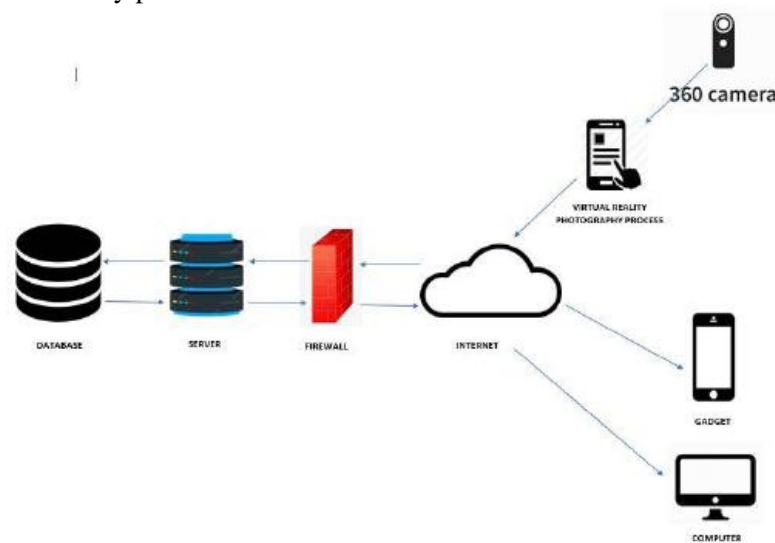


Figure 2. Virtual Reality Design Chart

### 2.1. Use Case Diagram

Use case diagram showing actor who can access use case in the system virtual built tours. In figure 3. The actor acts as admin and as visitors.

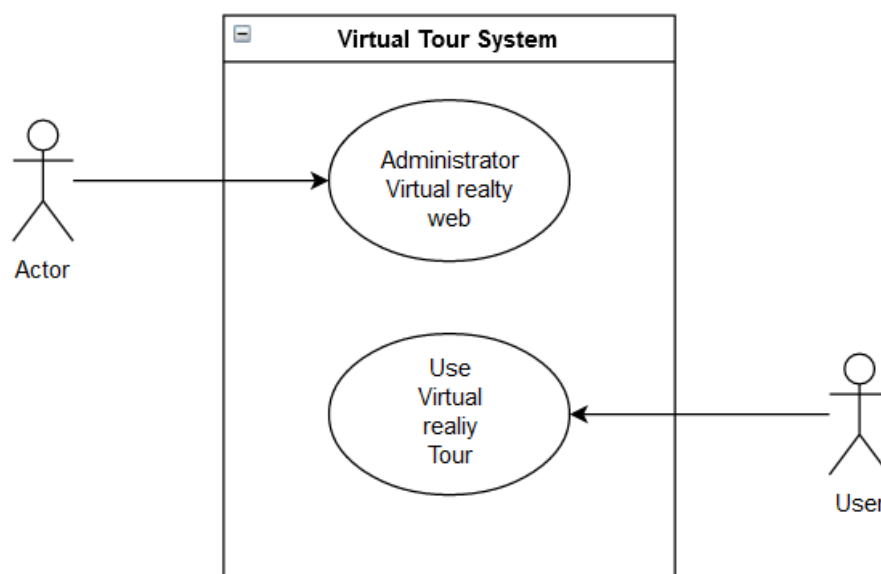


Figure 3. Use Case Diagram

**Table 1.** Response Time Testing

Actor	Description
Administrator	Admin can manage virtual tours good at adding spots, reduce or do updates on the system.
User	Visitor Use Virtual Reality Tour Medan

### 3. Result and Analysis

#### 3.1. Production

At this stage, the recording process was carried out at the tourist attraction of the al-mashun mosque and the Maimun Palace. Recording this video is adjusted to the plot of the storyboard that has been made previously.

#### 3.2. Virtual Reality Design

This process is the process of bringing together all the files that have been edited. This process concluded into several things, namely:

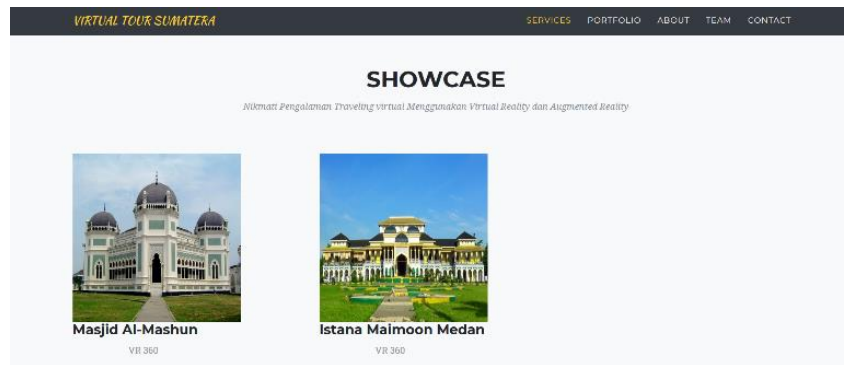
1. Making a hotspot that aims at the interactivity of the virtual tour. Explanatory graphics symbolizes hotspots.
2. Giving a straightforward plot following the previous storyboard.
3. Creating a virtual tour interface.
4. Publication of virtual tours can be done directly on the website because there are features for publication according to the desired platform.

Video 360 produces videos that can be seen from all corners of the place or room from the 360 capture results. This 360 video was created to see tourist objects up close as if the user was at a tourist location using their device.

**Figure 4.** Al-Manshun Mosque 360<sup>0</sup>

The research flow begins with taking a 360° photo of a tourist attraction. Masjid al-mashun has several points such as gates, mosque doors, monuments, and others and the Maimun Palace. The 360° image data was collected by observing the building and taking 360o images. From the results of the image, then do the editing modeling using software to combine separate images. The image file is exported into a 360° image to produce objects applied to VR media in the next stage. Feasibility trials were conducted to determine the VR world view, gyroscope interaction, and information content placement for tourist attractions. The trial was carried out on a computer and android device.

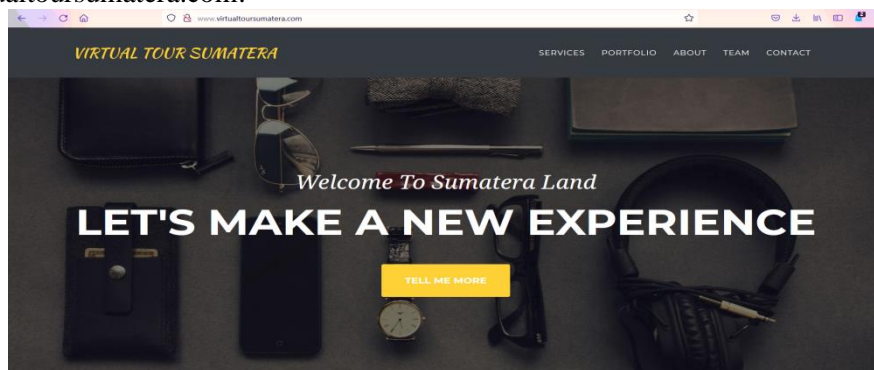
When displaying the information system as in the previous picture, users can use the function to get the sensation of reality in the virtual world through the user's mobile phone or gadget. Not only through mobile phones, but this tourist attraction information system also provides a feature to view photos of tourist objects through the website. This is shown on the web display page, where users can see some pictures of tourist objects. In addition to seeing photos of tourist objects, visitors can also choose the tourist objects they want to see for each tourist attraction, seen in the image below.



**Figure 5.** Virtual Reality Display on Website

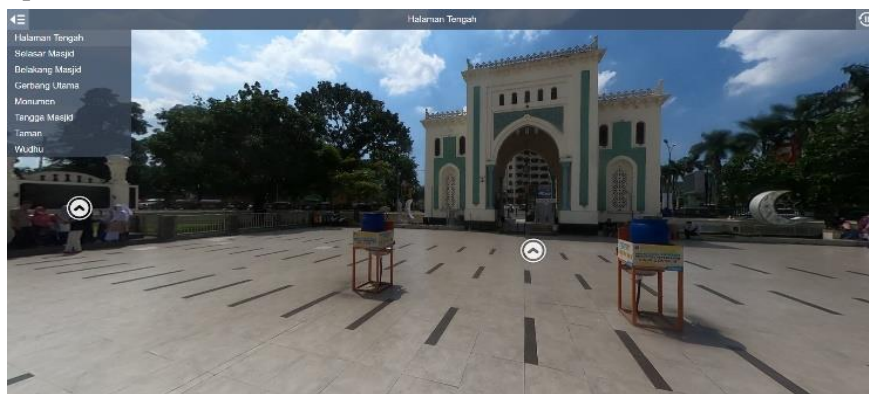
### 3.3. Assembly

In the initial modeling stage, all photos captured using a 360 camera are collected and then combined into one video that will automatically move from place to place with a predetermined time duration. In this study, researchers took samples from pictures of places and rooms. The whole image of 360<sup>0</sup> Medan city tourism is built on web-based virtual reality, and the stages of website development are carried out as supporting media to facilitate user access. The final stage of the VR development is to merge and upload it to the web [www.virtualtoursumatera.com](http://www.virtualtoursumatera.com).



**Figure 6.** Homepage Virtual Reality Tour

So that anyone can access it, in Figure 4, the following is a VR snippet of the Medan city tourism promotion.



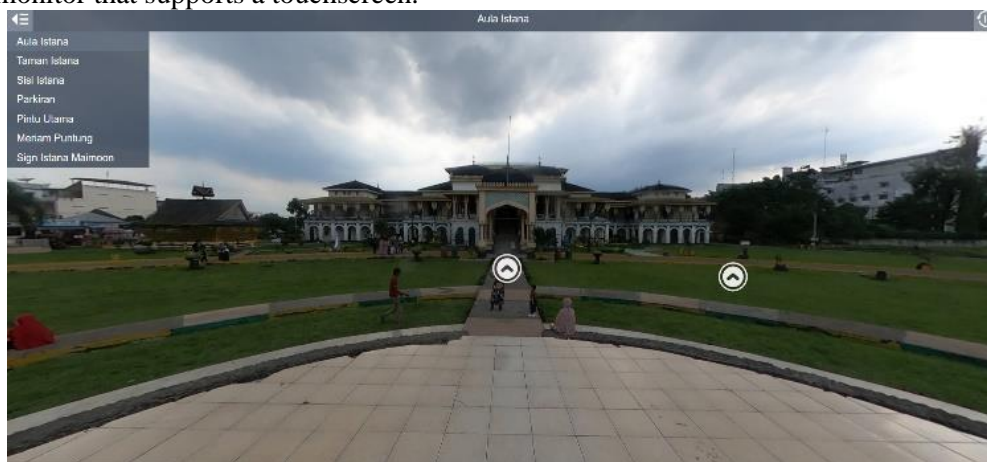
**Figure 7.** Virtual Reality Results

### 3.4. Trial

Testing of mobile VR applications is carried out to determine the application's performance and performance using the device. The results obtained are that the VR application runs quite smoothly using smartphones and PCs. When displaying scenes with many objects, it can still be appropriately handled without significant lag.



After VR has been successfully tested, the video will be uploaded to the website. Anyone who wants to experience visiting the Al-Mashun Mosque and Maimun Palace attractions in Medan can click on the desired tourist attraction on the web display and select the object's location to see by clicking the tool. The essential guide. Users can rotate the video degrees by simply dragging or sliding the touch on the mouse or mousepad and the touch screen on a monitor that supports a touchscreen.



**Figure 8.** Virtual Reality On Website

### 3.5. Post Production

After making the virtual tour is complete, the next step is the post-production stage which aims to test the product using the User Acceptance Test (UAT). The UAT process is carried out to get a response from the end-user (audience) of the virtual tour directly. The data obtained will be used to carry out UAT. Testing is done by checking that each function in this virtual tour can run as it should and from other aspects such as images presented, objects such as text, hotspots, and others. This test uses a questionnaire with random sampling that follows the design and is distributed online. With several respondents, as many as 20 people with respondent specifications based on ages between 18 years until 50 years and using different devices when accessing virtual tours ranging from laptops, Android-based smartphones, and iOS-based smartphones.

### 3.6. Result Response Time Testing

Response time testing refers to the time it takes for one system node to respond to a request from another [17]. It takes when the system or unit takes steps to react to specific inputs until the process is complete. Response Time measures the performance of each transaction or request. The response time starts when the user sends a request and ends when the application states that the request has been completed. After VR has been developed, the next step is to carry out the evaluation process. The evaluation process measures the online VR response time from access using Android devices or PCs. Both evaluations count the number of application errors in recognizing the marker and the cursor direction. The evaluation was carried out ten times for each VR test.

**Table 2.** Response Time Testing

Testing Type	Device Test	Waiting time	Error Rate
Android	Cursor	0.7	0
	Function/Touchscreen		
	Speed access	0.5	0
	Hotspot response	0.4	0
	Picture quality	1.4	0

Testing Type	Device Test	Waiting time	Error Rate
IOS	Cursor	0.8	0
	Function/Touchscreen		
	Speed access	0.5	0
	Hotspot response	0.4	0
	Picture quality	0.6	0
PC	Cursor	0.2	0
	Function/Touchscreen		
	Speed access	0.3	0
	Hotspot response	0.2	0
	Picture quality	0.3	0

#### 1.4. Result User Acceptance Test

Furthermore, an analysis of the usefulness of the virtual city tour of Medan is carried out using UAT. The User Acceptance Test has ten standard statements minimum that product users must answer to determine the feasibility of a product[18].

**Tabel 3.** Question List

No.	Question List
1	This virtual tour of the city of Medan is very helpful during the Covid-19 Pandemic
2	I feel that this virtual city tour is difficult to use.
3	I feel that this virtual city tour helps in tourism promotion
4	I need someone's help when using a virtual Medan city tour
5	I feel that the features (in terms of navigation, buttons, and 360° object views) in this virtual city tour are functioning.
6	I feel that many things are inconsistent and need to be corrected in the virtual city tour of Medan.
7	Using virtual Medan city tours helps introduce tourist attractions in Medan City
8	I find this virtual city tour confusing (in terms of navigation, buttons, and 360° object views).
9	I feel that there are no obstacles when using the virtual city tour of Medan using the device that I have
10	I had to get used to it first in using this virtual city tour of Medan.

Based on the data from the questionnaire, the total score for each statement will be processed. The first statement onwards will be symbolized by P1, P2, P3, and others. To find out the problems or shortcomings of this virtual tour. To find out, it takes an average percentage of the value obtained from each statement. This process aims to find out how many scores are obtained from users on virtual tours of the city of Medan. In the process of calculating this score.

**Tabel 4.** Data Processing Results

Question	Average
1	4.8
2	4.8
3	4.6
4	1
5	4.6
6	2
7	4
8	1.8
9	4
10	2

After testing the response time and user acceptance of the web-based virtual tour application for Medan city tourism went well and smoothly. This was evidenced by the application's speed [10], both the transition from one location to another through hotspot points created. With a score of less than 1 second .and for the image quality is very good and does not make it difficult for users to use the application. Furthermore, for the results from UAT to users through questionnaires, the average user satisfaction results are pretty high; 94% of users are satisfied with using virtual reality for web-based tourism, which is better than previous research[12]. This breakthrough has never been made in previous research, which only uses virtual reality for tourism without paying too much attention to the convenience of the user side and the development of virtual reality itself.

Based on user satisfaction and test speed in virtual reality for Medan city tourism, Medan city tourism can also attract users to visit these tourist sites and become pioneers in using virtual reality for Medan tourism. It can spur other regions that still use conventional methods to follow the development of virtual reality technology in promoting tourism for their respective regions.

The existence of web-based virtual reality for Medan city tourism can attract more visitors, both from local tourists to foreign tourists, and provide income for people directly related to the tourism section of Medan City. 19 for those who want to travel virtually and are very easy to access using PC or smartphone anywhere and anytime.

#### 4. Conclusion

After the manufacturing process, the results of the implementation of the method and testing were carried out, making a virtual city tour of Medan was successfully carried out using this method. With a user satisfaction rate of 94% and an interface access speed of <1 second. Web-based virtual tours use 360 video, which has the advantage of interactivity in text, hotspots, and solution explanation videos to experience a new user experience. Technology in tourism promotion in the city of Medan provides added value in the form of impressions and interest when virtual reality technology is applied to website users. Virtual reality technology requires high image quality, and the existing technology to apply virtual reality technology has not been able to replace the sensation directly compared to directly. Furthermore, VR can generate tourist interest in the community to visit the location to generate the economy for people involved in tourism.



## References

- [1] D. Hamilton, J. McKechnie, E. Edgerton, and C. Wilson, *Immersive virtual reality as a pedagogical tool in education: a systematic literature review of quantitative learning outcomes and experimental design*, vol. 8, no. 1. Springer Berlin Heidelberg, 2021.
- [2] A. Hajirasouli, S. Banihashemi, A. Kumarasuriyar, S. Talebi, and A. Tabadkani, "Virtual reality-based digitisation for endangered heritage sites: Theoretical framework and application," *J. Cult. Herit.*, vol. 49, pp. 140–151, 2021, doi: 10.1016/j.culher.2021.02.005.
- [3] P. Putra, M. A. Firdaus, and M. Farhan, "Penerapan Teknologi Virtual Reality Photography Pada Sistem Informasi Objek Wisata," *Comput. Eng. Sci. Syst. J.*, vol. 4, no. 1, p. 70, 2019, doi: 10.24114/cess.v4i1.11461.
- [4] I. Khairunnisa, A. D. Hasna, H. B. Kharoline, and A. A. Noor, "Inovasi Virtual Exhibition Masa Depan," *J. Altasia*, vol. 3, no. 1, pp. 28–34, 2021.
- [5] C. Flavián, S. Ibáñez-Sánchez, and C. Orús, "Integrating virtual reality devices into the body: effects of technological embodiment on customer engagement and behavioral intentions toward the destination," *J. Travel Tour. Mark.*, vol. 36, no. 7, pp. 847–863, 2019, doi: 10.1080/10548408.2019.1618781.
- [6] A. Al-Gindy, C. Felix, A. Ahmed, A. Matoug, and M. Alkhidir, "Virtual reality: Development of an integrated learning environment for education," *Int. J. Inf. Educ. Technol.*, vol. 10, no. 3, pp. 171–175, 2020, doi: 10.18178/ijiet.2020.10.3.1358.
- [7] I. Cicek, A. Bernik, and I. Tomicic, "Student thoughts on virtual reality in higher education—a survey questionnaire," *Inf.*, vol. 12, no. 4, pp. 1–10, 2021, doi: 10.3390/info12040151.
- [8] A. L. Noviandi, A. Setiyadi, and J. D. No, "Android Based Virtual Reality Development Using Cardboard for Wisata Batu Kuda Promotion Media," no. 112.
- [9] F. Poux, Q. Valembois, C. Mattes, L. Kobbelt, and R. Billen, "Initial user-centered design of a virtual reality heritage system: Applications for digital tourism," *Remote Sens.*, vol. 12, no. 16, 2020, doi: 10.3390/RS12162583.
- [10] J. Zhou, Y. You, and Y. Zhao, "Motion balance ability detection based on video analysis in virtual reality environment," *IEEE Access*, vol. 8, pp. 157602–157616, 2020, doi: 10.1109/ACCESS.2020.3019609.
- [11] Nurlisa Ginting and Selly Veronica, "Tata Guna Lahan Bukit Lawang sebagai Kawasan Wisata Berkelanjutan," *Talent. Conf. Ser. Energy Eng.*, vol. 2, no. 1, pp. 0–8, 2019, doi: 10.32734/ee.v2i1.381.
- [12] Sumit Patel, Binal Panchotiya, Akashkumar Patel, and Aishwariya Budharani, Shivam Ribadiya, "A Survey: Virtual, Augmented and Mixed Reality in Education," *Int. J. Eng. Res.*, vol. V9, no. 05, 2020, doi: 10.17577/ijertv9is050652.
- [13] M. J. Kim, C. K. Lee, and T. Jung, "Exploring Consumer Behavior in Virtual Reality Tourism Using an Extended Stimulus-Organism-Response Model," *J. Travel Res.*, vol. 59, no. 1, pp. 69–89, 2020, doi: 10.1177/0047287518818915.
- [14] K. Ahir, K. Govani, R. Gajera, and M. Shah, "Application on Virtual Reality for Enhanced Education Learning, Military Training and Sports," *Augment. Hum. Res.*, vol. 5, no. 1, 2020, doi: 10.1007/s41133-019-0025-2.
- [15] Y. Li, H. Song, and R. Guo, "A study on the causal process of virtual reality tourism and its attributes in terms of their effects on subjective well-being during COVID-19," *Int. J. Environ. Res. Public Health*, vol. 18, no. 3, pp. 1–16, 2021, doi: 10.3390/ijerph18031019.
- [16] C. Sagnier, E. Loup-Escande, D. Lourdeaux, I. Thouvenin, and G. Valléry, "User Acceptance of Virtual Reality: An Extended Technology Acceptance Model," *Int. J. Hum. Comput. Interact.*, vol. 36, no. 11, pp. 993–1007, 2020, doi: 10.1080/10447318.2019.1708612.
- [17] T. Hou, "Virtual Tourism Simulation System Based on VR Technology," *J. Phys. Conf.*

- Ser.*, vol. 1881, no. 3, 2021, doi: 10.1088/1742-6596/1881/3/032084.
- [18] E. R. Zorzal, S. F. Paulo, P. Rodrigues, J. J. Mendes, and D. S. Lopes, “An immersive educational tool for dental implant placement: A study on user acceptance,” *Int. J. Med. Inform.*, vol. 146, no. May 2020, 2021, doi: 10.1016/j.ijmedinf.2020.104342.



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