



Application of 360-Degree Virtual Tour as a Website-Based Media for Introduction to Pucak Meru Pura

I Gusti Ngurah Agung Bagus Yudistya Mahesatama*, Ketut Gus Oka Ciptahadi, I Made Arya Budhi Saputra

Program Studi Sistem Informasi, Institut Teknologi dan Bisnis STIKOM Bali, Denpasar, Indonesia

*Correspondence: E-mail: bagusyudistya@gmail.com

ABSTRACT

Pucak Meru Temple is one of the temples belonging to the Kahyangan Jagat Temple, which is located in Banjar Kasianan, Pangsang Village, Petang District, Badung Regency, Bali. Pucak Meru Temple has a cave called Goa Meru which is a historical witness to the establishment of this temple. Pucak Meru Temple has several uniqueness, namely, in Goa Meru flowing 5 sources of water, inside the cave there are also guards in the form of snakes and there are also many ancient kepeng coins, and during piodalan in this temple it always rains even during the dry season. when pujawali does not rain, it is certain that the drought will be long. Pucak Meru Temple is a temple that recently has the status of Kahyangan Jagat Temple, so the name of this temple as Kahyangan Jagat Temple is still foreign to the public. With the current development of information technology, the author built a Website-Based Virtual Tour 360 Degree application which aims to provide effective information and the impression as if you had been at Pucak Meru Temple. This application was built using the MDLC (Multimedia Development Life Cycle) method. Based on the test results using the heuristic evaluation method, the results were quite good and through the system usability scale testing, an average SUS score of 80 was obtained, thus concluding that each function is running well and can be used easily by users.

ARTICLE INFO

Article History:

Submitted/Received 27 Feb 2023

First Revised 09 Mar 2023

Accepted 4 Apr 2023

First Available online 15 May 2023

Publication Date 25 June 2023

Keyword:

Heuristic Evaluation,
Information Media,
MDLC,
Puncak Meru Temple,
Virtual Tour.

1. INTRODUCTION

Temples are cultural tourism destinations that are quite popular on the island of Bali, apart from that temples are also the main place of worship for people who are Hindus in Bali (Chiao et al., 2018). The existence of the sacred place of the temple apart from being a stana for the holy spirits of ancestors, holy teachers (Rsi Agastya/Bhatara Guru), or Hindu religious figures in ancient Bali in the past (Dang Hyang Nirartha, Dang Hyang Markandeya), is also a stana for the Gods which is a manifestation of Ida Sang Hyang Widi Wasa or God Almighty (Bennett and Saunders, 2019; Heriyanti, 2019). Temples in Bali can be divided into several groups based on their character or peculiarities, namely, Territorial Temples, Functional Temples, Kawitan Temples, and Public Temples. A Territorial Temple is a temple that has territorial (territorial) characteristics as a place of worship for members of the community of a banjar or a village that is bound by the territorial integrity of a banjar or village, which is included in the Territorial Temple, namely Pura Kahyangan Tiga. Furthermore, Functional Temple, which has a functional character, its devotees are bound by work ties because they have the same profession in the livelihood system. Then there is the Kawitan Temple. This temple has a character that is determined by the existence of wit or ancestral ties based on birth (geneological) lines. Furthermore, the Public Temple, this temple has a general characteristic as a place of worship for Ida Sang Hyang Hyang Widhi with all His manifestations (gods). This relatively common temple is worshiped by all Hindus, which are included in the general temple group, namely, Kahyangan Jagat Temple, Catur Loka Phala Temple and Sad Kahyangan Temple, as well as Dang Kahyangan Temple, which can be said to be the big temples on the island of Bali (Bennett and Saunders, 2019).

Pucak Meru Temple is one of the temples that belongs to the Kahyangan Jagat group, as a place of worship of Ida Shang Hyang Widhi Wasa, this temple is also known as Arca Pratista Temple (a temple that holds many pre-lingga god statues), located at, Jl. Puputan Badung, Banjar Kasianan, Pangsan Village, Petang District, Badung Regency, Bali. Pucak Meru Temple is approximately 31 km or 1 hour of travel time from the city of Denpasar, with a path that is easily traversed by two-wheeled or four-wheeled vehicles. This temple has several uniqueness, among others, in the location of the previous temple there is a cave called Goa Meru which flows 5 water drops, as soon as pemedek wants to enter the cave there is a guard in the form of a snake who guards the existence of the cave, inside the cave there are also many ancient kepeng coins, Furthermore, during pujawali or piodalan in this temple it always rains even though during the dry season, if during pujawali it doesn't rain, then it is certain that the dry season will be long (Mah et al., 2019). Pucak Meru Temple is a temple that recently has the status of Kahyangan Jagat Temple, with the designation of Pucak Meru Temple as Kahyangan Jagat Temple and the inauguration of purana (the history of the temple) which was held on 23 February 2021. So the name Pucak Meru Temple as Kahyangan Jagat Temple is still foreign heard by the public, plus the little information, journals, and articles that contain about the Pucak Meru Temple that can be obtained. This has also been confirmed by one of the temple administrators (I Gusti Ngurah Warasyadnya) and the leader of the Pucak Meru Temple (Gusti Ayu Merta), they also stated that information technology is urgently needed which can later assist in introducing the temple. Therefore, information technology is needed that can be used as an effective means of information as an effort to introduce and provide information about the Kahyangan Jagat Pucak Meru Temple, one of which is the Virtual Tour (Argyriou et al., 2020; De Luca et al., 2022; Ngongoloy et al., 2018). Virtual Tour is a simulation of a location consisting of a series. The series of images will be combined (stich) to produce a 360-degree panoramic photo. It can also use other multimedia elements such as sound effects, narration, text, and music (Riyadi and Nurhaida, 2022; Irwan

and Novianti, 2021). Virtual Tour itself is usually used to give the experience of 'having been' somewhere just by looking at the monitor screen. Presentation of virtual tours can be done by utilizing images or videos, in addition to using 3-dimensional models (Nata *et al.*, 2021). Previously, research on the Virtual Tour had been compiled by I Gusti Ayu Amalia Aryanti in 2021, by raising the object of the Kancing Gumi Temple. Which has produced a Website-based Virtual Tour 360 Degree application, as a medium to introduce and provide detailed information about the environment and buildings contained in Kancing Gumi Temple (Martínez-Graña, *et al.* 2013). Based on this, the author is interested in raising the title of the final assignment "Virtual Tour 360 Degree Application as a Website-Based Introduction Media for Pucak Meru Temple". The purpose of making this application is to introduce to the wider community about the historical value, the functions of each pelinggih, as well as detailed information contained in the Pucak Meru Temple which can be accessed through the Website page (Firdiarahma, 2021; Rasim *et al.*, 2021; Wibawa and Budiasa, 2018). It is hoped that in the future the Pucak Meru Temple will be better known by the wider community, so that many people want to visit and pray at this temple, especially Balinese people and those from outside Bali who are Hindus.

2. METHODS

Designing and building the application the author uses the Multimedia Development Life Cycle (MDLC) development method. In this development method there are 6 stages consisting of Concept, Design, Material Collecting, Assembly, Testing and Distribution. The following is an explanation of the development method used:

2.1. Concept

The stage to determine the initial idea or concept of the application to be made. In determining the concept, there are several things that need to be considered in designing and building this application, for example, such as in determining the target users of this virtual tour which is aimed at the wider community, especially people who want to know about and visit or pray at Pucak Meru Temple.

2.2 Design

The Design Stage is the stage of making the architecture of the Virtual Tour Application to introduce the Pucak Meru Temple which will be built later. At this stage the design of the program application will be made and developed, besides that, a discussion will also be held regarding the program's architectural requirements, appearance and shape as well as the material requirements for making the program.

2.3 Material Collecting

The material collecting stage is the process of collecting materials or data related to the research being carried out, there are several data collection methods used in this study such as the observation method, namely direct observation at the research site, the interview method, namely communicating directly to informants related to research, as well as the literature study method, namely collecting data through books, articles and various documents related to research.

2.4. Assembly

The assembly stage combines all the data and materials that have been collected and processed to become an application that can later be useful to the community.

2.5. Testing

The testing phase is carried out after completing the assembly stage. At this stage a system test is carried out by the manufacturer by running the application/program that has been made, so that it can be seen whether the application that has been completed can be used and runs well or if there are still deficiencies. System testing in this study was carried out using the Heuristic Evaluation (HE) and System Usability Scale (SUS) methods (Kabassi et al., 2019).

2.5. Distribution

The distribution stage is the stage carried out to introduce applications that have been built, so that later many users will know and use this system. Several ways of dissemination are carried out at this stage, namely through social media, Google Drive and YouTube.

3. RESULTS AND DISCUSSION

Degree Virtual Tour Application 360 as Website-Based Media Introduction to Pucak Meru Temple is a new strategy that is able to provide information about an object and will give users the impression as if they are directly on the object, namely Pucak Meru Temple, in this case which is an effort to improve the existence of religious tourism sites, namely temple buildings in Bali, especially the Pucak Meru Temple which has a history and uniqueness that needs to be known by the wider community. As for the process of making this application using the MDLC (Multimedia Development Life Cycle) development method so that the resulting system is in accordance with the design (Yang, et al., 2021).

3.1. System Design

System design is the initial stage that must be prepared in building a system, where the purpose of this process is to make an initial design and design of the system to be built which aims to provide an overview and detailed explanation of how the system will work

3.2. Menu Structure

The menu structure is a general description of the menus displayed in an application. The menus at this stage are divided into several sections to make it easier for users to use this application. The following is an overview of the menu structure on the website of the 360 Degree Virtual Tour Application Introduction to Pucak Meru Temple: (See Figure 1)

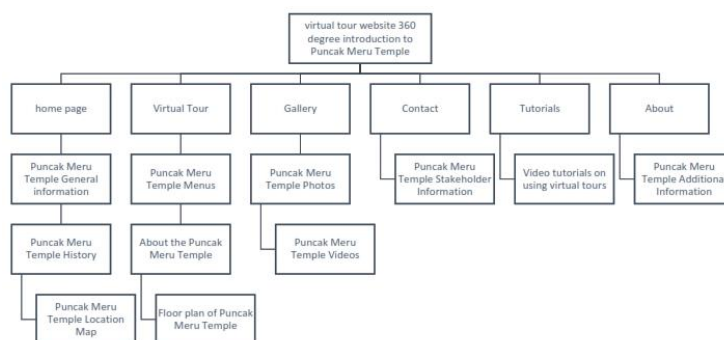


Figure 1. Menu Structure.

3.3. Storyboard Video Introduction to Puncak Meru Temple

A storyboard, or what is known as a storyboard, is a combination of picture sketches and narration (text) which are arranged sequentially according to the story idea, which can provide an explanation of the storyline that we make to others more easily. The following is a visual sketch of the Pucak Meru Temple introduction video, this video has a total video duration of 19 minutes and 20 seconds (see **Figure 2**).

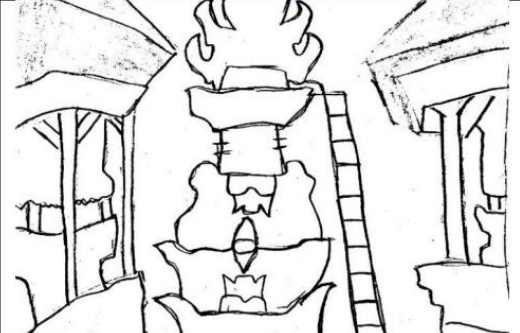
No	Ilustrasi	Keterangan
		Audio: Balinese Music (Framelens Audio Visual). SFX: Kicauan Burung. Transisi Video: Tidak Ada. Durasi: 41 Detik.

Figure 2. Storyboard.

3.4. Assembly of the Virtual Tour

Making the Virtual Tour 360 Degree application, requires materials in the form of 360 degree images of the object environment. 360 degree shooting using the Insta360 One X2 camera assisted by a tripod. Apart from that, the making of this application also uses the 3D Vista application and several other supporting software, to manage the 360 degree image to become a Virtual Tour application. There are several processes in making this application, namely:

a. Tool Use

Insta360 One X2 is a camera capable of producing 360 degree images. This camera has 2 buttons for operation, one is on the front of the camera just below the main screen which functions to take pictures and record videos manually, then the other is on the side of the camera which functions to turn the camera on and off. In addition, this round screen supports touch features, where users can easily make camera settings as desired through the main screen. The insta360 One X2 camera also has a built-in tripod which will make it easier for users to take pictures and videos (see **Figure 3**).



Figure 3. Insta360 One X2.

b. 360 Degree Image Capture

Taking pictures with the Insta360 One X2 camera can be done in two ways, namely with the help of a smartphone or manually only with the camera. It is more advisable to use assistance from a smartphone device, because by using a smartphone the user can immediately see the results of the images and save the results of the images on the smartphone (see **Figure 4**).



Figure 4. 360 degree image capture.

c. 360 Degree Image Management

Previously taken 360-degree images can be downloaded via the Insta 360 application and managed in a photo editing application, namely Photoshop, so that the image results are as desired. In Photoshop, you can do the color editing process and remove objects or elements that are not needed in a 360 degree image, such as removing or removing tripod objects or leaves and plastic waste that enter a 360 degree image. The following is a 360 degree image that has been managed and gone through the editing process (see **Figure 5**).



Figure 5. 360 degree image management.

d. 360 Degree Image Processing

In the process of processing this 360 degree image using 3DVista software which is usually used in building a 360 Degree Virtual Tour. The previously managed 360 degree images are then entered into the 3DVista application to link one image to another, then the user can adjust the image as desired by using the features available in the 3DVista application. Apart

from that, in the 3DVista application, users can also add other features, such as: background sound, location plans, explanations about objects packed into an info button and so on which aims to increase the attractiveness of users of the Virtual Tour application later (see **Figure 6**).

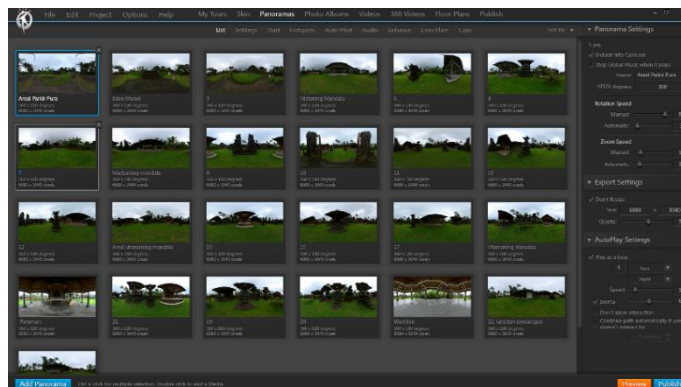


Figure 6. 360 Degree Image Processing.

3.5. System Implementation

System Implementation is the stage of system implementation, namely processing all data and materials that have been collected which are then combined into a system whose interface is built according to a predetermined interface design. The following is the result of system implementation of the 360 Degree Virtual Tour Application as a Web-Based Introduction Media for Pucak Meru Temple, including:

a. Implementation of the Virtual Tour Application

The implementation of the Virtual Tour application will display an overview of the 360 Degree Virtual Tour application for the Pucak Meru Temple that has been built (Martínez *et al.*, 2013). The Pucak Meru Temple Virtual Tour application consists of a series of images from each area of the temple that are linked together. Then there is information regarding the name and function of the building or pelinggih contained in the temple, and is equipped with several buttons that have their respective functions to make it easier for users to operate them. The following is the implementation of the Pucak Meru Temple Virtual Tour 360 Degree application (see **Figure 7**).

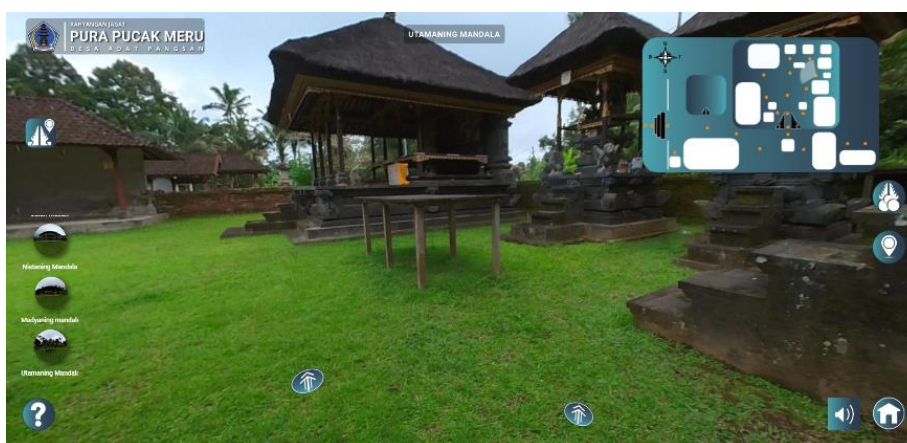


Figure 7. Implementation of the virtual tour application.

b. Home Page Implementation

The following is the implementation of the Home Page which is the initial appearance of the Pucak Meru Virtual Tour Application Website, which has several submenus ranging from general information and the uniqueness found in the Pucak Meru Temple, the history of the Pucak Meru Temple, and a map of the location of the Pucak Meru Temple. In addition, at the top of the home page there is a navigation bar which can also be found on all menus of the Pura Pucak Meru Virtual Tour Website (see **Figure 8**).



Figure 8. Home page implementation.

c. Implementation of Virtual Tour Pages

The following is an implementation of a Virtual Tour Page which will provide information to users about what a virtual tour is and displays a structure plan and layout of shrines and buildings contained in Pucak Meru Temple (Zhu and Cheng, 2022). This page is also equipped with a virtual tour application that users can access by pressing a button. "Start Virtual Tour" to start the Pucak Meru virtual tour (see **Figure 9**).

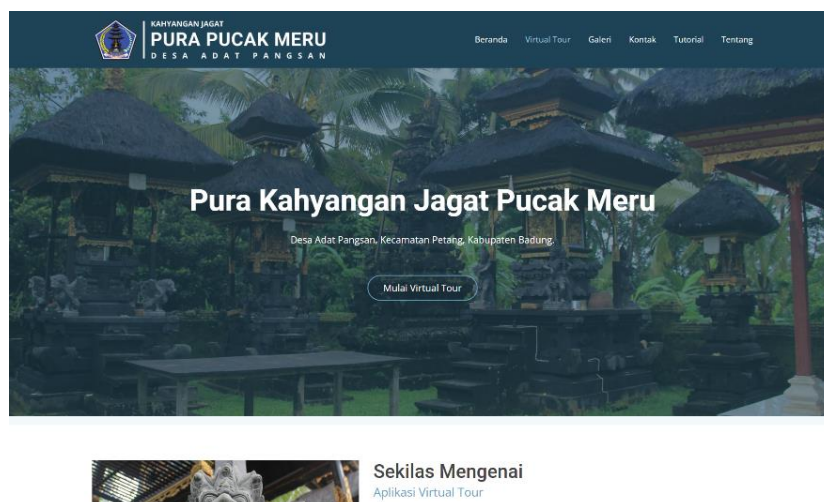


Figure 9. Implementation of virtual tour pages.

d. Gallery Page Implementation

The following is an implementation of the Gallery Page which will display an introductory video and photos of the Kahyangan Jagat Pucak Meru Temple starting from the pelinggih and also the temple areas accompanied by a description of the name of the pelinggih and the area (see **Figure 10**).



Figure 10. Gallery page implementation.

e. Implementation of Contact Pages

The following is an implementation of the Contact Page which will display information regarding the management of the Kahyangan Jagat Pucak Meru Temple, which includes the Pemangku Pura and Kelian Pura (see **Figure 11**).



Figure 11. Implementation of contact pages.

f. Implementation of Tutorial Pages

The following is an implementation of the Tutorial Page which will display a video tutorial on how to use the Kahyangan Jagat Pucak Meru virtual tour application (see **Figure 12**).



Figure 12. Tutorial page implementation.

g. About Page Implementation

The following is an implementation of the About page which will provide additional information about the Pucak Meru Temple, such as the important date of the temple's designation as the Kahyangan Jagat Temple, information on offerings and information regarding the stages of temple renovation (see Figure 13).



Figure 13. About page implementation.

3.6. System Testing

a. Evaluation of Heuristic Testing

The following is an implementation of the About page which will provide additional information about the Pucak Meru Temple, such as the important date of the temple's designation as the Kahyangan Jagat Temple, information on offerings and information regarding the stages of temple renovation.

b. Testing the System Usability Scale

The System Usability Scale (SUS) is a test method that is often used in assessing the usability of a system or product. This test aims to find usability problems, which affect when users interact with the system. Based on the assessment method on the system usability scale method and the calculation results obtained, it is concluded that this system has an Acceptability Ranges level in the Acceptable category. In addition, the Grade Scale is in category B, and the Adjective Rating is in the Excellent category.

4. CONCLUSION

The conclusion that can be drawn from the results of this study is that a 360 Degree Virtual Tour Application has been developed as a Website-Based Introduction Media for Pucak Meru Temple which can assist in the dissemination process and introduce the existence of Pucak Meru Temple to the wider community, using the Multimedia Development Life Cycle (MDLC) method.), then the application that has been built can be a guide for people who want to visit or pray at the Pucak Meru Temple, and can give the impression that the user has been at the Pucak Meru Temple by just looking at the monitor screen, and based on system testing using The heuristic evaluation that has been carried out has yielded quite good results such as a good interface design, ease of panoramic navigation and the existence of a user guide button and video tutorials that can make it easier for users to use this application. Furthermore, based on the results of testing the system usability scale that was given to 36 respondents with 10 statements, an average SUS score of 80 was obtained. So, from the results of testing the heuristic evaluation system and the system usability scale, it can be concluded that the 360 Degree Virtual Tour Application As Media The introduction of a website-based Pucak Meru Temple has met the usability standards that should be met from an application and can be used easily by users.

ACKNOWLEDGMENT

The author would like to thank Chancellor of ITB STIKOM Bali Dr. Dadang Hermawan, S.E., M.M., Ak., Mr. Ida Bagus Suradarma, S.E., M.Sc. as Deputy Chancellor I ITB STIKOM Bali, Mrs. Ni Luh Putri Srinadi, S.E., MM. Kom. as Deputy Chancellor II ITB STIKOM Bali, The leaders of Pucak Meru Temple, Kelian of Pucak Meru Temple and Pengempon of Pucak Meru Temple who have given permission and assisted in the research process, Parents, family, all friends and various parties who give prayers, help and support to the author.

AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

REFERENCES

- Argyriou, L., Economou, D., and Bouki, V. (2020). Design methodology for 360 immersive video applications: The case study of a cultural heritage virtual tour. *Personal and Ubiquitous Computing*, 24(6), 843-859.
- Bennett, J., A., and Saunders, C. P. (2019). A virtual tour of the cell: Impact of virtual reality on student learning and engagement in the STEM classroom. *Journal of Microbiology and Biology Education*, 20(2), 20.
- Chiao, H. M., Chen, Y. L., and Huang, W. H. (2018). Examining the usability of an online virtual tour-guiding platform for cultural tourism education. *Journal of Hospitality, Leisure, Sport and Tourism Education*, 23, 29-38.
- De Luca, V., Marcantonio, G., Barba, M. C., and De Paolis, L. T. (2022). A virtual tour for the promotion of tourism of the city of Bari. *Information*, 13(7), 339.

- Firdiarahma, F. (2021). The use of virtual reality as a substitute for the pre-school students' field trip activity during the learning from home period. *Indonesian Journal of Educational Research and Technology*, 1(2), 57-60.
- Heriyanti, K. (2019). Pura sebagai bentuk penerapan konsep ketuhanan saguna brahma. *Jnanasiddhanta: Jurnal Teologi Hindu*, 1(1), 56-62.
- Irwan, I., and Novianti, E. (2021). Virtual tour: Tourism communication media during the covid-19 pandemic in Indonesia. *Profetik: Jurnal Komunikasi*, 14(1), 135-150.
- Kabassi, K., Amelio, A., Komianos, V., and Oikonomou, K. (2019). Evaluating museum virtual tours: The case study of Italy. *Information*, 10(11), 351.
- Mah, O., B., P., Yan, Y., Tan, J., S., Y., Tan, Y., X., Tay, G., Q., Y., Chiam, D., J., ... and Feng, C., C. (2019). Generating a virtual tour for the preservation of the (in) tangible cultural heritage of tampines Chinese temple in Singapore. *Journal of Cultural Heritage*, 39, 202-211.
- Martínez-Graña, A. M., Goy, J. L., and Cimarra, C. A. (2013). A virtual tour of geological heritage: valourising geodiversity using google earth and qr code. *Computers & Geosciences*, 61, 83-93.
- Nata, G., N., M., Anthony, S., and Yudiasra, P., P. (2021). Knowledge discovery and virtual tour to support tourism promotion. *IAIC Transactions on Sustainable Digital Innovation (ITSDI)*, 2(2), 94-106.
- Ngongoloy, B., R., Rindengan, Y., D., and Sompie, S., R. (2018). Virtual tour instansi pemerintahan kabupaten minahasa tenggara. *Jurnal Teknik Informatika*, 13(1), 1-6.
- Rasim, R., Rosmansyah, Y., Langi, A.Z., and Munir, M. (2021). Immersive intelligent tutoring system for remedial learning using virtual learning environment. *Indonesian Journal of Science and Technology*, 6(3), 507-522.
- Riyadi, S., and Nurhaida, I. (2022). Aplikasi sistem virtual tour e-panorama 360 derajat berbasis android untuk pengenalan kampus mercu buana. *Jurnal Teknologi Informasi dan Ilmu Komputer*, 9(1), 17-24.
- Wibawa, M. I., and Budiasa, I. G. S. (2018). Pengaruh kebijakan pemerintah, partisipasi masyarakat dan kewirausahaan terhadap kualitas destinasi wisata pura taman ayun. *E-Jurnal Ekonomi dan Bisnis Universitas Udayana*, 7(4), 1051-1078.
- Yang, T., Lai, I., K., W., Fan, Z., B., and Mo, Q., M. (2021). The impact of a 360 virtual tour on the reduction of psychological stress caused by covid-19. *Technology in Society*, 64, 101514.
- Zhu, J., and Cheng, M. (2022). The rise of a new form of virtual tour: Airbnb peer-to-peer online experience. *Current Issues in Tourism*, 25(22), 3565-3570.