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Implementation of Virtual Tours Using Web-Based 360° Panoramas at The Faculty of Engineering, University of Islam Riau

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A B S T R A C T

The development of digital technology has opened up great opportunities for delivering campus information virtually. This study aims to develop and implement a 360° panorama-based virtual tour system at the Faculty of Engineering, Riau Islamic University, to provide an interactive overview to prospective students and the general public without having to visit the location directly. This system was developed using the Multimedia Development Life Cycle (MDLC) method, which consists of six stages: Concept, Design, Material Collecting, Assembly, Testing, and Distribution. The results of the study show that this web-based virtual tour system is capable of displaying various campus facilities, such as buildings, laboratories, halls, and lecturer rooms virtually. Evaluation using the Black Box method and questionnaires to users provided positive results, with the majority of respondents feeling helped and satisfied with the information conveyed through the system. It is hoped that this system will become an effective and efficient digital promotion and information medium for the Faculty of Engineering at UIR.

1. Introduction

The rapid development of digital technology has brought about various innovations that can facilitate the delivery of information quickly, accurately, and interactively. In the world of education, technology is no longer just a tool, but has become the main medium in supporting the process of promotion, socialization, and delivery of information to prospective students. Optimal use of technology enables educational institutions to reach a wider range of prospective students and provide a realistic picture of the campus environment and available facilities (Maulana et al., 2020).

The University of Riau (UIR) is one of the oldest universities in Riau Province under the auspices of the Riau Islamic Education Foundation (YLPI). The UIR Faculty of Engineering has six study programs that require a more interactive promotional approach to reach a wider range of prospective students (Adrianto, 2022).

A web-based virtual tour system is a relevant and innovative solution. This system provides a virtual campus exploration experience with easy and flexible access, so that prospective students and the general public can see various facilities such as classrooms, laboratories, and halls without having to visit the location directly.

Promotions using conventional media such as brochures or pamphlets have limitations in terms of space, cost, and difficulty in updating. This makes virtual tours an effective option that can convey campus information in a more realistic and interesting way (Satya et al., 2024) (Muawwal et al., 2021).

Virtual tours allow users to explore a location through immersive 360º panoramic images. This technology provides a realistic interactive experience, as if the user were actually at the location (Adestaria, 2023). In addition, virtual tours also serve as an effective promotional medium in reaching a wider audience (Gordon, 2019).

In this study, a web-based virtual tour system was developed for the UIR Faculty of Engineering using the Multimedia Development Life Cycle (MDLC) method, which consists of six stages: Concept, Design, Material Collecting, Assembly, Testing, and Distribution. 360° panoramic images were taken from various locations such as Buildings A to D, laboratories, and other supporting areas.

2. Method

This study uses the Multimedia Development Life Cycle (MDLC) method. The Multimedia Development Life Cycle (MDLC) method is the method that will be used in this study to develop a virtual tour system using 360° web-based panoramas at the Faculty of Engineering, Riau Islamic University (FT-UIR). MDLC is a multimedia software development method consisting of six stages, including: concept, design, material collecting, assembly, testing, and distribution.

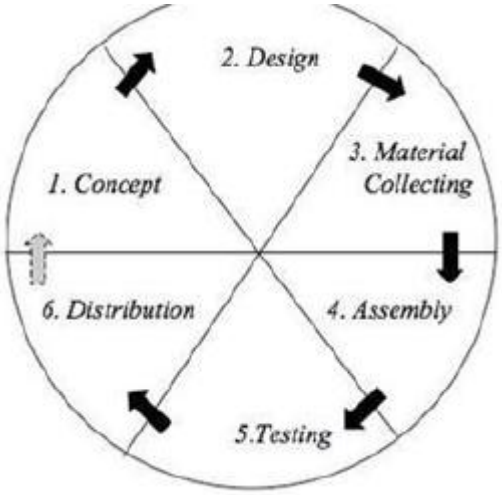

Figure 1. Main Menu of the Application

2.1. Research Location and Object

The research was conducted at the Faculty of Engineering, Riau Islamic University. The object of the research was a *virtual tour* information system that displays a 360° panorama of various building facilities.

2.2. Data Collection Methods

In the process of creating a *virtual tour* system at the Faculty of Engineering, Riau Islamic University, the author required accurate supporting data. Therefore, the author applied several data collection methods as follows.

a. Documentation

The documentation method in the research on the Implementation of a *Virtual Tour* Using a 360° Panorama Based on the *Web* at the Faculty of Engineering, Riau Islamic University was used to collect various photos of the facilities and environment at the Faculty of Engineering, Riau Islamic University, such as collecting images of facilities and the environment at the Faculty of Engineering, including classrooms, laboratories, parking lots, and other public areas. These photos will be used as the main material for creating a 360° panorama.

b. Observation

The observation method was used to obtain a real picture of the existing environment and facilities, such as observing the layout and structure of buildings, where the Faculty of Engineering has 4 buildings, including Building A, Building B, Building C, and Building D, laboratories, classrooms, parking lots, and other areas. In addition to observing the layout and structure of the buildings, it is also necessary to pay attention to the accessibility of the Faculty of Engineering, such as entrance routes, directional signs, and other supporting facilities.

c. Literature Study

The literature study method is a data collection technique by reading literature from relevant journals or information sources to support the research. In this study, we studied previous research related to the implementation of *virtual tours*, reading books, journals, or articles that explain the *Multimedia Development Life Cycle* (MDLC) method to understand each stage of multimedia development that will be used in the research.

2.3. System Development Method

The system was developed using the Multimedia Development Life Cycle (MDLC) method, which consists of six stages, namely:

1. *Concept*

The first stage in using the MDLC method is *Concept*, which is the stage of determining the objectives, main ideas, and scope of the multimedia project to be created. Therefore, the main objective of this study is to develop a web-based virtual tour system that can visually introduce the environment and facilities of the Faculty of Engineering, Riau Islamic University to prospective students, the community, and visitors.

2. *Design System* (User Design)

The second stage is to design the visual appearance and technical structure of the system so that it is easy to use and attractive to users. At this stage, the user interface (UI) is designed so that users can explore the location comfortably, for example through navigation features and interactive hotspots for each building. Flowcharts, such as flowcharts, use case diagrams, and activity diagrams, are used to describe the overall work process of the system. In addition, the database structure is designed to store image data, facility information, and virtual tour navigation.

3. *Material Collecting* (Data Collection)

This stage focuses on the process of collecting all the material needed for research purposes. In this study, 360° panoramic images were taken using a special camera or the *photo sphere camera foxfoi* application. The images were taken at specific locations within the Faculty of Engineering that had been determined in advance. After that, the 360° panoramic images that have been taken will be processed in 3sixty software, which is an application for panorama processing, which can produce complete and high-quality panoramic images. The 3sixty application also provides several hotspots that will be used in panorama processing. In addition to 360° panoramic images, additional data such as facility descriptions, room names, and other supporting information are collected to complete the virtual tour system.

4. *Assembly* (Creation)

In the *assembly* stage, the tool used to build the *virtual tour* is the *3sixty* application. The steps taken at this stage include:

a. Create a new project by naming the project, then specify the project directory and press the create button.

b. Importing the previously captured 360° panoramic images into the panoramas feature.c. Setting the action and position of the hotspot. This setting allows the hotspot to function as a navigation button to the next panorama, displaying images, information, and other interactive functions.

d. Navigation Creation: Hotspots between rooms and buildings are created to allow users to move locations interactively.

e. After that, the processed panoramas are integrated into a web-based platform using HTML5, CSS, and PHP.

5. Testing

During testing, ensure that the hotspots function properly so that room information appears according to the location clicked. Once functioning properly, testing can be performed in browsers such as Chrome and also on desktop and mobile devices. Finally, performance testing ensures that panoramic photos load quickly without compromising visual quality.

2.4 Support

Development of a *Virtual Tour* Implementation System Using 360° Panorama Based on the *Web* at the Faculty of Engineering, Riau Islamic University, using the MDLC method supported by a combination of specific hardware and software specifications. In terms of hardware, this system was developed using a Laptop-6MHOUE02 powered by an Intel® Celeron® N4000 CPU @ 1.10GHz with 8.00 GB of RAM (7.83 GB usable). The operating system runs on a 64-bit architecture, Oppo A92 with a Qualcomm® Snapdragon™ 665 processor and 8.00 GB RAM, as well as the CPH2059 model with IMEI & IP status. Meanwhile, for software, this system is built using *3sixty*, specifically *3sixty Web Tour Maker Version* 1.2.2 *Made with: Node.JS, Panolens.JS.* and *Photo sphere camera foxfoi* with version 1.1.1. The programming languages used include PHP, HTML, CSS, *JavaScript,* and *SQL*. Database management utilizes MySQL, which is integrated with XAMPP.

3. Results and Discussion

3.1. Implementation of System Page Display

a. Dashboard Page

Figure 2. Main Menu of the Application

b. Display Admin Login

Figure 3. Login Page

c. Browse View Virtual Tour 360°

This page is the starting point for users to explore the environment of the Faculty of Engineering, Riau Islamic University, *virtually*. Users can select the location or building they want to explore through the *dropdown* menu. A 360° panoramic view will appear after the location is selected, complete with navigation features and interactive *hotspots* that provide detailed information about each location.

Figure 4. Browse View Jelajahi *Virtual Tour 360°*

d. Drop-Down Display Building A

This image shows a 360° panoramic view of Building A at the Faculty of Engineering, Riau Islamic University. Users can explore the room interactively using directional navigation. Additional information about the building's functions, facilities, and room names is provided through the hotspot feature.

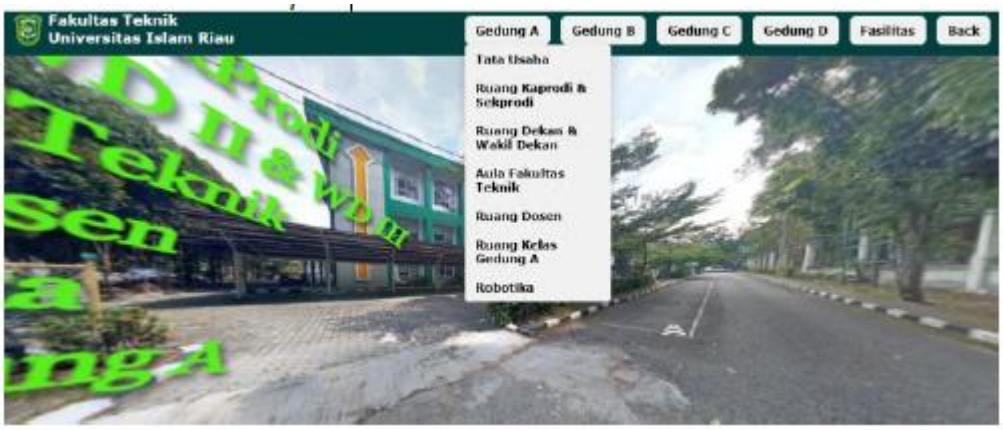

Figure 5. Drop-Down Display Building A

3.2 System Testing Implementation

The system testing used in this study employed the *black-box* and *white-box* methods as well as the *User Acceptance Test* (UAT) method. The testing was conducted using a questionnaire. The results of the *black-box and white-box* testing showed that the *virtual tour* functioned well, as both tests were able to find buildings and facilities at the Faculty of Engineering, Riau Islamic University, *virtually*. The virtual tour of the Faculty of Engineering at the Islamic University of Riau was tested using black-box testing, which involved filling out a questionnaire with 13 questions for 48 users who had already viewed the website. From the results of filling out the questionnaire, there were several notes and suggestions where many users said that the Riau Islamic University Faculty of Engineering virtual tour system was very helpful in finding out the location of each building and laboratory of all study programs as well as the facilities at the Riau Islamic University Faculty of Engineering.

Table 1. Table of Questionnaire Results from Those Who Have Viewed the Website

No	Question	Answer					Result
		STS	TS	N	S	SS	
1	The virtual tour website is easy to use and navigate.	0	0	3	18	27	48
2	I was able to find the Riau Islamic University Faculty of Engineering Laboratory on the website.	0	0	3	17	28	48
3	Campus facilities such as classrooms, laboratories, and gardens are clearly displayed.	0	0	3	22	23	48
4	I feel more familiar with the campus after viewing the website.	0	0	6	20	22	48
5	This website helped me make the decision to choose the Faculty of Engineering at UIR.	0	1	9	22	16	48
6	The information presented in the virtual tour covers all study programs at the Faculty of Engineering at UIR.	0	0	2	20	26	48
7	The 360º panoramic visual display on this website provides a realistic picture of the campus environment.	0	0	1	18	29	48
8	After seeing this website, I feel that it is not really necessary to visit the campus in person.	0	1	5	24	18	48
9	This website provides an interesting and interactive experience when I explore it.	0	0	3	24	21	48
10	I will recommend this website to my friends or other prospective students.	0	0	2	16	30	48
11	The instructions for using the website are easy to understand.	0	0	2	21	25	48
12	I feel more confident in choosing the Faculty of Engineering at UIR after seeing the virtual tour.	0	0	4	25	19	48
13	This website can be an effective promotional tool to attract new prospective students.	0	0	0	20	28	48

Table 1 above shows the table for those who have not seen the *website*, which has forty-eight (48) *user* responses and based on the average score calculation of 4.42 or 88.4%, this value is in the range of 4.21 – 5.00 with the interpretation of strongly agree. The results show that the *virtual tour* introduction system for the Faculty of Engineering at the Islamic University of Riau that has been evaluated has received very good acceptance from respondents, with a high level of satisfaction. However, in order to maintain and improve the quality of the system, continuous evaluation and refinement based on more detailed feedback from respondents is needed.

4. Conclusion

Based on the results of research and development of a 360° panoramic web-based Virtual Tour system at the Faculty of Engineering, Riau Islamic University, it can be concluded that this system was successfully developed using the Multimedia Development Life Cycle (MDLC) method, which includes six stages: concept, design, material collecting, assembly, testing, and distribution. This web-based application allows users to explore the Faculty of Engineering environment interactively and informatively. Functionality testing using the Black Box method showed that all system features, such as dropdown navigation, panorama image retrieval, and responsive display, functioned as expected without any functional errors. In addition, program logic structure testing using the White Box method with a control flow and decision coverage approach proved that all program logic paths ran well, with no errors or dead code found. The result of this Virtual Tour system is to provide access to campus information without the need to be physically present, to provide an interactive visual exploration experience through 360° panoramas, and to become an effective and efficient digital promotional medium for the UIR Faculty of Engineering. This system can also be accessed anytime and anywhere by prospective students and the general public, with positive responses from users who find the system useful. Overall, this system is suitable for use as a digital-based campus information and promotion medium, with validation showing that the system functions well, is positively received, and provides tangible benefits for the institution and users.

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