Analysis of Raspberry Pi Utilization Control System as a Web Server for Remote Electric Current Controller

Aulia Ichsan[1], Rico Wijaya Dewantoro[2]
[1]Department of Information Systems, Universitas Deli Sumatera, Indonesia
[2]Department of Information Technology, Universitas Prima Indonesia, Indonesia

ABSTRACT

Nowadays, the use of electric current used by companies, industries and the community is increasing rapidly. Buildings, buildings and industries sometimes still have their electrical devices on until morning even though working hours have ended. This is because people are negligent in turning off electronic devices. Manual control of electronic devices is one of the causes of users being negligent in saving electrical energy. For this reason, the community needs tools and solutions to overcome electricity savings. The results of the research conducted are a remote electric current control system using a raspberry pi and a web server. The working principle of this system is to control electronic devices remotely via a website that is accessed using the internet.

Keyword : WEB Server; Raspberry Pi; Electronics; PHP; Database

Corresponding Author:
Aulia Ichsan
Department of Information Systems
Universitas Deli Sumatera
Jl. Jenderal Besar Abdul Haris Nasution No 11 CDE, Pangkalan Masyhur, Kec. Medan Johor, Kota Medan, Sumatera Utara 20143
Email : auliaichsan15@gmail.com

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1. INTRODUCTION

As the population, educational facilities, and companies increase, the use of electricity increases. Users rarely pay attention to the amount of electricity they use. It is not uncommon to find electronic devices that are still on outside of working hours, even until the morning and the next day. This causes a waste of electricity. In overcoming these problems, it is necessary to save electricity systematically. One of the things that can be done is by building a remote control system and controller of electrical devices using the internet.

The presence of this control system can make it easier for users to save electrical energy. So users no longer need to manually turn ON-OFF. Users can control electrical devices remotely.

This Raspberry Pi is a tool to monitor the temperature of the WEB-based server room and a webcam to monitor the server room. Which later this Raspberry Pi can run commands and send them to the database. With this control system, it can help and make it easier for users to save electricity.

2. RESEARCH METHOD/MATERIAL AND METHOD/LETERATURE REVIEW

The stages of research carried out are:

a. Problem Identification
   Problem identification is the initial step in research that aims to help users in controlling electricity usage.
b. Problem Analysis
   At this stage, an analysis is carried out on the needs of the research object, as well as analyzing the elements needed by the research object.
c. Results and discussion
   The results and discussion in this study will be carried out
   after completing the analysis stage using the results of the stage. The results and discussion aim to check whether or not the implementation carried out is in accordance with the results of the previous stage.
d. Conclusion

This stage will produce information about the results of the system and design that have been built.

This study conducted a control system utilizing raspberry pi as a web server for remote electric current controllers in umsu environment. The research method used is literature study. Deepening the concept of a proposition by collecting literature related to the method using basic/pure research. The data collection method used to build software is the library research method through books related to the software to be built. Conducting an analysis of the existing system so that the information obtained provides a clear picture of the materials needed in making the basic framework for designing and building related to network monitoring.

3. RESULTS AND DISCUSSION

Discussion

Raspberry pi is a tool in the form of a single-board computer the size of a credit card. In which there are inputs and outputs that can be used to be directly connected to electronic components. So that it makes it easier for the system to design its software.

Ongoing Analysis

Analysis of the running system is an activity to analyze the work procedures that are currently being used. This mechanism will show how the system cycle works and the direction and targets that are being aimed for. This system analysis is intended to be able to improve.

Analysis of the Planned Design

The difference between the old procedure and the new procedure that we will propose, namely:

1. In each room, a remote electric current control system will be installed using a raspberry pi as a web server that is designed according to what will be used. This is done so that the room is used by maximizing conditions.
2. With the use of technology that is maximized, it is hoped that it can help the work process and make it easier to control the process of activities, evaluate the activities of the process.

Hardware and Software Equipment

To implement this system, several hardware and software are needed, including:

1. Raspberry Pi
   Raspberry is a device that functions as a web server in this study.
2. Arduino Uno Rev 3
   Arduino Uno Rev 3 is a microcontroller device that functions to control the lamp device.
3. Serial Cable
4. Raspbain OS
5. Apache
6. MySQL
7. Arduino_IDE
8. Notepad ++
9. PHP Programming Language

Web Server Hardware Design

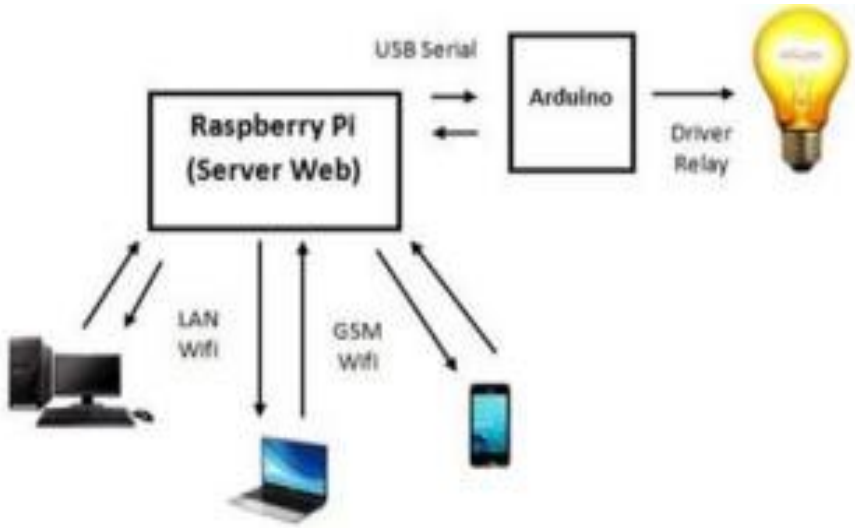

Figure 1. WEB Server Series

The working of the WEB server circuit in Figure 1 can be interpreted as acting as a user. The user can perform the action of "Turning on and Off" the lamp via WEB. WEB is embedded in the raspberry pi server. In addition to being able to "Turn on and Off" the lamp, the user can also monitor the lamp device. The user can carry out a two-way communication system with the Web Server in the form of controlling and monitoring using the web that has been embedded in the raspberry pi. Then the user can perform actions by clicking or sending commands via the web server, then the web server will send commands to the arduino uno via the serial port on the raspberry.

Testing and Implementation Test

WEB Server Testing

This test aims to see whether the web server system is really working or not. A website has been embedded in the server that can be used to control the lights remotely. On the web page, 3 buttons have been created to turn the lights off and on. If the "Turn off" button is pressed, the web sends a command via the server to the serial port on the raspberry.

Figure 2 shows the display of the lights that are turned on.

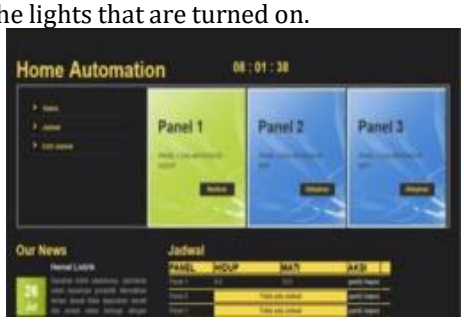

Figure 2. Web page lights on/off

In the test, the lamp has been tested three times manually and by scheduling. Table 1 shows the manual lamp testing.

Table 1 Manual ON-OFF Testing of Lamps

No	Panel	Lamp 1	Lamp 2	Lamp 3
1	Panel 1 Turn on	On	Off	Off
2	Panel 1 Turn off	Off	Off	Off
3	Panel 2 Turn on	Off	On	Off
4	Panel 2 Turn off	Off	Off	Off
5	Panel 3 Turn on	Off	Off	On
6	Panel 3 Turn off	Off	Off	Off

The table shows good results, namely the system is running as it should, namely when you click "Turn on" the light will be ON and when you click "Turn off" the light will be OFF, this applies to Panel 1, Panel 2, and Panel 3. While in the ON-OFF test the lights are automatically scheduled as shown in Table 2.

Table 2. On-Off Lamp Testing Table With Scheduling

No	Panel	Lamp 1	Lamp 2	Lamp 3
1	Panel 1 Turn on	On	Off	Off
2	Panel 1 Turn off	Off	Off	Off
3	Panel 2 Turn on	Off	On	Off
4	Panel 2 Turn off	Off	Off	Off
5	Panel 3 Turn on	Off	Off	On
6	Panel 3 Turn off	Off	Off	Off

In the table, the test results also show good results, such as when testing manually, the system runs as it should, that is, if you press "Turn on" the light will turn ON and if you press "Turn off" then the light will turn OFF, this also applies to Panel 1 , Panel 2 and Panel 3.

Response Time Testing

Response time testing to requests is done to determine the length of the system's response time to requests from users. The length of time is calculated using the PHP code source installed on the web. The response time testing mechanism is by measuring the length of time when the lights start to be executed or the lights are off. This response time testing is done 3 times each for the response time when the lights are executed ON and the response time when the lights are executed OFF in manual or automatic conditions with scheduling, for the response time measured at a distance of 1 meter from the system with the results shown in Table 3 and Table 4.

From the test result table 3 and 4 then averaged with the following results. When manual, the highest response time is when panel 2 is ON which is 1.484 seconds and the lowest is when panel 3 is ON which is 1.386 seconds. Then when the system runs automatically with scheduling, the highest response time when panel 2 is ON is 1.481 seconds and the lowest when panel 3 is ON is 1.381 seconds. Meanwhile, for more details, the test results of the average response time with a distance of 1 meter can be seen in Figure 3.

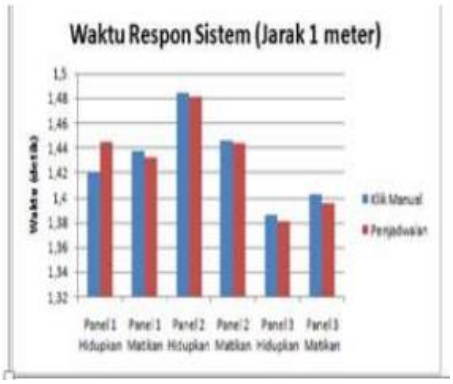

Figure 3. Average Response Time Graph During Manual

Figure 3 shows the graph of the average response time manually and automatically using scheduling with a distance of 1 meter from the system. While for testing with distance variations is done with wifi communication on raspberry, the distance variation is determined between 1 meter to 35 meters with multiples of 2 meters and with conditions without obstacles.

4. CONCLUSION

Based on the results of the research and discussion, the following conclusions were obtained: 1. Monitoring of lights is done either manually or automatically with scheduling using a WEB server. 2. To control and monitor the system, WEB is used as an interface embedded in the server. 3. The action of the lights turning on and off runs well according to the instructions from the WEB and the average system response to each command request, both manually and automatically with scheduling, is 1.429 seconds. 4. With the same results in the two conditions, there is consistency in the response time of the system. Meanwhile, for testing with distance variations, it was found that distance does not affect the system response time.

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