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IMPLEMENTATION OF THE INTERNET OF THINGS (IOT) FOR REMOTE LIGHT CONTROL USING NODEMCU ESP8266 AND THINGSPEAK VIA WEBSITE-BASED INTERNET

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Abstrak

Saat ini keberadaan internet berdampak pada interaksi masyarakat, kehidupan sosial, komunikasi dan budaya. Internet menghubungkan banyak perangkat, salah satunya adalah lampu. Lampu merupakan alat penunjang kehidupan yang berperan penting sebagai pengganti sinar matahari. Saat ini penggunaan lampu di masyarakat dirasa kurang efektif dan penggunaan lampu seringkali terabaikan. Sering dijumpai lampu yang menyala tetapi tidak digunakan (boros). Di sisi lain, proses mematikan dan menyalakan lampu secara manual sangat merepotkan sehingga hanya membuang-buang waktu. Oleh karena itu dibuatlah sistem kontrol lampu dan sistem yang dapat memantau penggunaan lampu secara lebih efektif dan efisien dengan menggunakan Internet of Things (IoT). Internet of Things didefinisikan sebagai interkoneksi perangkat komputasi tertanam, dan interkoneksi ini diidentifikasi dengan adanya infrastruktur Internet. Dengan adanya sistem ini diharapkan dapat mengatasi permasalahan dalam mengetahui kondisi dan pengendalian lampu dari jarak jauh menggunakan Nodemcu Esp8266 dan Thingspeak Melalui Website Berbasis Internet. Dalam penelitian ini, peneliti menggunakan Experiments sebagai metode penelitian dan SDLC sebagai metode pengembangan perangkat Internet of Things (IoT). Hasil dari penelitian ini adalah sistem kontrol lampu (LED) berbasis website menggunakan NodeMCU ESP8266, Thingspeak, dan Arduino IDE.

Kata Kunci: *Internet of Things (IoT), website, Nodemcu Esp 8266, IDE Arduino Thingspeak*

Abstract

Currently the existence of the internet has an impact on community interaction, social life, communication and culture. The internet connects many devices, one of which is lights. The lamp is a life support tool that plays an important role as a substitute for sunlight. Currently, the use of lamps in society is considered less effective and the use of lamps is often neglected. Often found lights that are on but not used (wasteful). On the other hand, the process of turning off and turning on the lights manually is very inconvenient, so it is a waste of time. Therefore, a lamp control system and a system that can monitor the use of lamps are made more effectively and efficiently using the Internet of Things (IoT). The Internet of Things is defined as the interconnection of embedded computing devices, and this interconnection is identified by the existence of the Internet infrastructure. With this system, it is expected to be able to overcome problems in knowing the conditions and controlling lights remotely using Nodemcu Esp8266 and Thingspeak Via Internet-Based Website. In this study, researchers used Experiments as a research method and SDLC as a method of developing Internet of Things (IoT) devices. The result of this research is a website-based light control system (LED) using NodeMCU ESP8266, Thingspeak, and Arduino IDE.

Keywords: *Internet of Things (IoT), website, Nodemcu Esp 8266, Thingspeak Arduino IDE*

1. Introduction

Lamps are a very important source of light in replacing sunlight. Currently, the use of lamps in the community is considered less effective, and the use of lamps is often neglected. Cases are often found, such as lamps that are lit but not used (wasteful). On the other hand, the process of turning off and turning on the lights manually is very inconvenient, so it is a waste of time. Therefore, it is necessary to create a lamp control system and a system that can monitor the use of lamps to be more effective and efficient. The internet

is part of the rapid development of technology in today's society, so it can be used as a medium of communication and control of devices remotely as long as they are still connected to each other. Internet of Things (IoT) is the development of network communication between objects. These objects are related to each other, connected to each other through internet communication and data exchange, which can then be transformed into information. The Internet of Things (IoT) is a combination of networks connected to machines or other devices that send and receive data over a network connection. Internet of Things is a technology that requires the operation, cooperation of hardware, and files over the Internet(Artono & Putra, 2019). Internet of Things (IoT) can be used in large homes by controlling electronic devices (such as indoor lights that are controlled remotely using internet communication) without worrying about the rapid development of technology that is very fast, easy to understand and apply in everyday life. -day. For example, in the development of technology that can be used with a connected internet network, using a mobile phone (i.e. android smartphone), it is easy to control or operate household appliances, such as lights, in every room in the house online. Therefore, users can more easily turn on and off lights remotely in conditions of a good internet connection. This remote control is able to make it easier for users to control building lights remotely.

Many researches related to smart home have been carried out, including research on the design and implementation of Wi-Fi-based smart home systems(Arafat, 2017), home security detectors via telegram messenger, designing and making smart home systems that can be accessed anywhere based on IoT. [3], the implementation of the NodeMCU ESP8266 smart home wifi module(Turesna et al., 2018). In this study, [6] discusses the design of an Internet Of Things (IoT)-based home security system, utilizing Telegram Messenger and Raspberry Pi Mini Computers. Based on several previous studies that have been stated, the research still has shortcomings where the IoT-based lamps in the study still cannot be controlled or controlled remotely. Based on the explanation above, the author wants to implement NodeMCU Esp8266 in making a control system tool to turn on and turn off lights remotely based on a website using an internet connection. NodeMCU is a versatile wifi module because it is equipped with GPIO, ADC, UART and PWM. In this journal the NodeMCU ESP8266 functions as a client and light controller. The ESP8266 NodeMCU will receive input from the user to control the lamp according to the lamp conditions specified by the user at the beginning, then send the lamp condition data to the server and receive data from the server to determine the active lamp. While on the server side, it will display information from the current status of the light conditions. This server-side website uses the PHP programming language and Thingspeak as an API for storing and retrieving data from things that use HTTP over the Internet. The manufacture of this lamp control system tool also uses the Arduino IDE. With the tool that will be designed, it is expected to be able to develop the ability to use electrical power and develop the usability of human work and even more time efficiency.

2. Research Method

This research was conducted using the Experiment method as a research method and SDLC (Software Development Lifecycle) as a method for developing a Web-based remote light control system. SDLC was chosen as the method in this research because this method is used to develop complex information technology systems. Complex technology systems need to be analyzed by people who are experts in their fields so that problems can be solved and the needs of system users can be identified correctly. Based on the SDLC stages that are carried out oriented to indicators of success in connecting the NodeMCU ESP8266 module with lights (LEDs) and other devices so that they can be used to solve multi-objective problems. To achieve these indicators, the stages of this research are as follows:

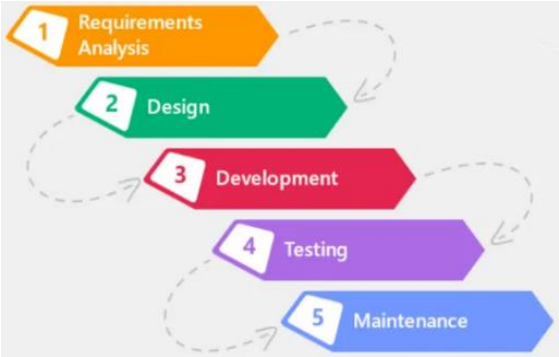


Figure 1. SDLC Stages

1. Needs Analysis.

In this case, the need to analyze the problems to be researched regarding the Website-based remote light control system as well as all the needs in researching both

from journals, literature books, tools and materials.

2. System Design Design

Design a tool to be built using the NodeMCU ESP8266 module, breadboard, male-to-male jumper cables, resistors, and lights (LED).

3. System programming.

Creating programs using Arduino IDE 1.8.13 and Thingspeak.

4. Tool testing.

Testing tools with program code created and internet connection.

A. Functional Needs Analysis

Analysis of functional requirements is a type of requirement that contains any processes that can be carried out by the system. Functional requirements also contain what information must exist and be generated by the system. The following functional requirements contained in the system to be built :

1. Users can turn on the lights remotely using a smartphone or other internet-connected device by accessing the domain
2. Users can turn off the lights remotely using a smartphone or other internet-connected device by accessing the domain
3. Officers can monitor the condition of the 2 lights (LED) by opening a browser and accessing the Thingspeak web server.

Materials and equipment needed in the manufacture of a Website-based remote light control system on the Internet of Things (IoT) include Hardware (Hardware) in the form of NodeMCU ESP8266, Breadboard, male-to-male jumper cable, 220 ohm resistor, LED, Smartphone/PC and USB Drivers. Software consists of Arduino IDE, Fritzing, Visual Studio Code, Thingspeak (web server).

B. System Design

System design is a system proposed by researchers based on a review of the literature study and site survey conducted in the previous stage. The design of this system is done by system planning, system implementation and system testing. To make it easier to design and create an Internet Of Things (IoT) application system for light control using the NodeMCU Esp8266 and Thingspeak based on this website, the System Block Diagram is designed as follows:

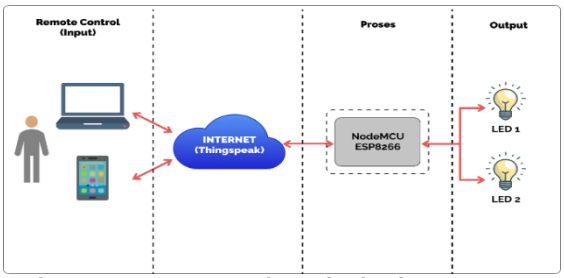


Figure 2. System Design Block Diagram

C. Hardware Configuration

The overall control system hardware configuration can be seen in Figure 3.

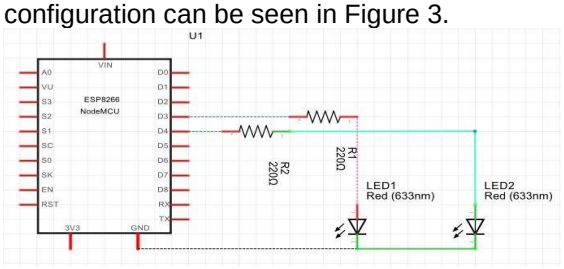


Figure 3. System Hardware Configuration

D. System Flowchart

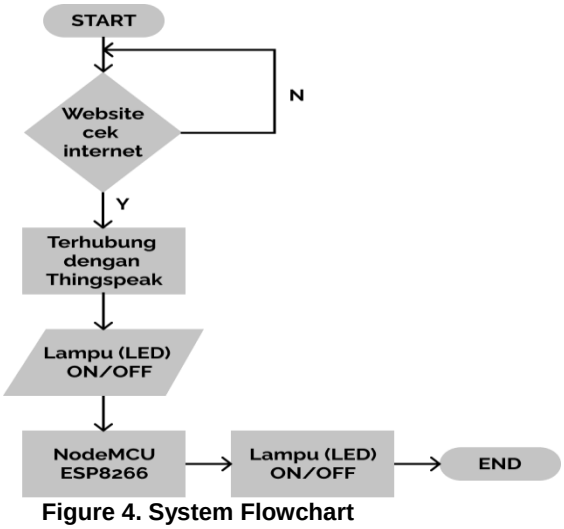


Figure 4. System Flowchart

3. Result and Discussion

This section will explain the process of making equipment from the application of the Internet of Things (IoT) for remote control of lights using the NodeMCU Esp8266 and the website-based Thingspeak.

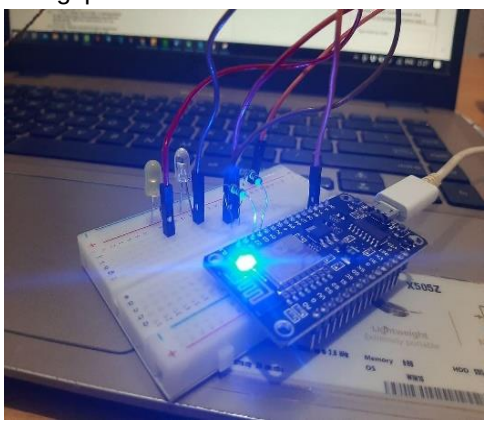


Figure 5. IoT lamp control circuit

After the hardware circuit has been designed, the next process is to create a project on the thingspeak.com platform.

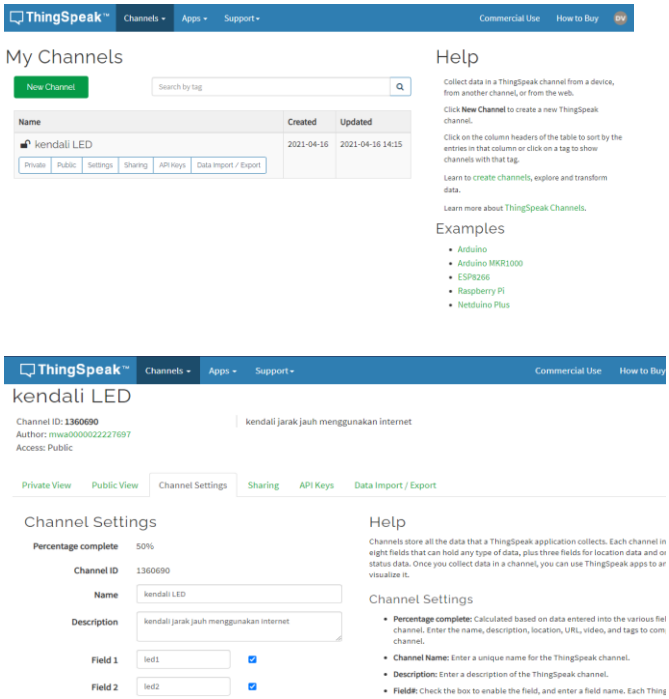


Figure 7. Creating a Project on Thingspeak.com

After creating a project on the platform, then programming is done using the Arduino language in the Arduino IDE

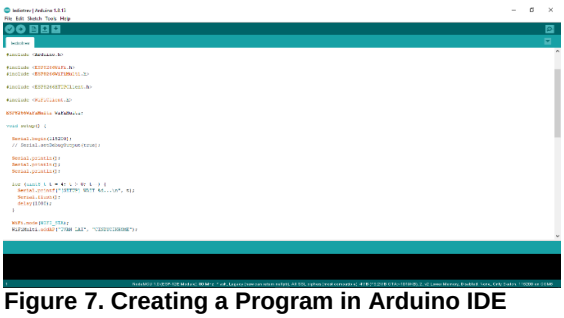


Figure 7. Creating a Program in Arduino IDE

After completing the program, the program is then tested. This test was conducted to determine the connectivity between the code on the Arduino IDE, Website and NodeMCU ESP8266. This test is done by connecting WiFi on an Android device with an ESP8266 connected to thingspeak. The IoT-based home control system on this website must be used in internet-connected conditions. the following are the stages of testing:

1. Website Functionality Testing

The design of this website is tested with the aim of knowing whether the visualization that occurs on the light button can run well according to the design. The test is done by pressing the light button in each field, then the lamp will respond with a color change to turn on or turn off the lamp as the last condition of the lamp. Figure 9 shows the initial view of the control menu on the website.

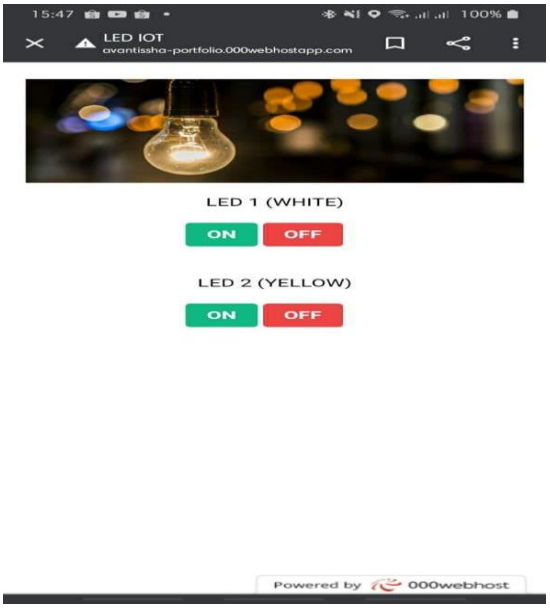


Figure 8. Initial Website Appearance

Table 1. Data on the results of website functionality testing

State	Succeed	Fail
Button Lampu1 menyala	Y	-
Button Lampu 1 mati	Y	-
Button Lampu 2 menyala	Y	-
Button Lampu 2 mati	Y	-

Table 1. shows the 2 light buttons and 4 color changes in the condition of the lights. There is no lamp that cannot change color. Existing conditions show the lights as expected.

2. Integration Testing between Website and NodeMCU ESP8266

This test is carried out with the aim of knowing if the ESP8266 NodeMCU is connected to the internet and the information sent by the website can work properly according to the design and the output of the ESP8266 NodeMCU can be displayed via a serial monitor display. On the website the button is pressed to turn the lights on or off.

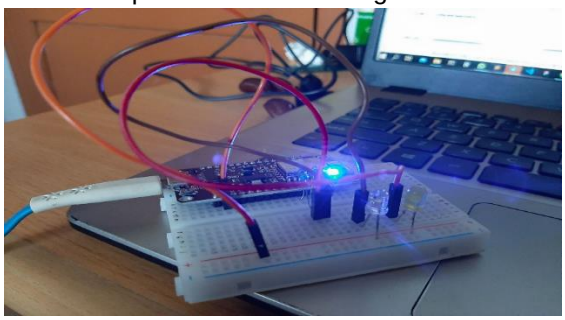


Figure 10. Test Results The lights are off on the serial monitor

Figure 10 shows the results of the system testing. The lights are off. This test shows that all channels can receive orders to turn off the lights.

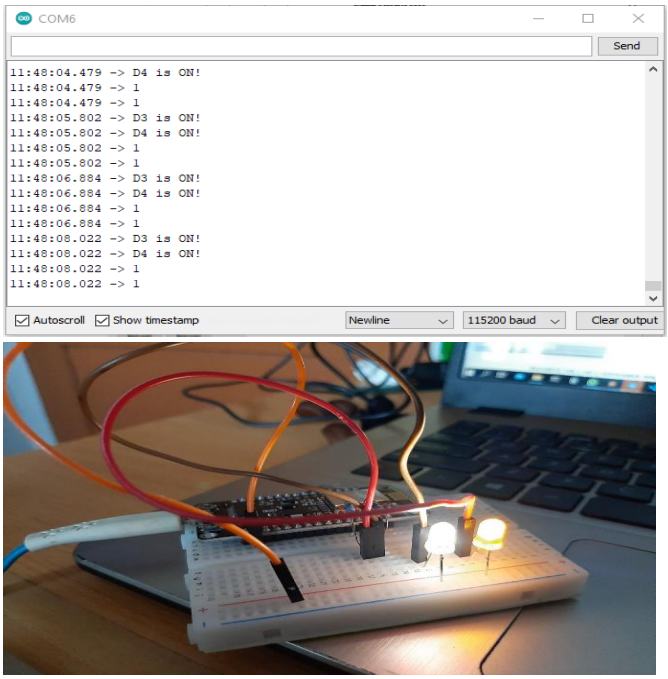


Figure 11. Test Results The light is on on the serial monitor

Figure 11 shows the results of the system testing. The lights are off. This test shows that all channels can receive commands to turn on the lights.

Table 2. Integration between Website and NodeMCU ESP8266

Keadaan	Berhasil	Gagal
Button Lampu 1 menyala	Y	-
Button Lampu 1 mati	Y	-
Button Lampu 2 menyala	Y	-
Button Lampu 2 mati	Y	-

Table 2. shows that the integration between the Website and the ESP8266 NodeMCU is very good. It can be seen from

Table 2, the data obtained on the website corresponds to the last condition of the lamp.

3. Overall System Test

This test is carried out by combining all the necessary parts from the website to the prototype and also according to the program contained in the NodeMCU ESP8266. When the device is powered on, the NodeMCU ESP8266 will wait for a command from the website. The interface on the website for the lighting device leads to the main controller in the form of the NodeMCU ESP8266. The main controller functions as the initiator of the website, so that lighting control is involved at the beginning and at the end of the system work process. Testing is done by accessing the website from any device and connected to the internet network. In the website program enter APIKeys and in the Arduino IDE program enter the Channel ID obtained from the web server (Thingspeak). After entering the Channel ID along with the APIKeys obtained from the web server on the website program and Arduino IDE, then save and select the upload menu on the Arduino IDE. After the upload menu is pressed, the condition of the light will indicate the state of the light is off as the initial initiation value and this can be seen from the serial monitor. On the website when the ON button is pressed on one of the lights, the light that was originally turned off will turn on which will send data to the web server to process the ESP8266 NodeMCU to get HIGH input, causing the lights to turn on light up. When the OFF button is pressed, the light conditions turn off which will send data to the web server to process the ESP8266 NodeMCU to get a LOW input, causing the lights to turn off. Test results on the device can be seen in Figure 12. when the device is not active.

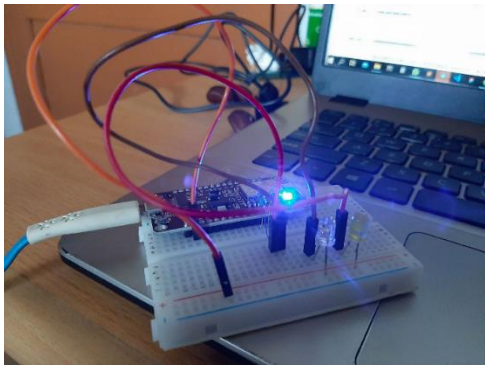
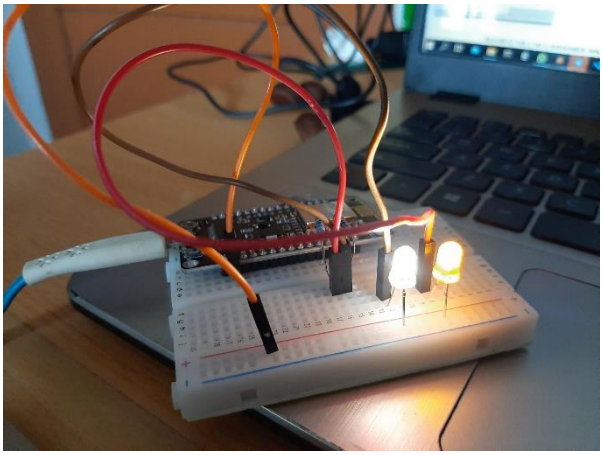
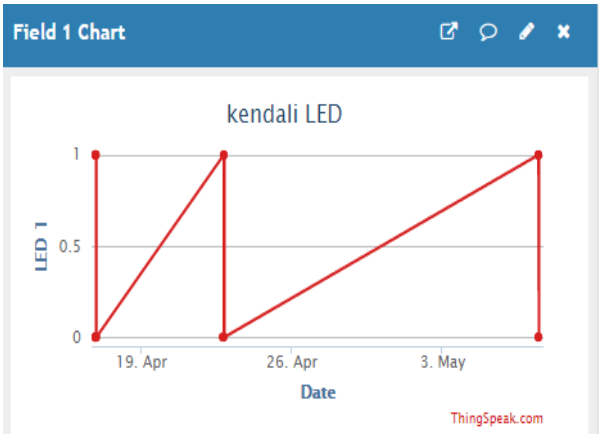


Figure 12. System Inactive

The test results on the device can be seen in Figure 13. when the control system is active or the NodeMCU ESP8266 is working properly according to the uploaded program.





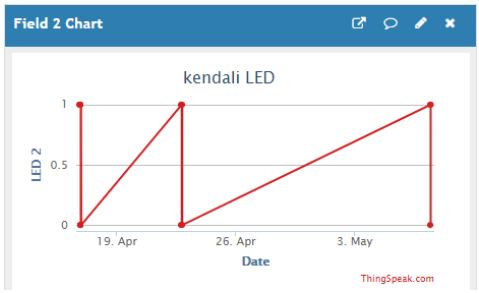


Figure 13. Active System

4. Conclusion

From the results of website testing, all the light buttons run according to the functions and orders to turn on or turn off the lights. Devices made can receive orders to turn on or turn off lights from the website one by one. The website can receive and send updates to the thingspeak.com web server and this system can make it easier for users to control existing lights remotely and can monitor the last condition of the lights.

With this website for remote control of lights, the use of lights will be more effective, efficient, and save electricity so there is no need to bother or waste time turning off and turning on the lights. With just one click on the website, the lights can be more easily controlled remotely (as long as they must be connected to the internet).

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