IOT-BASED REMOTE LIGHT CONTROL SYSTEM USING BOT TELEGRAM APPLICATION (CASE STUDY OF SMP AL WASHLIYAH CIREBON)

Syaiful Haq Al Furuqi*1, Muhamad Abu Hafsin2, Haryono3

1,3Teknik Informatika, Universitas Pradita, Indonesia
2Bisnis dan Ilmu Sosial, Universitas Amikom Purwokerto, Indonesia
Email: 1syaiful.haq@student.pradita.ac.id, 2mhafsin11@yahoo.com, 3haryono@pradita.ac.id

Abstract

Advances in technology nowadays could make it easier for human beings in order to save time doing work that is commonly done. Smartphones are currently developing rapidly, and at the moment social media applications can be used to emerge as remote controllers which could manage electronic devices remotely. This study objectives to construct an IoT-based remote light control system using the telegram application. The consequences of this have a look at are predicted to save the user's time to turn on or turn off the lights remotely. Users only need to open the telegram application, then select the bot constructed to control the lights, and be asked to press the available commands. The consequences of this study take a look at the telegram bot application can turn the lights on and off properly, this has a delay less than 60 seconds according to the connection used, for every command that is pressed from the telegram bot utility.

Keywords: *IoT, Lights Control, Smartphone, Telegram, Telegram Bot.*

1. INTRODUCTION

Technological advances are currently growing rapidly, from what initially mobile phones could only be used to send short messages using the Short Message Service (SMS), now SMS is almost not used at all, except for receiving One Time Password (OTP) pins, and switching to social media.

Reported by dataindonesia.id sourced from We Are Social, the number of active users of social media in Indonesia was 191 million people in January 2022, an increase of 12.35% from 170 million people in the previous year[1] as shown in fig 1.

Fig 1. Media social active users in Indonesia

Telegram is one of the most popular social media applications today. Quoted from uzone.id from Gizmo China, more than 6 million telegrams have been downloaded in Indonesia in January 2021[2], Then, as reported by databooks.katadata.co.id, the

Telegram application had 500 million users globally that year[3] as shown in fig 2.
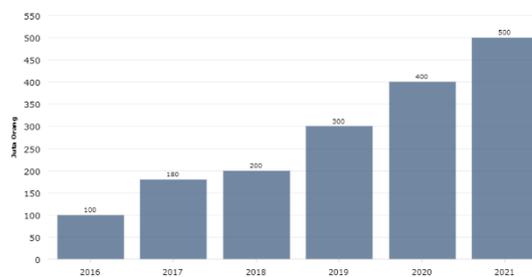

Fig 2. Telegram users global

Telegram is designed to make it easier for users to send text messages, images, audio, videos and files to each other[4], Telegram uses cloud technology, where all types of messages, text, images, audio, video, and files are stored in the cloud, so it can save memory from smartphones, and sending messages is faster[5], the advantages of Telegram compared with the other instant messaging such as WhatsApp is bot support, edit message that have been sent, open API, public group that can be contained up to 200.000 member, login on multiple devices, and there is a feature called Channel by default provided by Telegram to share any information such as broadcast message to subscriber of the channel[6].

Telegram is based on open source, which provides an Application Programming Interface (API) to be developed freely. There are 2 kinds of API, namely Instant Messaging (IM) telegram, and

telegram bot. IM telegram, the user has been provided with the source code to be developed, so they do not have to start from scratch again. Telegram bots allow users to create bots that will perform and respond to commands from users[7].

Internet of Things (IoT) is a concept aimed at expanding the utility of continuously connected internet connectivity[8], and is usually used to control objects that are connected to an electronic device remotely.

NodeMCU is an open source based IoT platform consisting of the Espressif System ESP series and firmware using the Lua scripting language, NodeMCU has combined ESP8266 into a board with various functions like a microcontroller[9], and has been integrated with the wireless fidelity (wifi) module, and has been equipped with a reset button, flash, and has a 3.3 V regulator IC type AMS1117 so that it can work with an input voltage of more than 5 V[10].
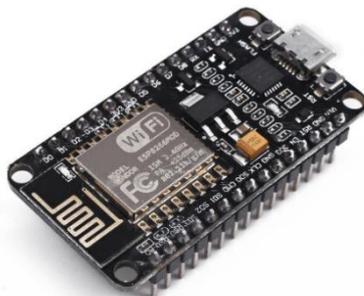

Fig 3. NodeMCU ESP8266

Relays are electronic devices that can connect or stop large electric currents using only small electric currents, besides that relays are switches that work using electromagnetic principles, where when there is a weak current flowing through the soft iron core coil, it will turn into a magnet. After changing the iron core, it will pull the iron anchor as a result, the switch will be connected and an electric current can flow then when the weak current entering the coil is stopped, the switch will be disconnected[11].

Fig 4. Relay 4 Channel

Light Emitting Diode (LED) is a semiconductor that can convert more electrical energy into light, is hardware and solid (solid-state component) so that it is superior in durability. LEDs are widely used in electronic devices because of their small size,

practical installation method, and low electricity consumption. One of the advantages of LEDs is their relatively long life, which is more than 30,000 hours. The disadvantage is that the price per lumen (unit of light) is more expensive than incandescent lamps, TL and SL, easily damaged if operated at an ambient temperature that is too high, for example in industry[12].

The series circuit is one of the electrical circuits arranged in parallel (in series)[13], in a series circuit the strong electric current flowing in each load is the same, the amount of voltage drop across the series circuit of each series load is equal to the total voltage on the voltage source, the current flowing in the series circuit depends on the amount of load or load resistance in the circuit, and if one load or part of the circuit is disconnected, the current flow will stop[14].

The software used to program the MCU Node is Arduino IDE. Arduino IDE which is software for writing Node MCU program listings by adding the ESP8266 library to the board manager, so that the system that has been created can work as desired. The language used is the C programming language, where the program listings can be compiled and uploaded directly to the Arduino IDE using the Arduino IDE[15], [16].
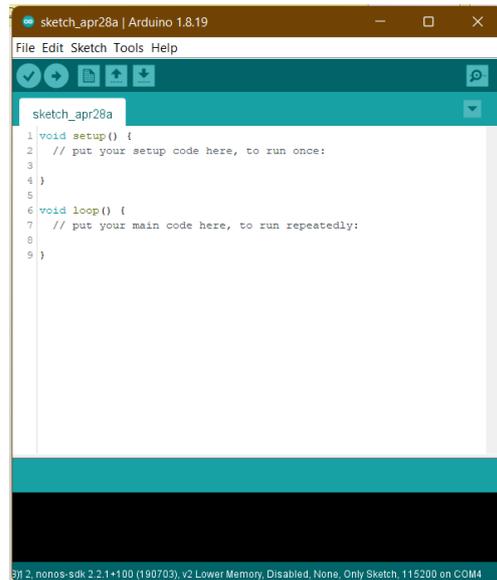

Fig 5. Arduino IDE

The C programming language is a high-level programming language developed by Dennis Ritchie and Ken Thompson. Currently the C language already has many derivatives, C++, C#, Java, PHP, Javascript, etc. These languages have a syntax similar to C. The C language is also known as "God's programming language", meaning that C is the father of all other programming languages[17].

The use case diagram is one of the Unified Modeling Language (UML) models, which works by describing user interactions with the system, and consists of actors and interactions with the system[18].

This study titled **"IoT-based remote light control system using bot telegram application (case study of SMP Al Washliyah Cirebon)"** which is expected to make it easier for users to control lights remotely, so that it can make it easier for users, users can control the lights only by using the telegram social media application which is already popular today..

2.   RESEARCH METHODOLOGY

Fig 6 shows the research methodology, this research begins by reviewing the available literature, making a prototype, before coding, the researcher makes a bot on Telegram first to get an API token that will be entered into NodeMCU, coding makes a program that will be entered into NodeMCU, then compiles the program and uploads the program that has been created. The last one is a test bot telegram that has been created.
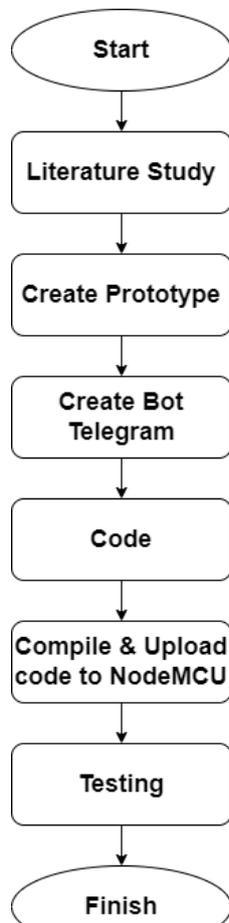

Fig 6. Flowchart Research

3.   RESULT AND DISCUSSION

The design of the prototype model is as shown below in fig 7 by connecting a female to female jumper from the NodeMCU ESP8266 to the relay, and using a series circuit to connect the cable from AC power to the 4 LED lamp and to the 4 channel relay.
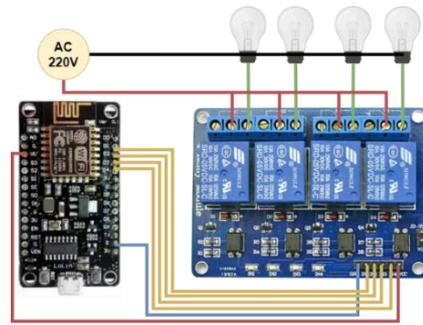

Fig 7. Prototype Model

Making a telegram bot using BotFather by searching in the search field on telegram, then pressing start, then selecting /newbots after that, they are asked to enter the name of the bot that will be created, then enter the username on the bot to be created which will be a telegram shortcut link for example t.me/projectbot, then they will get a token to be included in the program that will be embedded in the nodeMCU ESP8266, below in fig 8 shows the botfather interface.
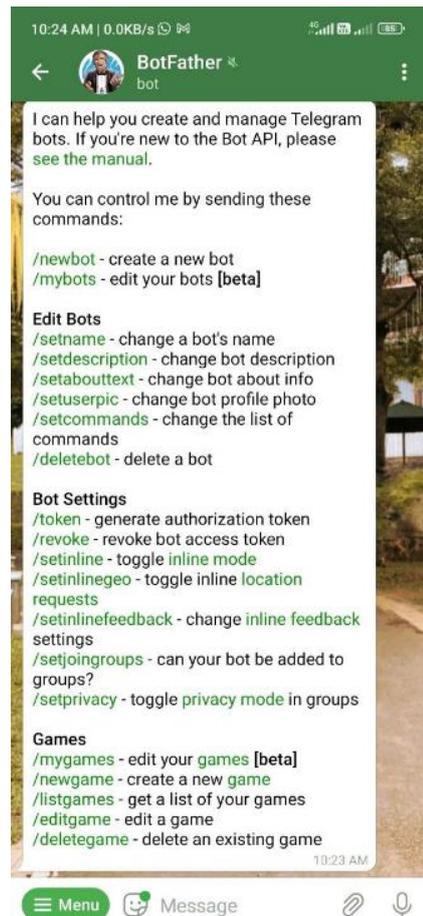

Fig 8. BotFather Menu

Fig 9 below shows how to make a bot using Botfather, firstly type "/newbot" to create a new bot, then asked to type the name of the bot will be created, then asked to type the username, after those all, API Token obtained to input in the code.

Fig 9. Result of Making Bot

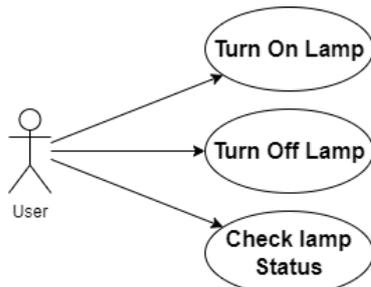Making programs embedded in nodeMCU and ESP8266 based on the following use case diagram in fig 10 below.

Fig 10. Use Case Diagram

The token obtained from BotFather is input in the code embedded in the NodeMCU using the Arduino IDE as shown below in the fig 11.

```
35  String ssid = "      ";
36  String pass = "      ";
37  String token = "      ";
38
39  void setup() {
40
41    Serial.begin(115200);
42    Serial.println("Memulai Koneksi...");
43
44    myBot.wifiConnect(ssid, pass);
45    myBot.setTelegramToken(token);
46
47    if (myBot.testConnection())
48        Serial.println("\nKoneksi Ke Telegram BOT Berhasil!");
49    else
50        Serial.println("\nTidak Terkoneksi Ke Telegram BOT");
```

Fig 11. Snippet of Code To Be Embedded

After compile the code to the ESP8266, test each command button that has been created. Fig 12 below is the interface of the bot that have been created. After enter to bot, tap on start button, and all the button shows.

Fig 12. Telegram Bot Menu

There are 7 buttons, namely "Lampu 1", "Lampu 2", "Lampu 3", "Lampu 4", "Semua Lampu ON", "Semua Lampu OFF", and "Cek Status".

The initial condition is the lights are all off, then test each button to find out if the results are as desired.

Test the "Lampu 1" button to turn on the lamp, it is because the lamps are all off, so there comes a message told that the lamp 1 is off, and asking whether the user want to turning it on or not, then the user select "Ya" to turn on the lamp, as shown below in fig 13.

Fig 13. Telegram Bot Turning On Lamp 1

The result is the lamp 1 is on, as shown below in fig 14.

Fig 14. Result Turning On Lamp 1

Test the "Lampu 2" button, turn on the lamp, then the user select "Ya", as shown below in fig 15.

Lampu 2 7:04 PM ✓✓

Saat ini Lampu 2 dalam keadaan OFF
Apakah anda ingin menyalakan Lampu 2?
7:05 PM

✅ Ya   ❌ Tidak

💡 Lampu 2 Telah Dinyalakan 7:05 PM

Fig 15. Telegram Bot Turning On Lamp 2

The result is the lamp 2 is on, as shown below in fig 16.

Fig 16. Result Turning On Lamp 2

Test the "Lampu 3" button, turn on lamp, then the user select "Ya", as shown below in fig 17.

Lampu 3 7:05 PM ✓✓

Saat ini Lampu 3 dalam keadaan OFF
Apakah anda ingin menyalakan Lampu 3?
7:05 PM

✅ Ya   ❌ Tidak

💡 Lampu 3 Telah Dinyalakan 7:05 PM

Fig 17. Telegram Bot Turning On Lamp 3

The result is the lamp 3 is on, as shown below in fig 18.

Fig 18. Result Turning On Lamp 3

Test the "Lampu 4" button, turn on the lamp, then the user select "Ya", as shown below in fig 19.

Lampu 4 7:06 PM ✓✓

Saat ini Lampu 4 dalam keadaan OFF
Apakah anda ingin menyalakan Lampu 4?
7:06 PM

✅ Ya   ❌ Tidak

💡 Lampu 4 Telah Dinyalakan 7:06 PM

Fig 19. Telegram Bot Turning On Lamp 4

The result is the lamp 4 is on, as shown below in fig 20.

Fig 20. Result Turning On Lamp 4

Test the "Cek Status" button, to check the lamp status, which lamp is on or off, as shown below in fig 21.

Cek Status 7:06 PM ✓✓

Status saat ini :

👉 Lampu 1 ON

👉 Lampu 2 ON

👉 Lampu 3 ON

👉 Lampu 4 ON

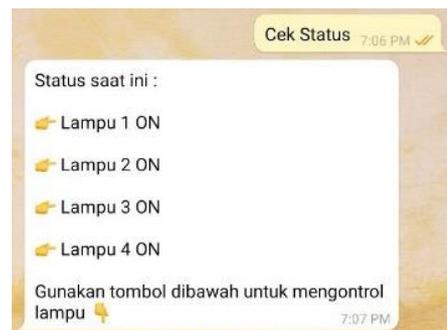Gunakan tombol dibawah untuk mengontrol lampu 💡
7:07 PM

Fig 21. Check Status After Turning All Lamps On

Test the "Semua Lampu OFF" button, to turn off all the lamp, then the user select "Ya", as shown below in fig 22.

Fig 22. Telegram Bot Turning Off All Lamp

The result is all the lamp is off, as shown below in fig 23.

Fig 23. Result Turning Off All the Lamp

Test the "Semua Lampu ON" button, to turn on all the lamp, then the user select "Ya", as shown below in fig 24.

Fig 24. Telegram Bot Turning On All Lamp

The result is all the lamp is on, as shown below in fig 25.

Fig 25. Result Turning On All the Lamp

If the lamps are on, user can turn it off by select which lamp the user want to turn off.

The fig 26 below is test to turn off the lamp 1, by select " Lampu 1" button, then select "Ya".

Fig 26. Telegram Bot Turning Off Lamp 1

The result is the lamp 1 is off, as shown below in fig 27.

Fig 27. Result Turning Off Lamp 1

The fig 28 below is test to turn off the lamp 1, by select " Lampu 2" button, then select "Ya".

Fig 28. Telegram Bot Turning Off Lamp 2

The result is the lamp 2 is off, as shown below in fig 29.

Fig 29. Result Turning Off Lamp 2

The fig 30 below is test to turn off the lamp 1, by select " Lampu 2" button, then select "Ya".

Fig 30. Telegram Bot Turning Off Lamp 3

The result is the lamp 3 is off, as shown below in fig 31.

Fig 31. Result Turning Off Lamp 3

The fig 32 below is test to turn off the lamp 1, by select " Lampu 2" button, then select "Ya".

Fig 32. Telegram Bot Turning Off Lamp 4

The result is the lamp 4 is off, as shown below in fig 33.

Fig 33. Result Turning Off Lamp 4

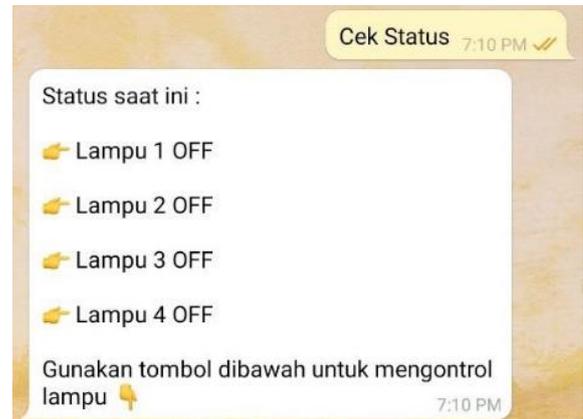Then check the status to find out the status of all lamps are off, as shown in fig 34.

Fig 34. Check Status After Turning All Lamps Off.

4. CONCLUSION

From programming and testing the telegram bot, the telegram bot can control lights remotely using NodeMCU which is connected to a 4 channel relay, then connected to the lamp in a series circuit, and connected to electricity, from every button pressed, there is a delay for approximately 60 seconds according to the connection which ESP8266 used before each command works, from turning on or off lamp 1, lamp 2, lamp 3, lamp 4, turning on or off all lamps simultaneously.

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