

Smart Wifi Home Automation System Using Smartphone and Notification Via Telegram

Muhammad Hazim Syahmi Mohd Yusoff , Shahrul Adli Zulfikar Husni, Irshyad Syahmi Ros Husaini, Mohamad Md Som *

Electrical Engineering Department, Centre for Diploma Studies,
Universiti Tun Hussein Onn Malaysia, Pagoh Education Hub, 84600 Johor,
MALAYSIA

DOI: <https://doi.org/10.30880/mari.2022.03.02.042>

Received 31 March 2022; Accepted 31 May 2022; Available online 28 July 2022

Abstract: Home automation system has been in use for decades, but it remains a niche product for high-end consumers due to the project's costing and budgeting. Security is one of the significant factors that prevent the Smart Home Automation System from being implemented. The hectic daily life routine sometimes makes us forget to switch off the devices at home. The clumsiness attitude, combined with our hectic daily routine, causes us to be in such a hurry that we forget to turn off the lights and fans. It will result in a significant increase in the electricity bill. Besides, it is one of the electricity wastes that will lead to the earth's degeneration into an unhealthy environment. The project's strength is the ability to use a smartphone to control home devices such as a lamp and a fan. The system is related to home appliances using NodeMCU. Home appliances can help the user to control the devices at home and improving home security systems. Telegram application is the main software that is being used in this project. It is used as a platform to give the command. Compared to another project that uses a laptop, this project uses a smartphone to give commands, which is much more convenient for users.

Keywords: home automation system, Wifi, NODEMCU, Telegram

1. Introduction

A smart home is a dwelling that utilizes internet-linked gadgets to monitor and operate equipment and systems, such as lighting and heating digitally. Smart home technology, also known as home automation, can offer safety, comfort, convenience, and energy efficiency to homeowners by allowing them to manage electrical appliances via smartphones or other network devices. The internet of things, or IoT, is a network of interconnected computing devices, mechanical and digital machinery, objects,

*Corresponding author: mohamads@uthm.edu.my

animals, or people with unique identities (UIDs) and the capability to transfer data directly. The development of domestic automation has become popular in recent days with the advent of IoT. Many types of equipment are controlled and monitored to aid people. [1]

Smart home systems and devices frequently work together, share consumer information and automate activities depending on homeowners' preferences. IoT technology is used to come up with the innovative idea for smart homes. The internet allows us to find instant solutions to a variety of issues. IoT can be used to improve people's living standards by providing them with information about their surroundings [2].

The objectives of this project are as build an electrical circuit "Smart Wifi Home Automation Using Smartphone and Notification via Telegram" based on the microcontroller NodeMCU. Then, study the effectiveness of controlling and managing electrical equipment using automatic versus manual and lastly improving home security systems.

Users can use the Blynk application in a smartphone to operate electrical appliances in the house, such as lights and fans. The program also allows users to control electrical appliances only by using their smartphones [3]. With the availability of the internet, users can easily control home appliances from anywhere on a smartphone [4]. This project also includes additional features and functions that set it apart from other similar projects.

This project is equipped with a Microwave Motion Sensor that can detect any movement within the home area. When there is movement, the lights and fan will turn on automatically, and when there is no movement, they will turn off automatically, without the user having to turn the switch on or off. The NodeMCU will interact with the Telegram bot to send messages to a personal telegram account. When motion is detected, the user will receive a notification on the smartphone [5]. The device's final feature is that whenever a light switch or a fan is turned on or off, it will notify the user's smartphone via the Telegram application. This feature can help to improve the security system in the user's home in an indirect way.

2. Materials And Methods

2.1 Components and Software

Figure 1 shows that the primary controller board for this project is the NodeMCU ESP8266, which is utilized as a microcontroller to operate the circuit. We also utilize the NodeMCU to connect to a local Wi-Fi hotspot, connect to the internet and send data to the Blynk server with the authentication code.



Figure 1: NodeMCU ESP8266

The sensors are another important component in this project. In this experiment, we employed two types of sensors. **Figure 2** shows a microwave sensor that can detect motion up to 7 meters away. **Figure 3** shows the current sensor that measure a current value in the circuit.



Figure 2: Microwave Sensor



Figure 3: Current Sensor

Table 1 shows a list of all components that have been used and their functions.

Table 1: List of all components that have been used and their functions

No.	Components	Function
1.	Lolin Node MCU V3 ESP8266	To connect to an internet network.
2.	4-Channel Relay	To control high voltage and high current load.
3.	Microwave Sensor RCWL-0516	To detect motion.
4.	Current Sensor 20A ACS712	To detect and measure electric current.
5.	Breadboard	To make quick electrical connections between components.
6.	3 Pin Socket	To supply electric current.
7.	3 Pin Plug	As a connector to supply electric current from socket.
8.	Bulb	As an output (Load)
9.	Fan	As an output (Load)
10.	Jumper Wire	Used to connect two points to each other without soldering.
11.	Cable Wire	Enabling the transfer of electrical signals or power from one device to the other.
12.	Wire Connector Terminal Block PVC	To connect many wires to the AC plug.

Table 2 shows a list of all software that have been used and their functions.

Table 2: List of all software that have been used and their functions

No.	Software	Function
1.	Arduino IDE	To program instructions to components connected to an Arduino Nano using the C ++ language.
2.	Blynk	To control Arduino UNO over the Internet.
3.	Telegram	As the application for user to receive notification using smartphone.

2.1 Flow Chart

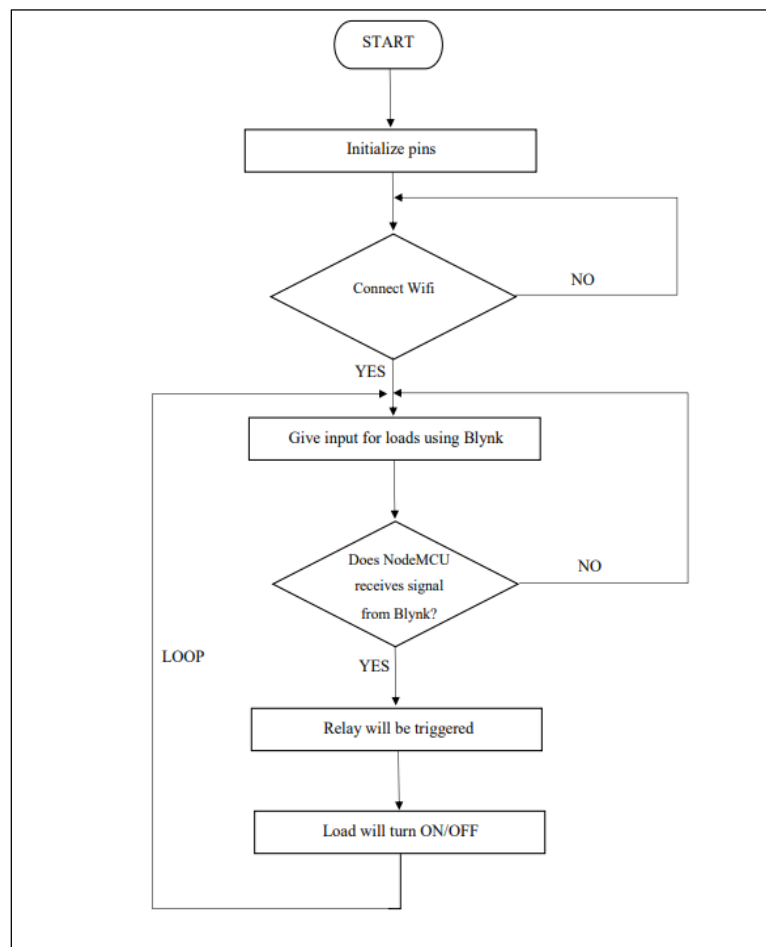


Figure 4: Flow chart of process ON/OFF load using Blynk

The flow chart in **Figure 4** explains the ON and OFF loads more efficiently by using Blynk application. The first thing to do is initializing the pins. Then, NodeMCU will be connected to Wifi to allow the user to use Blynk. After that, the user can give input either ON or OFF for loads. If the NodeMCU receives a signal from Blynk, the relay used in the circuit will be triggered and energized. Hence the load will turn ON or OFF based on the input given. This flow of process will keep looping. However, if the NodeMCU does not receive a signal after the user gives input, the user must give input to the loads again.

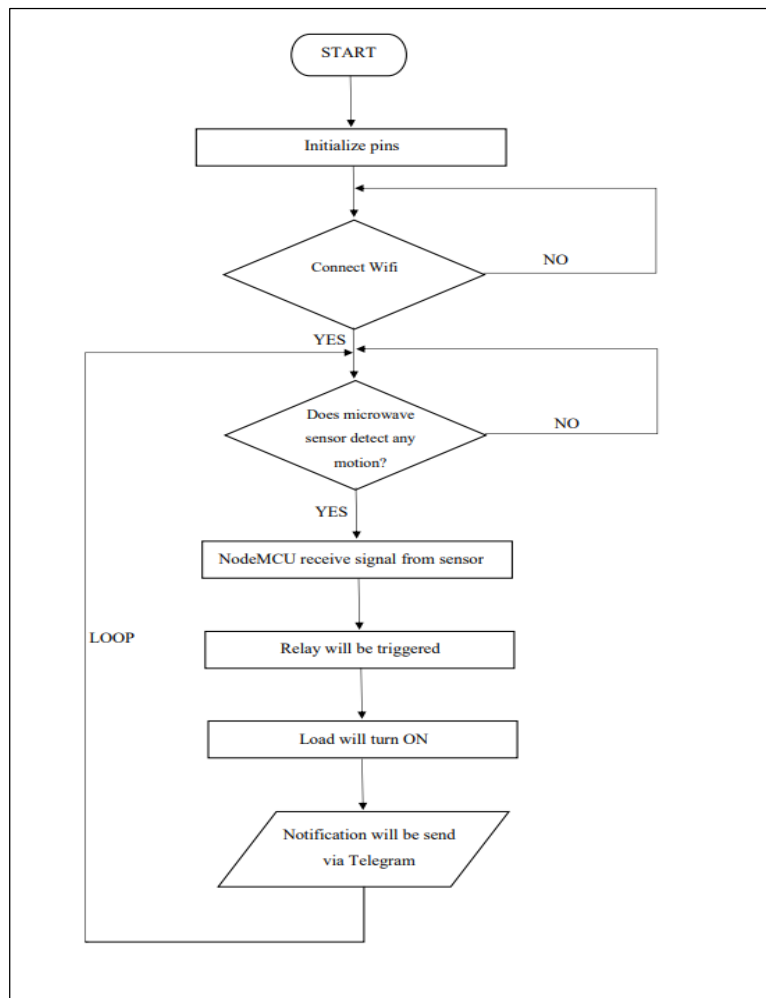


Figure 5: Flowchart of process notification via Telegram

Figure 5 shows a flow chart that explains the process of notification via Telegram. Initializing pins is the first step. Then, NodeMCU will be connected to Wifi. If a motion near the sensor ranges between 7 meters, the microwave sensor acts as the motion sensor will detect the motion and send a signal to NodeMCU. After that, the relay will be triggered and energized to make the load turn ON. By using Blynk, notification of the load status will be sent to the user via the Telegram application. The process will keep looping.

2.2 Block Diagram

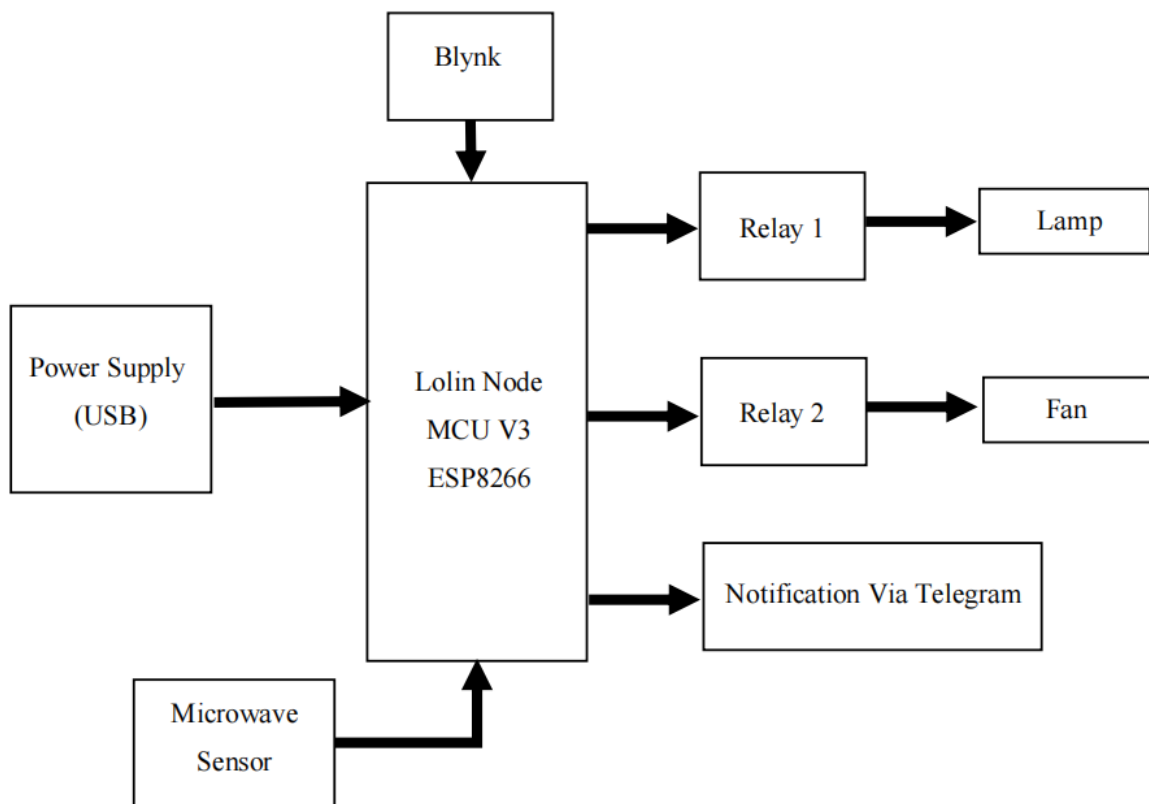


Figure 6: Block Diagram of Smart Wifi Home Automation System Using Smartphone and Notification Via Telegram

Figure 6 shows the block diagram of smart wifi home automation system using smartphone and notification via telegram. The power supply and the microwave sensor is the input for this project. Power supply will be connected to both Arduino Uno and Node MCU ESP8266 which acts as the processor or microcontroller of the project. The microwave sensor will be connected to the Node MCU and will send signal to Node MCU in case it detect any motion. Then, the relay, load and notification via Telegram is the output of this project. If Node MCU receives signal, the relay will be triggered as the current flow into it. The load which is a lamp and a fan will be turn ON or Turn OFF. Node MCU will also send notification to the telegram of the user using blynk to inform about the loads status.

2.3 Circuit Diagram

The component assembly for the system prototype design is shown in **Figure 7**. All components were connected using jumper wires.

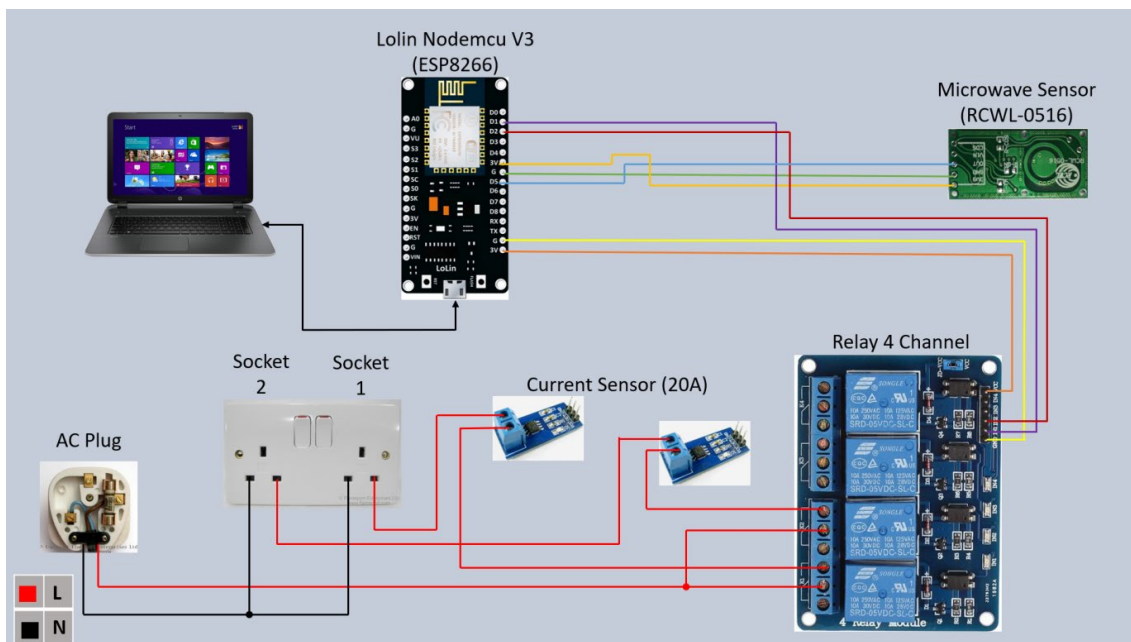


Figure 7: Circuit Diagram of Smart Wifi Home Automation System Using Smartphone and Notification Via Telegram

3. Results and Discussion

On this project, a test was conducted to assess and monitor the system's effectiveness. The test was carried out by motion sensor and virtual switch. Prototype testing was used to conduct the test.

3.1 Results

Table 3: Result with Microwave Sensor (RCWL-0516)

Load	Motion	Switch	Status
Bulb	Detected	ON	ON
Bulb	Not Detect	OFF	OFF
Fan	Detected	ON	ON
Fan	Not Detect	OFF	OFF

Table 3 shows the load status when Microwave Sensor detect a motion or not. Based on the table, when Microwave sensor detected motion, relay will triggered and switch will On and allows current flow to the loads which is bulb and fan. When there are no motion, relay is normally open and switch is Off cause no current can flow to the loads.

Table 4: Result using virtual switch

Load	Switch	Status
Bulb	ON	ON
Bulb	OFF	OFF
Fan	ON	ON
Fan	OFF	OFF

Table 4 shows the load status when loads are controlled using virtual switch. Based on the table, when the switch is turn on in Blynk software, load status will be on. When the virtual switch is off, the load status will be off.

Table 5: Telegram notification

Motion	Notification
Detected	Receive
Not detect	Did not receive

Table 5 shows notification status via Telegram when Microwave Sensor detect motion or not. When Microwave Sensor detected a motion, Telegram will receive “Motion detected!!” notification. If no motion detected, Telegram will not receive any notification.

4. Conclusion

The completion of this Smart WIFI Home Automation project can increase students' knowledge and experience in the Internet of Things (IoT). Apart from that, this Smart WIFI Home Automation project can also help the Malaysian community overcome the problem of human weakness, which is forgetfulness. With our Smart WIFI Home Automation Project, we can control the electrical appliances in the house, such as fans and lamps, anytime and anywhere. With this Smart WIFI Home Automation, Malaysians are more aware of the problems related to their home. This project can also open the eyes and minds of the Malaysian community by providing exposure and approach on the Internet of Things (IoT) and Arduino Technology more effectively to be used in their daily lives. This project can also help prevent the wastage of electricity that can increase house electricity bills and affect the environment, such as greenhouse gases and acid rain. Finally, it is hoped that this project can be beneficial and accepted by the Malaysian community and foreign communities that are comparable to other products in line with the development of technology today.

Acknowledgment

Thanks to the Centers for Diploma Studies of Electrical Engineering, Universiti Tun Hussein Onn Malaysia for its support.

References

- [1] Sharon Shea (2020). *DEFINITION smart home or building (home automation or domotics)*. Achieved on July, 2020, from <https://internetofthingsagenda.techtarget.com/definition/smart-home-or-building>
- [2] Sathyan Munirathinam (2020). Chapter Six - Industry 4.0: Industrial Internet of Things (IIOT). *Advances in Computers*, 117(1), 129-164.
- [3] Subhajit (2020). Home Automation With Blynk Using NodeMCU ESP8266. Achieved on December 12, 2020, from <https://iotcircuitHub.com/nodemcu-esp8266-blynk-home-automation/>
- [4] Techstudycell (2020). *Home Automation using NodeMCU & Blynk App (IoT) – WiFi Relay Module*. Achieved on May 11, 2020, from <https://easyelectronicproject.com/esp32-projects/home-automation-nodemcu-blynk-relay-1/>
- [5] Rui Santos (2021). *Telegram: ESP8266 NodeMCU Motion Detection with Notifications (Arduino IDE)*. Achieved on 2013-2021 from <https://randomnerdtutorials.com/telegram-esp8266-nodemcu-motion-detection-arduino/>