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Remote Smart Switch

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Abstract: In this paper, Remote Smart Switch project will be discussed and explained in detail. Remote Smart Switch used Internet of Things based (IoT) system and used Blynk to connect the software and the hardware. Significantly, Remote Smart Switch lets the consumer to control the condition of fan and lamp switches remotely without manually pressed the conventional switch on the wall. Electrical consumer tends to forget to turn off their electrical appliance switches specifically the fan and the lamp which will lead to waste of electrical consumption in their household. The Remote Smart Switch's main objective is to prevent electrical waste and facilitate controlling the switches of the lamp and fan remotely wherever the consumer is. In addition, it can track the condition of the switches either is still turn on or off. It allows the consumer not in the particular connection range to have access to deal with the switch. Smartphones and electrical appliances in the home need to be connected to Wi-Fi. Therefore, the user can control the lights and a fan via a smartphone without using conventional wall switches. Methodologies used such as flowcharts and coding also explained in detail to design the operation of our Remote Smart Switch project. The development of our hardware such as the microcontroller, DC motor and other electronic components to build our prototype are decided followed by testing and calibrating our project. As a consequence, the result and discussion can obtain from the testing and calibrating of the circuit. This project, for example, explained the capabilities of the Blynk and the extent to which programming can assist us. It helps us understand how the Internet of Things (IoT) works in this modern era, where smartphone is a device we always have with us.

Keywords: Switches, Internet of Things, Remotely

1. Introduction

A Remote Smart Switch is an automated device which is it remotely control the condition of the switch off electrical appliances mainly the fan and lamp. A Remote Smart Switch is installed in the consumer smartphone where it is connected to the internet monitor and control the switch off electrical appliances. It used the Internet of Things (IoT) approach to help to interconnect the communication system between the devices and the hardware. With the aid of Blynk application and Wi-Fi connection all the software and hardware will be paired with each other.

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Its initial goal was to connect physical devices to the internet [1]. Smart Switch connects all the devices and appliances, mainly the lamp and fan in a consumer home so they can communicate with each other [2]. NodeMcu microcontroller is used as one of the components in the hardware, hence it will serve as an internet gateway as it is embedded with ESP8266 CIP [3]. The ESP8266 includes an 802.11b/g/n HT40 Wi-Fi transceiver, which allows it to connect to a Wi-Fi network and interact with the Internet, as well as create its own network to which other devices can connect. Blynk also used to build Remote Smart Switch as it can support any hardware platforms and microcontroller, and there are five connections that help Blynk server to connect with the microcontroller board which are Ethernet, Wi-Fi, Cellular, Bluetooth and Serial [4]. However, in Remote Smart Switch we will use Wi-Fi connection as there is the rising number of Wi-Fi connection and range required to control and monitoring our project.

As the conventional switches are located in different parts of the wall in the house, one's may forget to switch off either the lamp or the fan when they leave the room or the house. Hence, these may increase the usage of electricity in their household as well as spike up electricity billing. Moreover, conventional switches also inadequate for handicap people, especially the one who has movement restriction. Subsequently, the Remote Smart Switch will help the consumer to control the switches of the lamp and fan remotely without the need to manually press the conventional switch.

There are various objectives for this project to be created, but the main objectives of this project are to facilitate controlling the lamp and fan switches remotely without manually press the conventional switch on the wall. Then, to prevent waste of electrical consumption as well as increasing of electrical billing and lastly to keep track of whether the switch is still turned on or not.

2. Methodology

These project activities will not exist without the use of appropriate resources. Without those resources, it is difficult to start this project successfully. Different projects require different materials and complete all information and equipment.

2.1 Materials

Materials are defined as goods or things used to produce a prototype in the completion of this Remote Smart Switch project. Several materials and equipment have been used for this completed project. The list of materials and equipment required is as follows:

2.1.1 NodeMcu

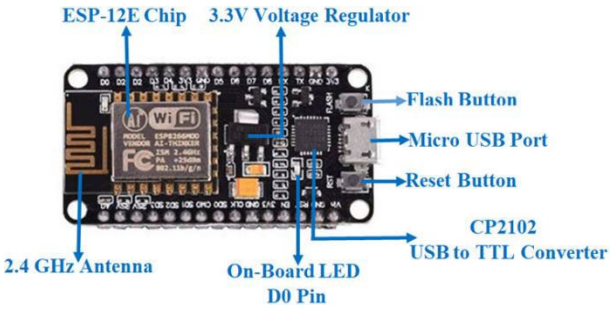

Figure 1: NodeMcu

NodeMcu in **Figure 1** is a microcontroller that has been equipped with the ESP8266 WIFI module in it. More precisely, the NodeMcu is the same as the Arduino. What differentiates it is that NodeMcu has the advantage of WIFI in it and is suitable for projects that use the internet. NodeMcu has a notice board that develops Lua resources designed specifically for it. In addition, its function is to

store data and programs. This is because it has a flash memory of 4MB and 128 KB of RAM. NodeMcu can be applied in projects that require Wi-Fi and bluetooth functionality, IoT device prototypes or Network projects.

2.1.2 DC Motor

A direct current (DC) motor, on the other hand, is a type of electric machine that converts electrical energy into mechanical energy. The electric current generated will be used by the magnetic field and contribute to the DC Motor to operate. Therefore, it will be the one that drives the movement of the rotor in a fixed output shaft. We use a DC motor to drive the fans. As we have learned in this guide, DC motors use a magnetic field to process electrical energy into mechanical energy, and by using a brushless motor, the ceiling fan of a DC motor can be operated from ordinary household AC electricity.

2.1.3 LED

Light-emitting diode (LEDs) in **Figure 2** are described as solid-state devices. Light-emitting diodes are heavily doped p-n junctions. Based on the semiconductor material used and the amount of doping, an LED will emit a colored light at a particular spectral wavelength when forward biased. LED is encapsulated with a transparent cover so that emitted light can come out.

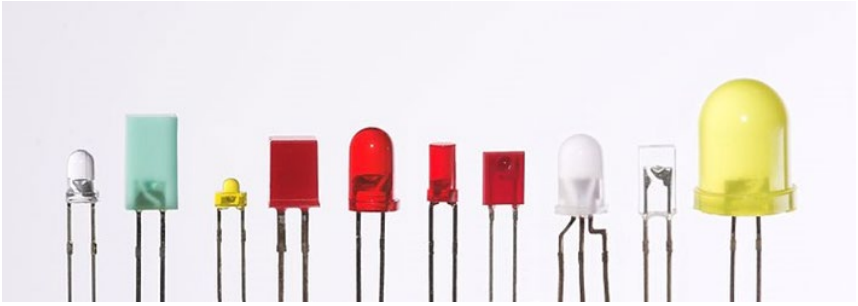

Figure 2: LED

2.1.4 Breadboard

The breadboard serves to make quick electrical connections between components such as capacitors, LEDs, resistors, and more. The breadboard has a large number of small sockets on it, and is used to connect several groups of sockets electrically to each other.

2.1.5 Relay

Relays are switches that are used to close and open circuits both electronically and mechanically. It regulates the opening and closing of an electronic circuit's circuit contacts. When energy (electricity or charge) is supplied, the states are subject to change. Relays are typically used to control power as well as switch smaller current values in a control circuit. The relays have two primary functions: high voltage application and low voltage application. Arcing is reduced in high voltage applications, while overall circuit noise is reduced in low voltage applications.

2.1.6 AC/DC Adapter

The AC/DC adapter is an external power supply used with the device. The device uses a battery and no supply source. The AC/DC adapter used is intended to reduce the size of the laptop. This can reduce the need for a standard -sized power supply.

2.1.7 Resistor

The resistor serves to reduce the current flow and lower the voltage level in the circuit at the same time. In electronic circuits, resistors are used to limit the flow of current. Not only that, but it acts to adjust the signal level, stopping the transmission line between other uses as well as an active element of bias. We used a 220ohm resistor for this project. Wire and mini fans are among the materials used to complete this project. **Figure 3** shows the conceptual design of the project.

Figure 3: The top view of project design

2.2 Methods for simulation and coding

To convert schematic circuit to PCB circuit, we used Tinkercad software by drawing the electronic circuit shown in **Figure 4** in the schematic circuit section and then transfer the schematic circuit to PCB layout. After the complete draw the schematic circuit, transfer the circuit to PCB section to design PCB layout.

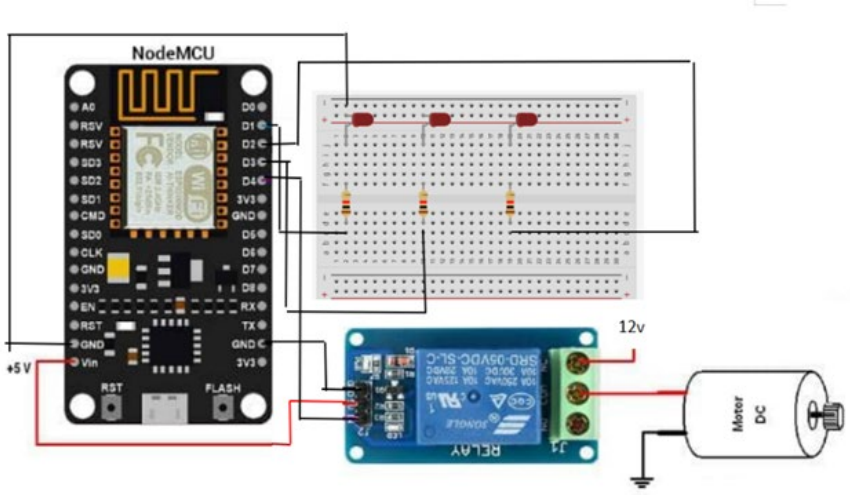

Figure 4: Schematic Diagram

The process for our project can be shown by the flowchart in **Figure 5**, where the basic graphical representation will provide better understanding for our project operation.

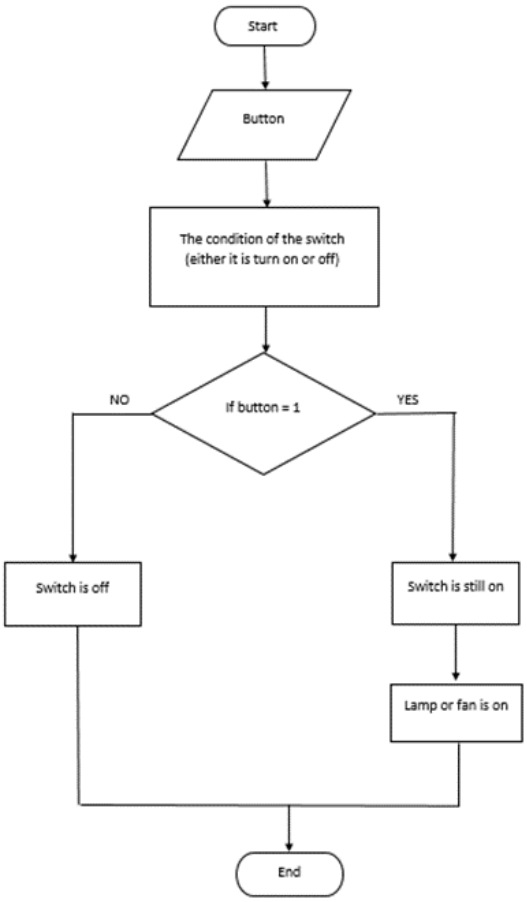

Figure 5: Flowchart

2.3 Coding

The functionality of NodeMcu also partially comparable to an Arduino microcontroller specification that leads to the entire module can be compiled by the Arduino C++ compiler. Hence, it will write the complete firmware when the ESP8266 creates the binary firmware file of the code written by the user and the NodeMcu firmware will generate a new binary firmware code which mean the code can be run in the Arduino IDE. The coding for our project can be shown in **Figure 6**.

NodeMCU §

```
#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>

// You should get Auth Token in the Blynk App.
// Go to the Project Settings (nut icon).
char auth[] = "6o5EP3WJWntOLP-gpoHPLhumY8YVMk23";

// Your WiFi credentials.
// Set password to "" for open networks.
char ssid[] = "4G-MiFi-D52A";
char pass[] = "12345678";

void setup()
{
  // Debug console
  Serial.begin(9600);

  Blynk.begin(auth, ssid, pass);
  // You can also specify server:
  //Blynk.begin(auth, ssid, pass, "blynk-cloud.com", 80);
  //Blynk.begin(auth, ssid, pass, IPAddress(192,168,1,100), 8080);
}

void loop()
{
  Blynk.run();
```

Figure 6: Coding

3. Results and Discussion

The result and discussion of the Smart Switch project will be further explained in this part of the paper. This project is regarding utilizing a smart phone to control the switch of a lamp and fan with the aid of Wi-Fi connection.

3.1 Results

Figure 7 until 10 show the condition of our LED and DC Motor which represent lamp and fan respectively when the button in the smart phone is pressed.

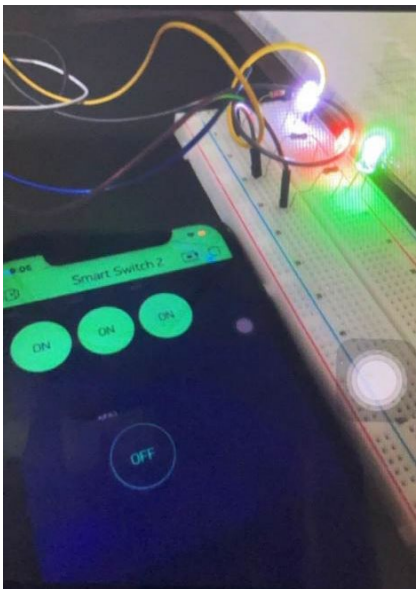

Figure 7: LED button is on

Figure 8: Fan button is on

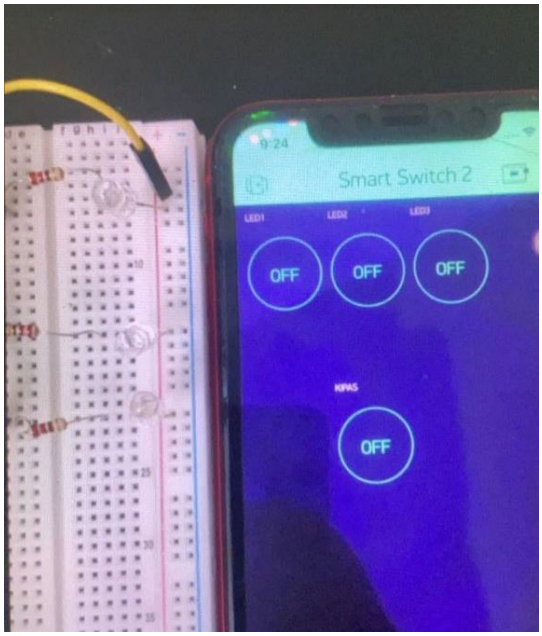

Figure 9: LED button is off

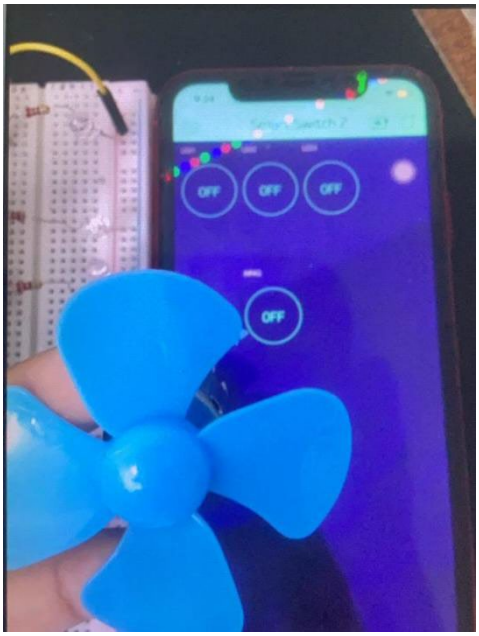

Figure 10: Fan button is off

3.2 Discussions

Table 1 shows the result obtained from our project Smart Switch system. This indicates we can control the condition of the switch using the smart phone as well as keep track either the switch is still on or closed.

Table 1: Analysis of Result

Load	Condition of Button	Switch	Loads Condition
LED 1 (act as lamp)	1	On	On
	0	Off	Off
LED 2 (act as lamp)	1	On	On
	0	Off	Off
LED 3 (act as lamp)	1	On	On
	0	Off	Off
DC Motor (act as fan)	1	On	On
	0	Off	Off

4. Conclusion

The goal of this project is to make it easier to manage the lamp and fan from a distance without having to manually press the wall switch. To control the switch from our phone, we utilize the billing app. The goal is to avoid wasting electricity while also keeping track of whether the switch is still on.

The report for this project informs us about the capabilities of the Blynk and the extent to which programming can help us. It assists us in comprehending how the Internet of Things (IoT) works in this modern era, where smartphone is a device that we carry with us at all times. At the time provided for the final year project, we were able to discover, discuss, and grasp the structures and operations of codding.

Universiti Tun Hussein Onn Malaysia students will be able to hone their technical abilities in managing and dealing with the technical skills needed to ensure the project's success. They believe that by adopting our prototype, society will be able to regulate their switches more easily and safely.

Recommendation

From the observation, there are a lot of beneficial things happened around us nowadays. So, we have taken this chance by doing a project that can help our community to gain a brighter life. However, the most important way is we can develop all ideas to make our project an example of the in wall-plug houses. This kind of design new wall outlets with smart, internet-connected equivalents, providing a cleaner and more seamless finish than cluttering your regular outlets with chunky smart plugs. Ordinarily, installing these takes more energy/cost than simply purchasing a plug, and if/when technology advances, replacing and upgrading will be more difficult.

To illustrate, we can see if this idea works, it means that Smart plugs allow you to control the electricity supply of almost any device using your smartphone or a smart speaker assistant such as Voice Commands, Google Assistant, or Apple's Siri. Smart Switch can be used to replace inefficient lighting controls with something far more intellectual.

Acknowledgement

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