

Construction of Wifi Smart Plug

Nay Min Oo*, Khin Soe Moe**

Abstract

This research is to construct the WiFi smart plug by using ESP8266 WiFi module (ESP-01/NodeMCU), 4- channel relay module, Blynk application, IFTTT application and google assistant. In Blynk application, the four buttons were set to control the four relays of 4- channel relay module. The ESP8266 standalone sketch was uploaded to the ESP8266 WiFi module. Digital Pins from ESP8266 WiFi module were wired to the pins of 4- channel relay module. Vcc and ground of the both modules were powered by the 5 V adapter. The AC pilot lamps and a plug were wired to the outputs of the 4- channel relay module. In the IFTTT application, the web hooks are connected by creating trigger and typing a web request. The constructed WiFi smart plug can be switched on and off by using the smartphone (button from Blynk application or voice command) from anywhere in the world as long as the internet network is available.

Key Words: Blynk, IFTTT, Arduino IDE

Introduction

Internet of Things (IoT) is used for all technologies that enable the connection of a device to the Internet. Such systems depend on the collection of data. The data is then used for monitoring, controlling and transferring information to other devices via the internet. This allows specific actions to be automatically activated whenever certain situations arise. Instead of manually going up to the device and taking action, those actions can be taken at the press of a button. These days, most smart IoT home automation devices allow to control them via an application or even via voice commands. This research is to construct the WiFi smart plug using Node MCU ESP8266 module, 4- channel relay module, Blynk application, IFTTT application and google assistant. In IoT home automation system, the electronic device used in home can be controlled by smart phone from anywhere when the internet connection or WiFi network is available. This WiFi smart plug that can be controlled by smartphone application is one of the devices in home automation system. It can be handled very easily and helps to do things in daily life. It can control the wired .device such as washing machine, motor, fan and etc In fact, construction of wifi smart plug is to switch directly AC on and off of any exciting socket from the smartphone application.

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Blynk Application Setup

The first thing, the Blynk Application is downloaded from play store and install it to the smartphone. After installing, open the Blynk application and login with facebook or g-mail account. And then select "New Project" and give the "Project Name" such as Node MCU and select the connection type in WiFi and finally creating Blynk account is finished. Blynk will send the "Auth Token" to the login g-mail account. In Blynk application, there are four buttons to control the four relays. In the widget box, choose the button from menu and name the button as "Switch 1" and select in digital pin D0 which is the output pin of ESP8266 WiFi module. Similarly, it can be got by doing another buttons: "Switch 2" as D1, "Switch 3" as D2 and "Switch 4" as D3 as shown in Figure (1), Figure (2), Figure (3) and Figure (4) respectively.

Downloading and Setting up Arduino IDE and Blynk Libraries

Arduino integrated development environment (Arduino 1.8.19) is downloaded from <http://arduino.cc/en/Main/Software> and installed in the computer. The photograph of the Arduino IDE window is shown in Figure (5).

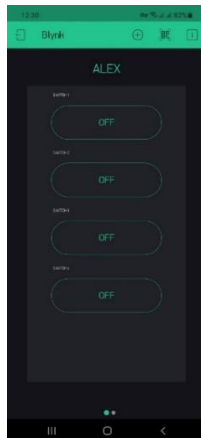


Figure (1). The four buttons for the Blynk application

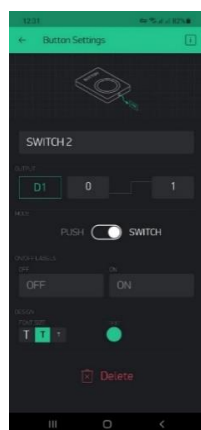


Figure (3). Setting for switch 2 button in Blynk application

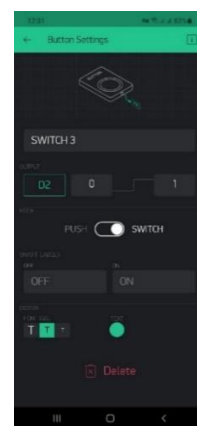


Figure (4). Setting for switch 3 button in Blynk application

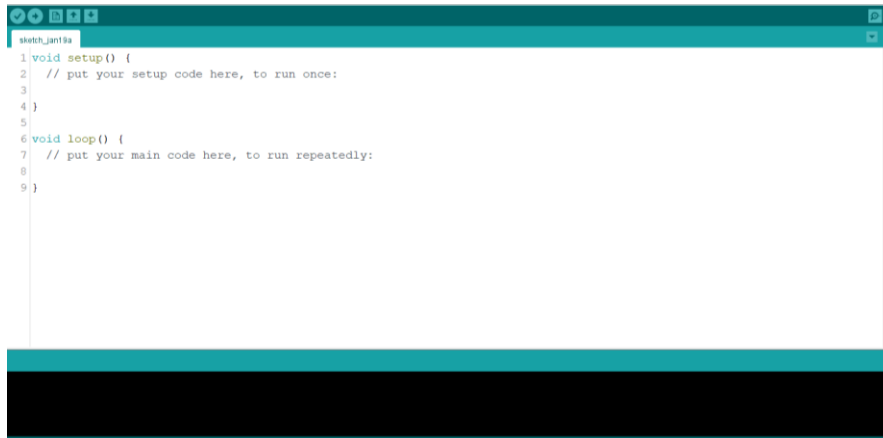


Figure (5). The photograph of the Arduino IDE window

To program Node MCU, the appropriate board for the Arduino IDE software is needed. Arduino IDE is opened and click on "Sketch", select "Include Library" and select "Manage libraries". The "Library Manager" box will appear and search "Blynk" in the search bar. The Blynk (by Vollodymyr Shymansky version 1.0.1) is installed. And then, open the preferences in "File Menu". In the preferences box, http://arduino.esp8266.com/stable/package_esp8266com_index.json (or) https://github.com/esp8266/Arduino/releases/download/2.7.4/package_esp8266com_index.json is copied and pasted as additional boards manager URLs as shown in Figure (6). From the "Board Manager" in "Tools", ESP8266 is installed. Node MCU is chosen for the board and port is selected from the device manager by connecting the ESP8266 module via USB. The IDE for the ESP8266 standalone from the example in file is opened as shown in Figure (7). Authentication token which has been sent form Blynk, network name and password were edited in ESP8266 standalone sketch and uploaded to the ESP8266 WiFi module.

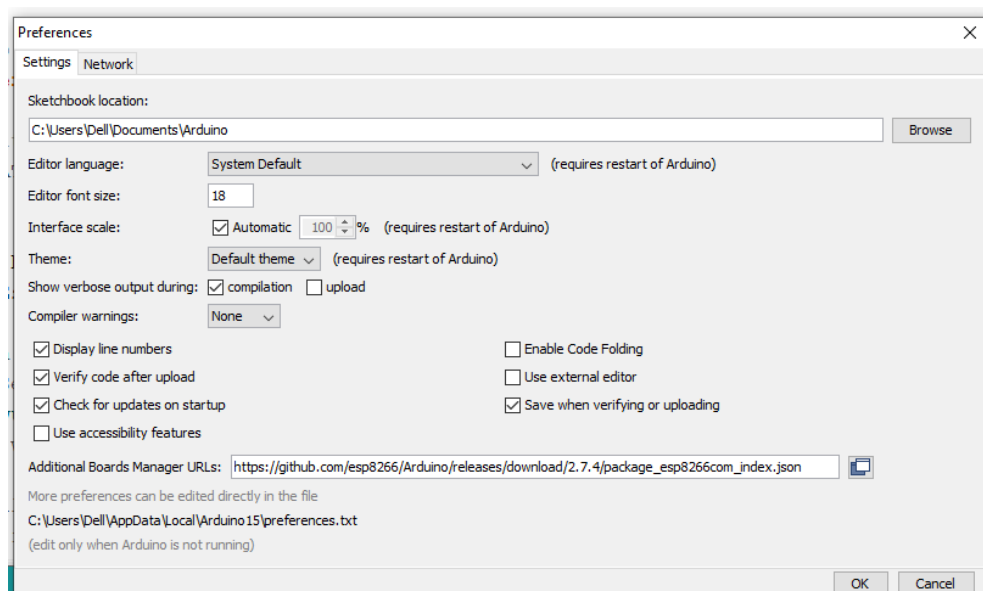


Figure (6). Setting the additional boards manager URLs

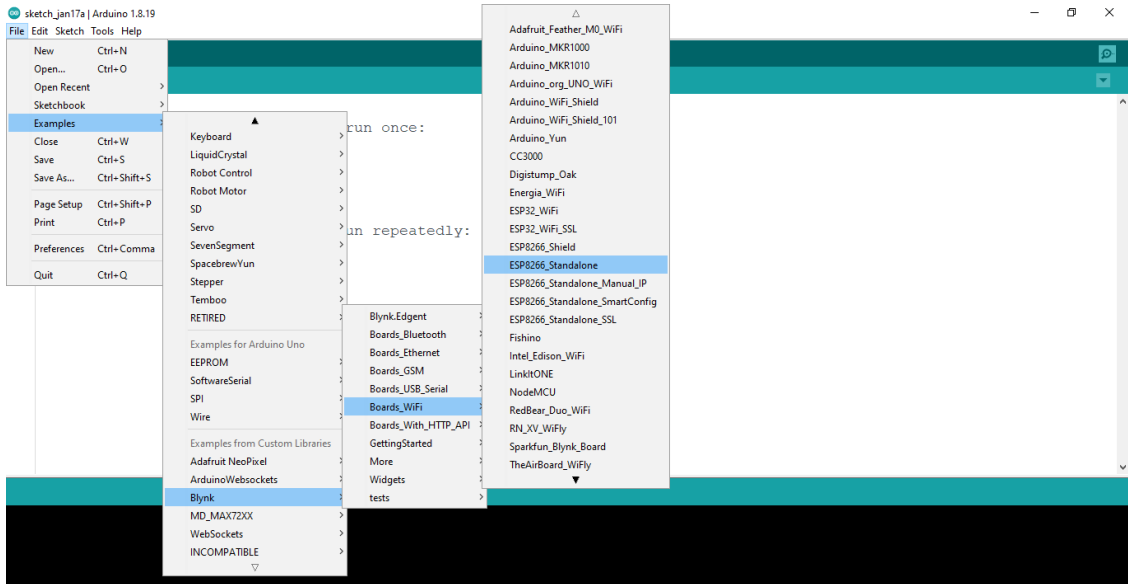


Figure (7). The Arduino IDE for the ESP8266 standalone from the example

Hardware Assembly

In this research, ESP8266 WiFi module (ESP-01/NodeMCU) and 4- channel relay module are the main component devices in construction of WiFi smart plug. Pinout diagram of the module used in this research is shown in Figure (8) and Figure (9) respectively. Digital Pins D0(GPIO16), D1(GPIO5), D2(GPIO4), D3(GPIO0) from ESP8266 WiFi module are connected to the pins of 4- channel relay module IN1, IN2, IN3, IN4 respectively. Power supply (Vcc) and ground (GND) of the both modules are powered by the 5 V adapter. AC pilot lamps and a plug are wired to the outputs of the 4- channel relay module and the completed circuit diagram is shown in Figure (10). The photograph of the constructed WiFi smart plug is shown in Figure (11).

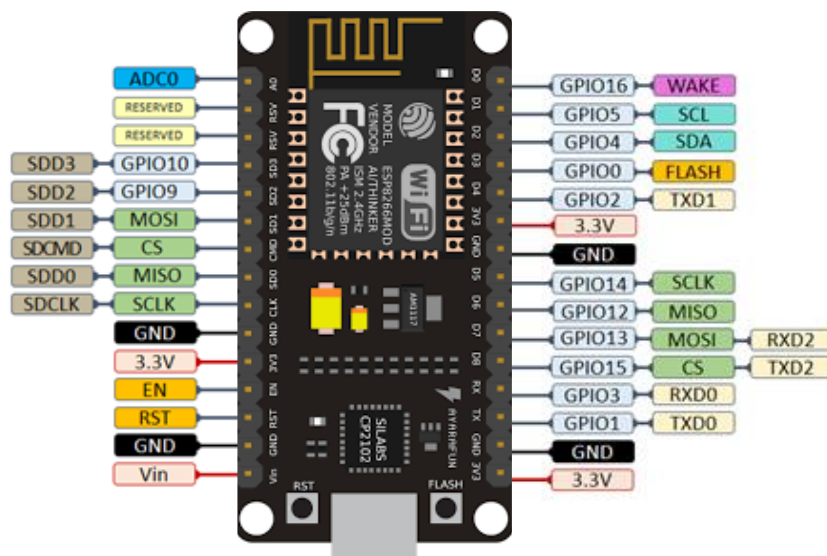


Figure (8). The pinout diagram of Node MCU ESP8266 WiFi module

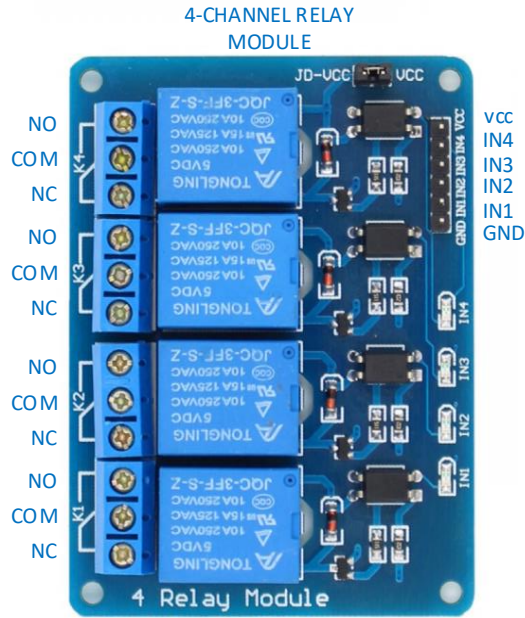


Figure (9). The pinout diagram of 4-channel relay module

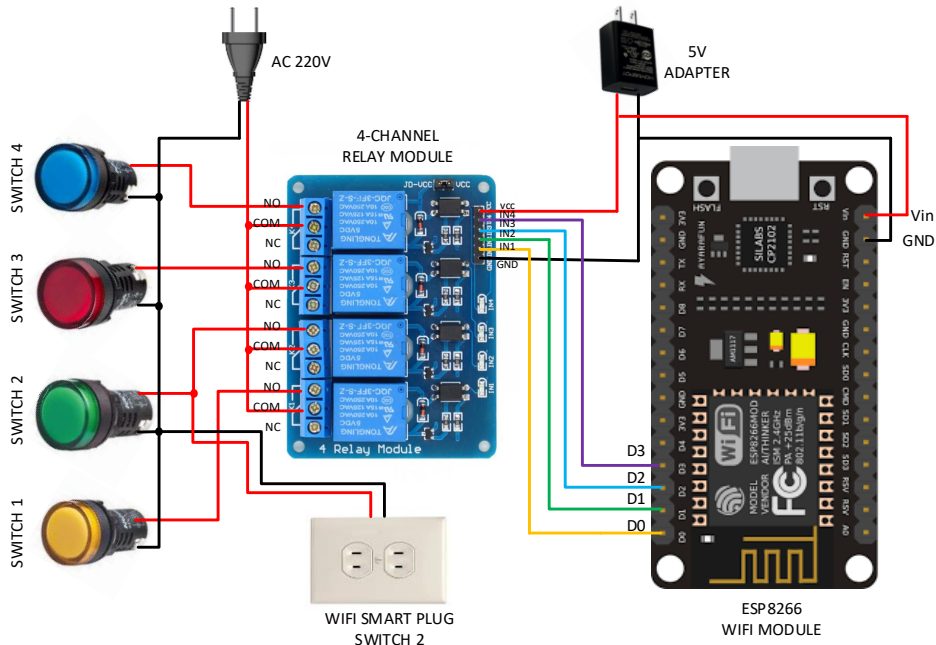


Figure (10). Completed circuit diagram of wifi smart plug

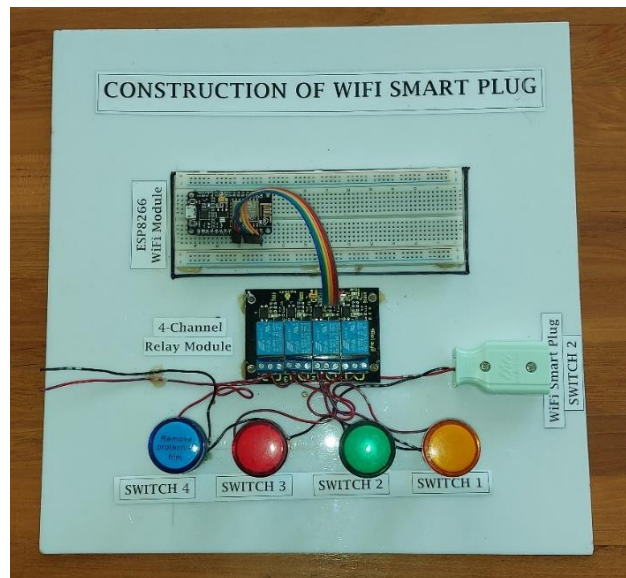


Figure (11). The photograph of the constructed WiFi smart plug

Configuring the IFTTT

Node MCU, relay and Blynk application are used to construct WiFi smart plug. Google assistant is needed to control the relay with the voice command. In fact, google assistant directly controls neither the ESP8266 nor the Blynk application with smartphone as shown in Figure (12). So IFTTT which is intermediate tool is needed to solve this problem.

First of all, go to <https://ifttt.com> and sign up for google account to get a free account to turn on applet. In "My Applets" box, select the "Create" and click on "If This". Choose the google assistant, trigger and connect service. Then, sign in with g-mail account to continue IFTTT and create trigger by saying simple phrase as shown in Figure (13) and Figure (14). Click on "Then That" and type the "Web hooks" in the blank search bar. Making a web request and connect to the web hooks. Complete the action fields as shown in Figure (15) and Figure (16).

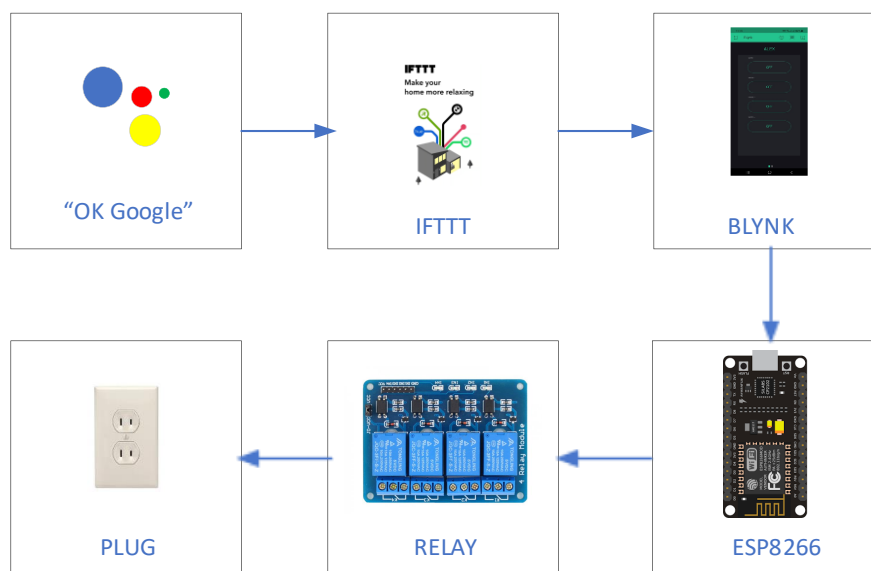


Figure (12). Block diagram of WiFi smart plug

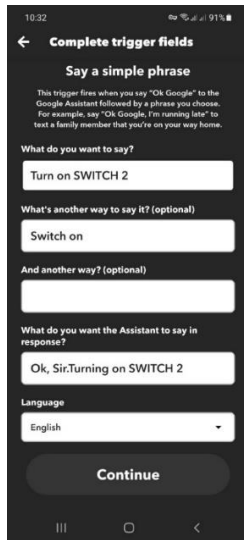


Figure (13). Triggering to turn on switch 2

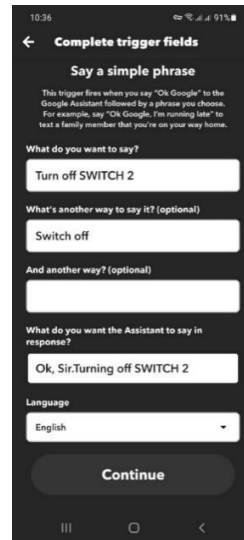


Figure (14). Triggering to turn off switch 2



Figure (15). Making web request to turn on switch 2



Figure (16). Making web request to turn off switch 2

Results and Discussion

The purpose of this research is to construct the WiFi smart plug by using ESP8266 WiFi module (ESP-01/NodeMCU), 4- channel relay module, Blynk application, IFTTT application and google assistant. The WiFi smart plug can be switched in two ways. The first one is using the Blynk application buttons and the second is voice command with the help of google assistant and IFTTT

application. In this research work, although the Blynk application button can be used to switch all the relay in 4-channel relay module on and off, the voice command can do only one relay (i.e., SWITCH 2). This is because of IFTTT free service, in free service for research can get only one service. So, in this research work, the voice command can control only SWITCH 2. This WiFi smart plug can turn any of the existing electrical devices into smart objects and that can turn appliances on and off remotely anywhere in the world by using smartphone application. Using voice command, the disable can turn on and off home appliances without discomfort.

Conclusion

This research, WiFi smart plug, was successfully designed and constructed based on the internet of things (IoT) by using ESP8266 WiFi module (ESP-01/NodeMCU), 4- channel relay module, Blynk application, IFTTT application and google assistant. The constructed WiFi smart plug can be switched on and off remotely by using the smartphone from anywhere in the world as long as the internet network is available. The internet of things helps people live and work smarter, as well as gain complete control over their lives. IoT has the ability to access information from anywhere at any time on any device and improves communication among the connected electronic devices that can transfer data packets over a connected network. It also saves time and money and helps to improve the quality of a business's services as well as reducing the need for human intervention. The future scope for this research is to do research using sensors that can collect data on rainfall, humidity, temperature, soil content and etc...and to construct the electronic device based on internet of things.

Acknowledgements

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Appendix

Source Code

```
#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>
// You should get Auth Token in the Blynk App.
// Go to the Project Settings (nut icon).
char auth[] = "bfd1cWwuvZNA5xDNHrdJzT2R1WluAhD1";
// Your WiFi credentials.
// Set password to "" for open networks.
char ssid[] = "ALEX";
char pass[] = "18145978";
void setup()
{
  // Debug console
  Serial.begin(9600);
  Blynk.begin(auth, ssid, pass);
}
void loop()
{
  Blynk.run();
}
```