Design of Internet Controlled Switch Box using IoT

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ABSTRACT

IoT (Internet of things) is a developing technique that is more useful to control or monitor the appliances via internet. Existing appliances can be connected to WIFI network and to internet with the help of ESP8266 microcontroller. A web socket is implemented in ESP8266 and it can be accessed through mobile Android application. Home appliances connected in smart switch box, people can control appliances anytime anywhere. This paper gives overview of Internet Controlled Switch Box.

Indexing terms/Keywords

IoT, Remote control, ESP8266, Relay.

I. INTRODUCTION

The Figure 1. Shows the connection diagram of the Internet controlled switch box. The power supply unit, Wi-Fi switch, Relay, Two way switch and mobile phone with app created for the smart switch box. The box achieves control function through relay via Wi-Fi switch, which determine the connection between power input and home appliances. ESP8266 chip is chosen as the Wi-Fi device, which can connects the box with mobile phone in same Wi-Fi environment. The design chooses ESP8266 as the main control chip to control the relay so that the device can Turn ON or OFF connected with smart box.
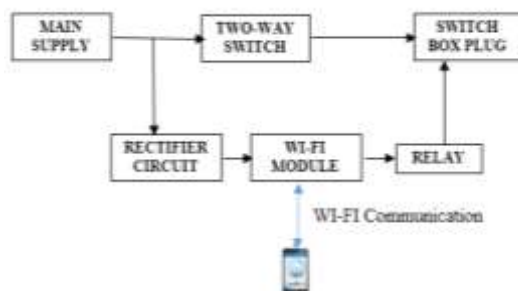

Figure 1.   Block diagram of Internet controlled   switch box.

II. Wi-Fi MODULE

WI-FI switch is the heart to the whole IoT because it mainly deals with the connectivity and communication. Figure 3. Shows the block diagram of WIFI module based on ESP8266. Voltage regulator offers constant power to ESP8266. Through port UTXD and URXD, WIFI chip can communicate with relay to transfer control signal. PCB antenna is chosen to make module smaller. Besides, some GPIO are reserved for extensive ports
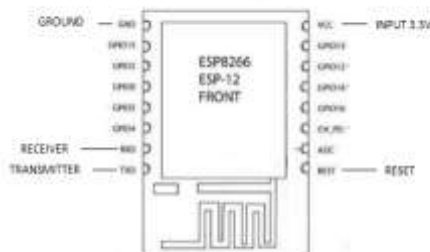

Figure 2.   Pin diagram of ESP8266 WI-FI module.

The Vcc pin is used to give input supply to Wi-Fi module. TXD and RXD pins acts as Transmitter and Receiver pin of the switches in the switch can Transmits a data to other device via TXD and receives a signal from the same device via TXD. Other pins are used to connect the external devices like relays, LED's etc. as per requirement.

The ESP device was shown below

ESP8266 WI-FI

III. POWER SUPPLY MODULE & CIRCUIT.

Power supply unit is the important area that determines the stability of system. The availability of raw source is 230 V, the controller which is used in the system was operates at 3.3V. So, old mobile charger circuit is added and shown in Fig. 2. The step down transformer used to step down the voltage and then pi (π) filter consist of capacitors C1, C2 and inductance L1 to reduce electromagnetic interference noise. The diode bridge rectifier is used to convert AC to DC supply and delivers 5V. The 5V is converted into3.3V using voltage regulator and supplies to the ESP switch.

The Wi-Fi device connected in series with relays which is used to interconnect the ESP switch (Wi-Fi switch) and Plug. From the main supply the plug is directly connected with plug. From this circuit the switch box can be operated directly via two way switch and also via internet using ESP switch.
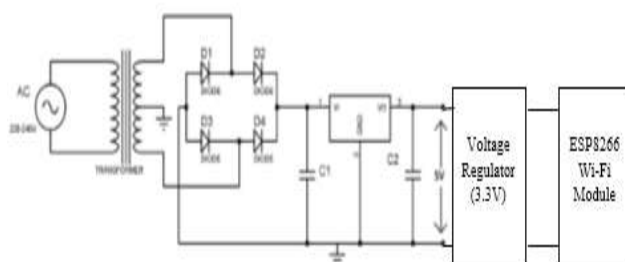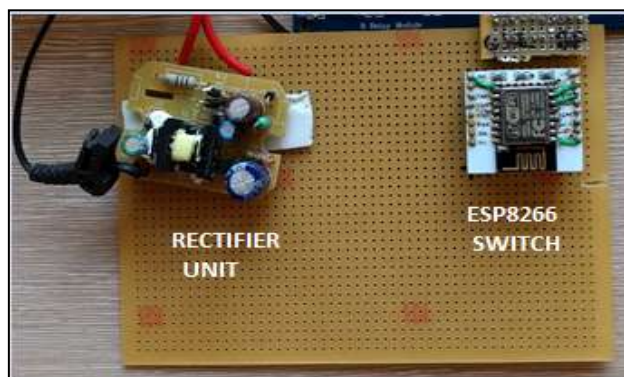

Figure 3.   Schematic of power supply module.

The practical implementation of rectifier circuit that supplies to ESP switch was shown below.

RECTIFIER UNIT

ESP8266 SWITCH

5105 | P a g e
N o v e m b e r   2 0 1 6
w w w . c i r w o r l d . c o m

IV ESP SWITCH WITH RELAY

The WI-FI switch was operated at DC voltage and to interlink this switch AC source by using relays. The relay circuit gets input from the controller (WI-FI switch) and controls the plug socket to Turn On or OFF. The interconnection of WI-FI switch and the relay connection was shown below.
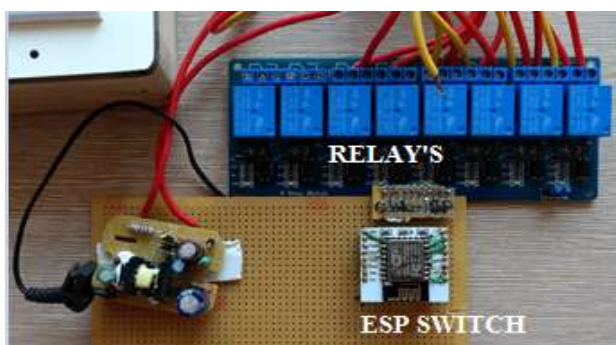

Figure 4. ESP Switch connected with Relay

V WI-FI MODULE PROGRAMMER

The Arduino IDE is used to embed the coding to the Arduino board. The same software package is used to ESP8266 switch by installing the ESP switch driver. The programming language, coding syntax used for arduino is too used here. The programmer window is shown below.
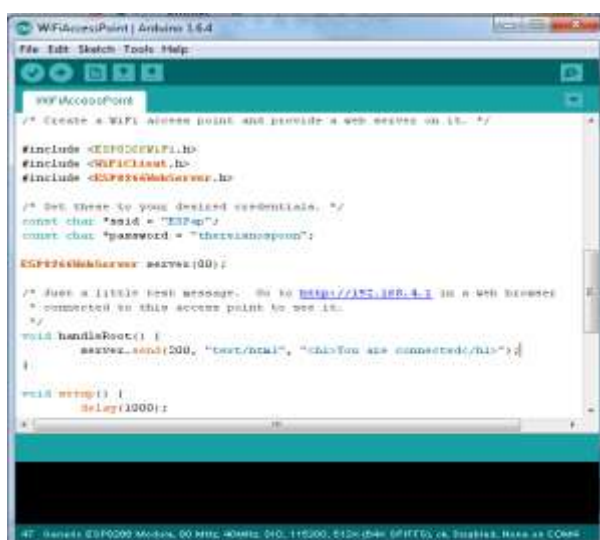

Figure 5.   Programmer Window

V. MOBILE CONTROLLER

The mobile application is created using Eclipse- Java developer coding for to control the Internet controlled switch box for ON and OFF command using pre-defined syntax's. The Snap Shot of the mobile app was given below.

I S S N **2321-807X**
V o l u m e 1 2 N u m b e r 1 8
J o u r n a l o f A d v a n c e s i n c h e m i s t r y

Figure 6. Mobile App connected with server

After successfully creating app it is connected with the server via server it links with the WI-FI switch. In that the Socket named 1 to 6 those individual plugs (sockets) can be Turn ON or OFF using the app and switch.

VI. OVER ALL EXPLANATIONS.

The switch box contains two way switches, ESP switch and the devices which is connected with it. The mobile app which connects with the ESP switch which is present inside the switch box via internet. Here the control strategies are in two methods.

1.Using the ON or OFF buttons in the mobile app. This app gives the control signals to the ESP switch and controls the plug point ON and OFF.

2.If the mobile phone was not available or any issues in the network connectivity the two way switch is very useful to Turn ON or OFF the plug points.

Two way switch and ESP Switch Control techniques

1.If the device turned ON or OFF using mobile, in case the device have to turn OFF or ON the two way switch play a role to control the socket without using mobile.

2.If the device turned ON or OFF using switch, in case the device have to turn OFF or ON it can be controlled using mobile.
If the two way switch is replaced by normal switch the above operations cannot be possible and it will increase the complexity of the overall circuit. The single switch which is in top of the switch box socket controls the input supply to the ESP switch.
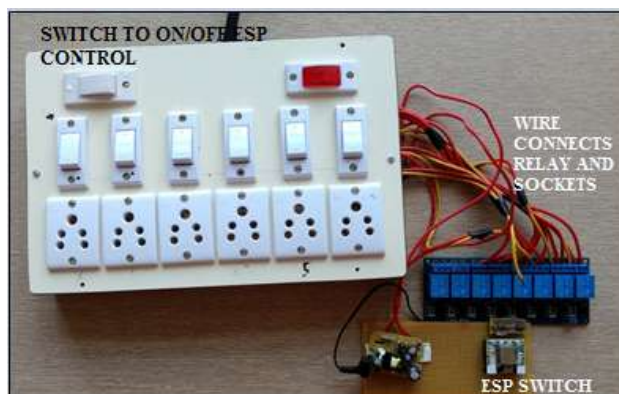
The practical setup of the devices was shown below.

Figure 7. Internet Controlled Switch Box

VI. CONCLUSIONS

This paper deals with the proposed design of Internet controlled switch box. Control strategy was showed at the end of paper. This paper contribute to an easy design of IoT device.

VII. FUTURE WORK

By keeping this paper as a base one using Raspberry-Pi and ESP switches the Home automation has been planned to do in a future. Each and Every rooms will become automated

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