iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** VII **Month of publication:** July 2022

DOI: https://doi.org/10.22214/ijraset.2022.45532

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue VII July 2022- Available at www.ijraset.com

Wireless Control of Electrical Devices with Realtime Feedback

Mr. Akshay M. Sawade[1], Mr. Aditya B. Mandlik[2]
[1, 2]*Department of Electrical Engineering, Maharashtra Institute of Technology, Aurangabad Maharashtra 431005 INDIA*

Abstract: ***This research idea originates from the core concepts of IoT connecting devices and focuses on minimizing human interference regarding the control of devices. This invention shapes its user into smart ones by making them a vital part of the technology. The end-user can supervise the devices connected to the developed hardware that reflects the operating state of these connected devices by use of the microcontroller ESP12F. The device state is presented to the end-user through the mobile application using the backend as the Blynk platform. This project is run on the cloud server and hence provides real-time status of the connected device.***

Keywords: ESP12-F, Blynk, Wireless control, Realtime feedback Wi-Fi, Blynk.

I. INTRODUCTION

Electrical load controlled by computer systems has many advantages compared with manual controlled loads. Nowadays, many programs and applications help to control things better using codes or python algorithms in artificial intelligence projects [1-5]. This research suggests wireless control of electrical equipment based on IoT technology that helps to achieve energy saving and easy load monitoring.

With the continuous advancements in wireless technology, different types of connections like GSM, Wi-Fi, and Bluetooth came into the picture. Each of these connections has its unique specifications and applications. Among the four popular wireless connections, that is often implemented in projects, Wi-Fi has widely opted with its suitable capability [6-9]. The capabilities of Wi-Fi are more than enough to be implemented in the design. Also, most of the current laptops/notebooks or smartphones come with a built-in Wi-Fi adapter. It will indirectly reduce the cost of this system [10-14].

This project controls electrical loads with multiple options of control. Through smartphone with internet and Blynk application as a control panel, and Esp12f microcontroller on another side as a controller that receives commands from a smartphone. The main feature of this project is that it can control electrical load without Wi-Fi in the absence of internet through a manual switch as done in day-to-day usage.

The backend as Blynk server provides the facility to schedule on/off the timing of connected electrical load. Switching of the electrical load is made by solid-state relay with BT136 TRIAC and Moc3021 optoisolator. The microcontroller used in this system is small, low cost and operates at low power.

The rest of the paper is arranged as stated below. Section II briefs about the opted technology. The block diagram and the details of the developed hardware are explained in Section

The details of the software required & programming instructions are mentioned in Section IV. Section V informs about the future scope of the research carried out, whereas the concluding remarks are summarized in Section VI.

II. TECHNOLOGY

A. Internet Of Things

This project specifically focuses on the development of an IoT-based system to control any electrical device connected to the project. In this project, we have designed and developed firmware for the smart and easy control of electrical devices that indirectly helps to minimize the human interaction to preserve the integrity of whole electrical equipment's in the area. We used an Esp-12f microcontroller, a popular open- source IoT platform called Blynk, to execute the process of control. The control system implements wireless technology to provide remote access from a smartphone. We are using a cloud server-based communication that adds to practicality of the project by enabling unrestricted access of the appliances to the user irrespective of the distance factor. We provided a data transmission network to create a strong automation. The system is intended to control electrical appliances and devices.

B. Multiple Controls

Multiple control gives the different modes of controlling to the user to operate this system. There are two modes in this system as:

1) *Manual Control:* Manual control is the conventional type of control, which is there in almost all existing systems. With this controller, the device can be manually turned on/off by physically examining and pressing the device switch to turn on/off. Such a controller is a tedious method and is quite problematic; if the user is a working professional; or the distance between different devices switchboard is sufficiently large.
2) *Internet based Control:* In internet-based control, the user can control the electrical equipment from any part of the work with Blynk mobile app and working internet connection. The mobile app is connected wirelessly to the circuit of electrical equipment. With internet control device can also be scheduled to turn on/off automatically.

C. Real Time Feedback

The wireless control of electrical devices is done through the internet using the Blynk cloud platform. To make this project practically implementable real-time feedback is a very important aspect of the project. This means that if any device is turned on/off through a manual switch, the status of the electrical device should be immediately reflected on the mobile app.

III. BLOCK DIAGRAM

The block diagram of the proposed hardware is shown in Fig. 1.

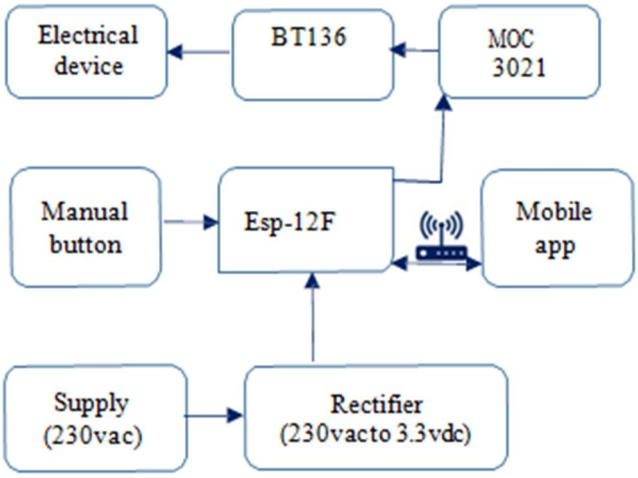


Fig.1. Block diagram

IV. SYSTEM HARDWARE

ESP12F Microcontroller (Fig. 2) is a Wi-Fi module, and it is responsible for all the operation of system. ESP-12F is a member of the "ESP-XX" series. It is a miniature Wi-Fi module used to establish a wireless network connection for a microcontroller or processor. The core of ESP-12F is ESP8266EX. This module cannot be programmer directly, it requires a USB to TTL programming circuit to flash the code.

A. ESP12F

Fig.2. Esp12f

B. BT136

TRIACs are switching devices with bi-directional and they are frequently used in switching AC-based applications. AC load that uses below 4A then BT136 600E TRIAC (Fig. 3) is suitable for this application. A special semiconductor device like TRIAC replaces the SCR structure to achieve bidirectional control. This is a bidirectional switching device, used to control the AC power it is controlled by Moc3021 opt isolator.

Fig.3.BT136

C. MOC3021 Opto- isolator

MOC3021 (Fig. 4) is a non-zero crossing based opt isolator consists of gallium arsenide infrared emitting diodes, optically coupled to a silicon-based TRIAC. Optocoupler has multiple types and every type have almost the same operating functionality, but sometimes its internal structure makes it different from another optocoupler. It is having internal TRIAC installed which gives it a capability to control any external switching devices like HIGH POWER TRIAC, MOSFETS, and Solid States Relay. MOC3021 electrically isolate the high-power AC devices with low power DC microcontroller.

Fig.4. MOC3021

V. WORKING

The Supply of 220V AC is given to the circuit, the supply goes to rectifier which is responsible for the conversion of 220vac to 3.3vdc microcontroller ESP12f operates on 3.3vdc. This Wi-Fi module first searches for known Wi-Fi network, if Wi-Fi has internet access it works in online mode. In online mode any electrical device can be controlled from anywhere in the world with use of blynk mobile application. If internet is absent the microcontroller works in offline mode. We can control electrical appliance as we control regularly with switch.

In online mode, wireless connection is established in between mobile app and microcontroller esp12f using blynk server. This blynk application and can be called as the virtual controller of the electrical appliances. Using this blynk app we can turn on and off any electrical device. If online mode convention switch can also be used to turn on/off the electrical devices. If devices are operated through manual button, real time status of device is reflected on mobile application.

Whenever button is pressed from mobile app, a signal is sent to blynk server, blynk server processes it transfers the signal to esp12f through internet. After this esp12f gives high pulse to moc3021, moc3021 make TRIAC to switch on the electrical device. In this way the operation of circuit is carried out.

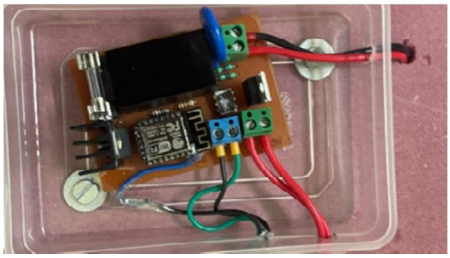


Fig.5. Developed hardware model

VII. SOFTWARE

Software used for this project is as follows:

1) *Arduino IDE (for writing code of project):* Arduino IDE is used to write code in Esp12F. The libraries of Esp8266 are installed in Arduino IDE software to make ESP12f compatible with Arduino IDE software. Wi-Fi library of Esp-8266 is used for wireless communication between mobile app and circuit.
2) *Blynk legacy (for backend and mobile app)*: Blynk platform is used to provide the backend communication service for this project. To use it blynk libraries and authentication token in added in the code snippet.
3) *Graphical User Interface of mobile app*

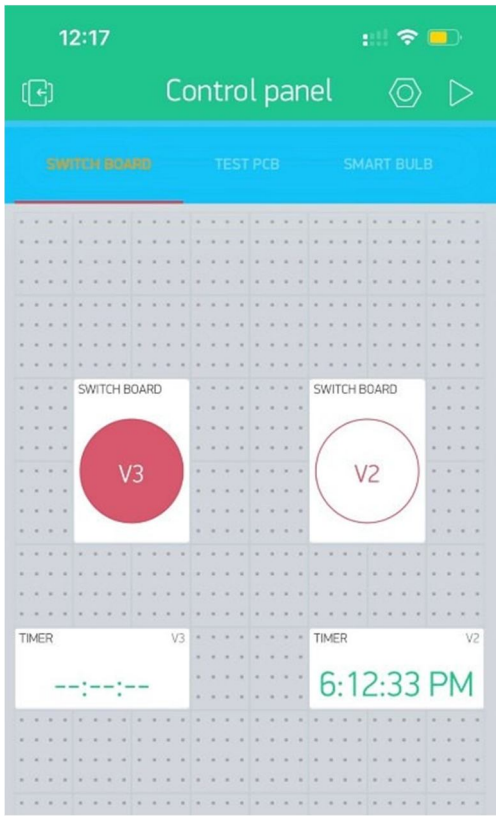


Fig.6. GUI of mobile app

VIII. PROGRAMMING & INSTRUCTIONS

The program is written in C++ and uploaded in esp12f microcontroller using USB to TTL module. Libraries of Esp8266 and blynk are added at top of code. The microcontroller pins are defined, followed by Wi-Fi credentials, authentication token of mobile app and main logic of with internet and without interned functions are defined in code. Based on the availability of internet, respective block of code is executed. The code snippet is as follows:

```
(Libraries are defined)
#include <ESP8266WiFi.h>
#include <Blynk.h>

(Pins are defined)
#Define S1 12
#Define T1 16

(Wi-Fi credentials & mobile app authentication token)
char ssid [] = "Airtel Xtreme";
char pass [] = "Airtel@1";
```



```
char auth [] = "a8Yz55Kz3PyvMcBOCTh98Cvxki";

(setup)
void setup ()
{
pinMode(S1, INPUT);
pinMode(T1, OUTPUT);

WiFi.begin(ssid, pass);
Blynk.config(auth);//, ssid, pass);
}

(Check availability of internet)
void loop() {
if (WiFi.status() != WL_CONNECTED)
{
if (MODE == 0)
with_internet();
else
without_internet();
}

(Without internet)
void without_internet()
{
digitalWrite(T1, digitalRead(S1));
}

(With internet)
void with_internet()
{
if (digitalRead(S1) == LOW)
digitalWrite(T1, LOW);
Blynk.virtualWrite(V1, 0);
}

(Real time feedback from mobile app)
BLYNK_WRITE(V1) //
{
 if (param.asInt() == 1)
 {
  digitalWrite(12, HIGH);
 }
 else
 {
  digitalWrite(12, LOW);
 }
}
```

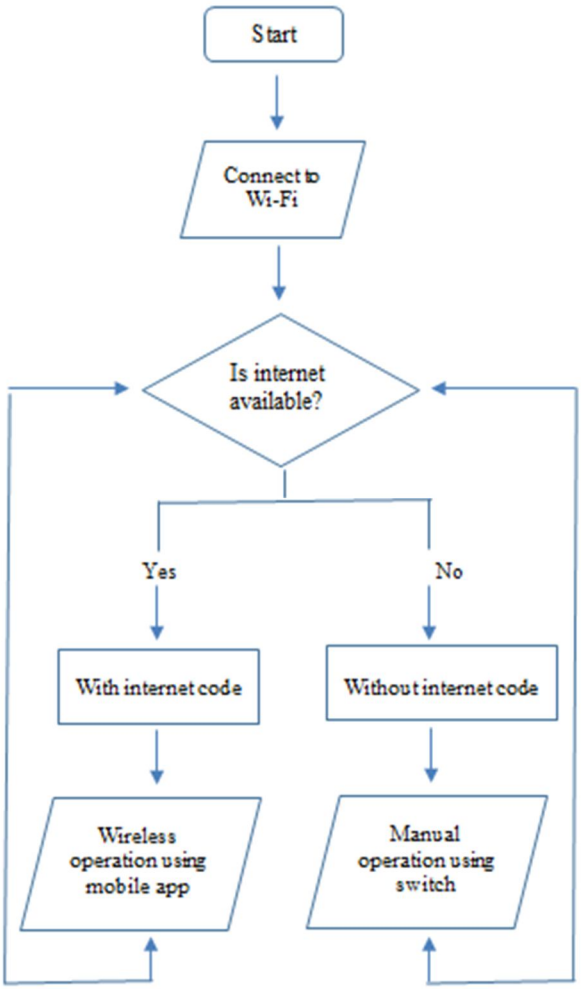



Fig.7. Instructions used for ESP12F (flowchart)

IX. FUTURE SCOPE

Future Scope of this project are as follows:

1) The backend of project can be developed using Amazon AWS or Microsoft azure for better reliability and scalability of project.

2) Logic can be written in micro python coding language for microcontroller, it will help to optimize the working of project

X. CONCLUSION

It is evident from this project work that any electrical device can be controlled manually and also with mobile app using low-cost components. This project can be used to control multiple electrical appliances ranging from the security lamps, the television to the to the air conditioning system and even the entire house lighting system. The components required are so small and few that they can be packaged into a small container. The designed system was tested a number of times and certified to control different electrical appliances used in the house.

REFERENCES

[1] IoT, 23.07.2018, retrieved from: https://en.wikipedia.org/- wiki/Internet_of_things.

[2] Mohsen Darianian , Martin Peter Michael, "Smart Home Mobile RFID Based Internet-of-Things Systems and Services," International Conference on Advanced Computer Theory and Engineering, 2008.

[3] N. Vikram , K.S. Harish , M.S. Nihaal , Raksha Umesh , Aashik Shetty , Ashok Kumar, "A Low-Cost Home Automation System Using Wi-Fi Based Wireless Sensor Network Incorporating Internet of Things(IoT)," 7th International Advance Computing Conference, 2017.

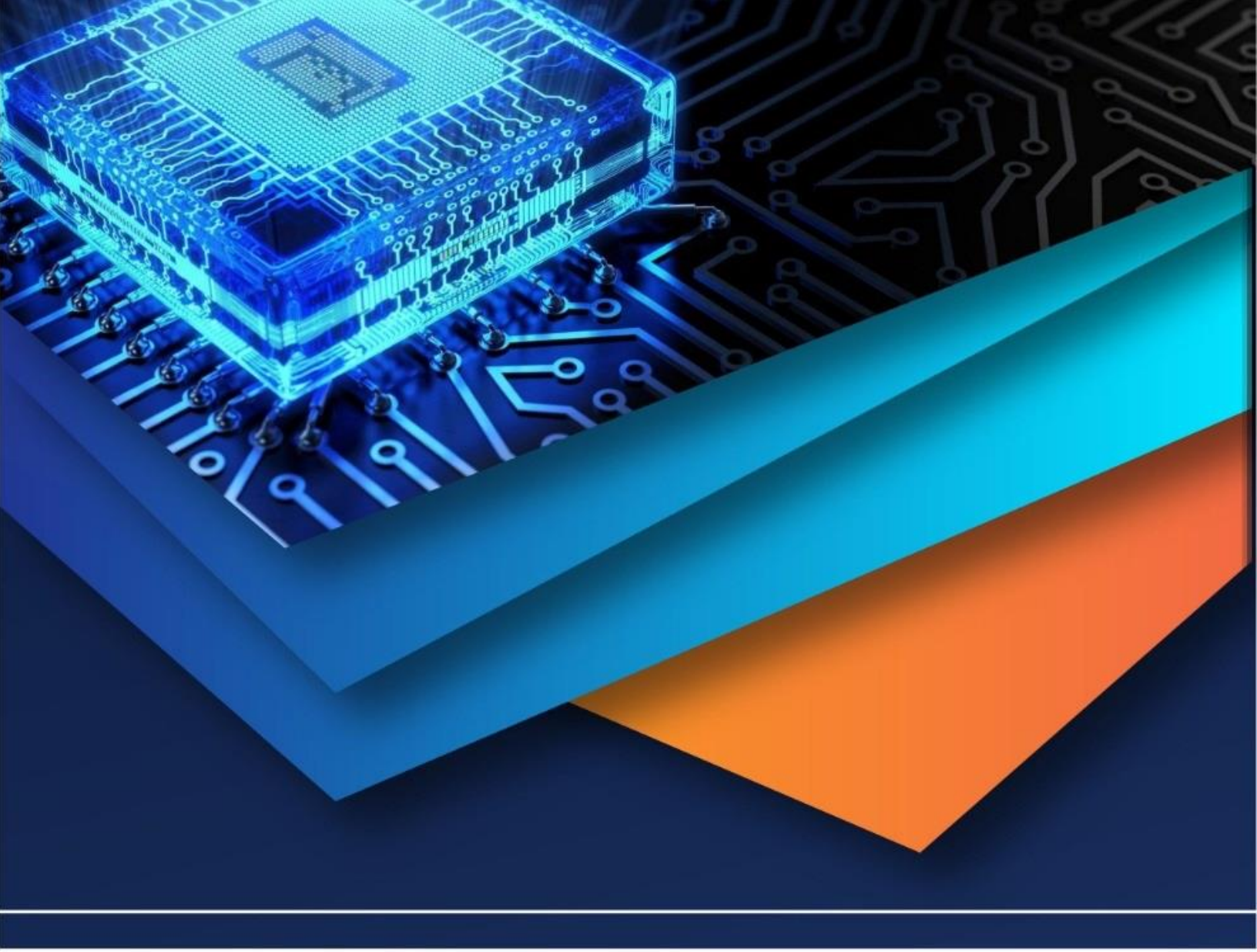
[4] Kumar Mandula, Ramu Parupalli, CH.A.S. Murty, E. Magesh, Rutul Lunagariya, "Mobile-based home automation using Internet of Things(IoT)," International Conference on Control, Instrumentation, Communication and Computational Technologies (ICCICCT), 2015.

[5] S. M. Brundha, P. Lakshmi, S. Santhanalakshm, "Home automation in client-server approach with user notification along with efficient security alerting system," International Conference On Smart Technologies For Smart Nation (SmartTechCon), 2017

BIOGRAPHIES

Mr. Akshay M. Sawade
Pursuing Final year in Bachelors of Electrical Engineering from Maharashtra Institute of Technology, Aurangabad under the affiliation of Dr. Babasaheb Ambedkar Marathwada university.

Mr. Aditya B. Mandlik
Pursuing Final year in Bachelors of Electrical Engineering from Maharashtra Institute of Technology, Aurangabad under the affiliation of Dr. Babasaheb Ambedkar Marathwada university.



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY