

AI Powered Virtual Assistant Automation of Voice Controlled Timer Switch

Sanjiv S Paul¹, Mehul A Bhole², Ketaki L Bansod³

¹⁻³B.E. in Electrical Engineering, Lokmanya Tilak College of Engineering, Koparkhairane, Navi Mumbai, Maharashtra, India

⁴Student, Department of Electrical Engineering, LTCOE, Maharashtra, India

Abstract - There is sudden rise in popularity of automation in past few years. Not only industries and major corporations but various residential complexes are moving towards automation. One of the biggest reasons for this is increase in work load. Nowadays people are getting so much busy that they find operating electrical devices manually arduous and inconvenient. This paper not only presents a more cost effective solution to home automation system that is available in market today, but also introduces some original features like VOICE AUTOMATED TIMER SWITCH USING AI POWERED VIRTUAL ASSISTANT as opposed to mechanical timer switch which are available at high price in market. Nodemcu along with relay module is used in this project.

Keywords—Home Automation, Internet of things (IOT), Smart Home, Bluetooth, Internet, WIFI Module ESP8266, Node Mcu, Artificial Intelligence, Google assistant, Timer Switch, Voice Automation

1. INTRODUCTION

Nowadays, time management is one of the biggest concerns of human kind. This has resulted increase in popularity of automation systems. The internet of things commonly abbreviated as IOT is a network of internet connected objects able to collect and exchange data. In simple words it can be use to operate various electrical devices remotely. This is basic building block of our automation.

The main objective of our project is to improve the timer switches used in the market today. The timer switches currently used are manually operated and also technology used to make this switch is very costly. We have improved the reliability of the timer switches by making them voice automated. To be specific our switches can be controlled by Google assistant. More over the technology used to build our switches is cheaper as compared to mechanical timer switches that are used currently.

2. BASIC ARCHITECTURE

One disadvantage of conventional timer switch is that they are to be controlled physically by human. This architecture consists of relay module operated by nodemcu. Basic idea of the project is to turn this relay 'on' and 'off' for specific period of time using nodemcu. However nodemcu itself is

controlled with help of Google assistant. This system improves overall reliability of the switch. The given block diagram consists of various subsystem like nodemcu, communication system, relay and switches.

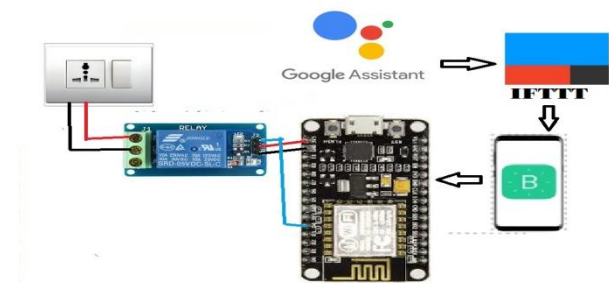


Fig -1: Basic Block Diagram

2.1 Node Mcu

The Node mcu (node microcontroller unit) is an interfacing board which is available at low cost. It initially included firmware which runs on ESP8266 wifi SoC from espressif system, and hardware which is based on esp12 module. It contains crucial elements of computer: CPU, RAM, networking (WIFI).

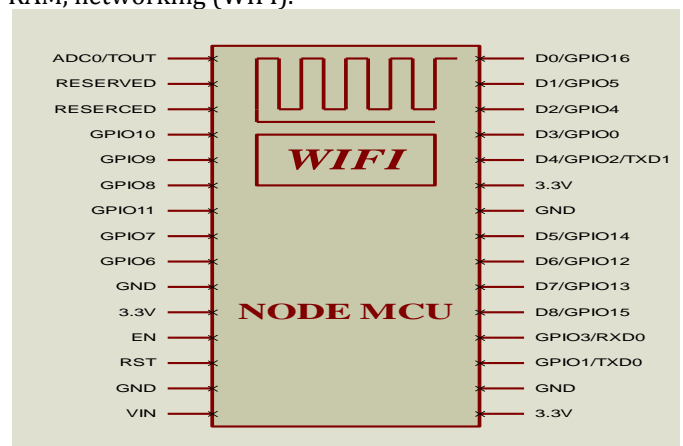


Fig -2: Node Mcu

Table -1: Specifications

Feature	Rating
Microcontroller	ESP8266 32bit
Clock Speed	80MHZ

Operating Voltage	3.3V
Analog Input pin	1
Digital I/O	11
PWM pins	4
Flash ROM/ SRAM	4MB/ 64KB

2.2 Relay Module

Relay is an electrically operated switch. It consists of two types: latching and non-latching. We are using a non-latching type relay module. It comprises of 3 terminals for connecting load such as NO, NC and COM. It also has three pins: VCC, GND, and IN. We have used a single channel 5V DC relay module.

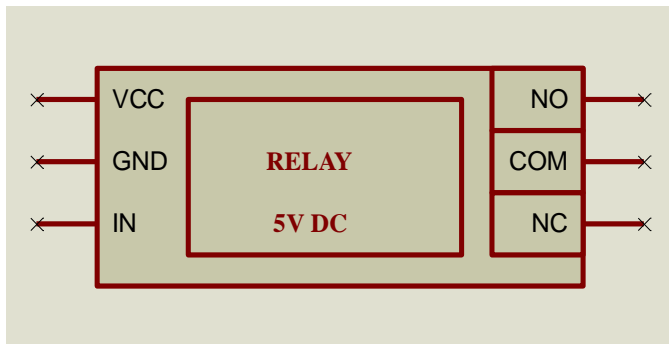


Fig -3: Relay module

2.3 Communication system

BLYNK: For controlling Arduino, Raspberry Pi, NodeMCU and such interfacing boards over the internet. It is a digital dashboard where you can build the graphical interface for your project by simply dragging and dropping widgets. In simple words, you can create a remote for your IOT project using Blynk.

IFTTT: IFTTT stands for famous programming conditional statement "IF THIS, THEN THAT". It is basically a software platform which connects apps, devices, services from different developers. In simple words, it is a platform which helps you to control your interfacing boards over voice command with Artificial Intelligence-powered virtual assistants (Google Assistant, Siri, Cortana, and Alexa).

AI POWERED VIRTUAL ASSISTANTS: Google Assistant for Android, Siri for iOS devices, Amazon's Alexa, Cortana for Windows. With help of IFTTT, you can control interfacing boards with any of these virtual assistants. We have used Google Assistant for our project.

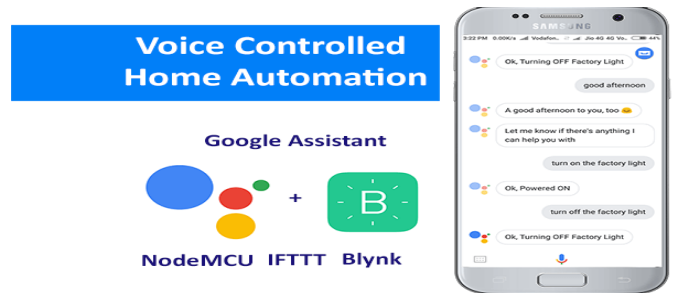


Fig -4: Communication System

3. EXPERIMENTAL SETUP

The figure 5 shows the experimental setup of our paper in which we have used NodeMCU as a microcontroller. The relay module has 6 terminals, out of which 3 are connected to the switch side and 3 pins which are connected to the NodeMCU. The relay and switch connection between the relay and switch is made by connecting the relay's NO and COM terminal parallel to the switch.

Relay and NodeMCU connection: The connection between the relay and NodeMCU is done by connecting the VCC of the relay to the 3.3V of the NodeMCU. Also, connect the ground of both the relay and NodeMCU. The IN pin of the relay is connected to one of the digital pins.

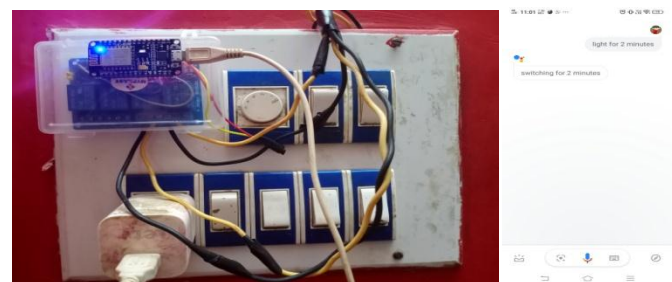


Fig -5: Experimental setup

After connection is done, setup the Blynk app. Open the app, start a new project, then select the board as NodeMCU, select WiFi, and press OK. After the project is created, a character authentication code is generated at your email. Now, in the add widgets option, select the slider. In the slider properties, set the virtual pin V1, range 0-24, and press OK. Thus, the Blynk app is setup. Now, open the IFTTT app and create an applet. Then search for the virtual assistant that you have (Google Assistant, Siri, Alexa) and select the trigger. In that, select 'say a phrase with number' (complete the fields as 'switch on for # hours' where # indicates numbers). Then press the continue button and search for webhooks. In webhooks, add the URL (<https://188.166.206.43/authenticationcode/update/V1>). Now, in the method, enter PUT, in the content type, enter application/json, and in the body, enter [{"NumberField"}].

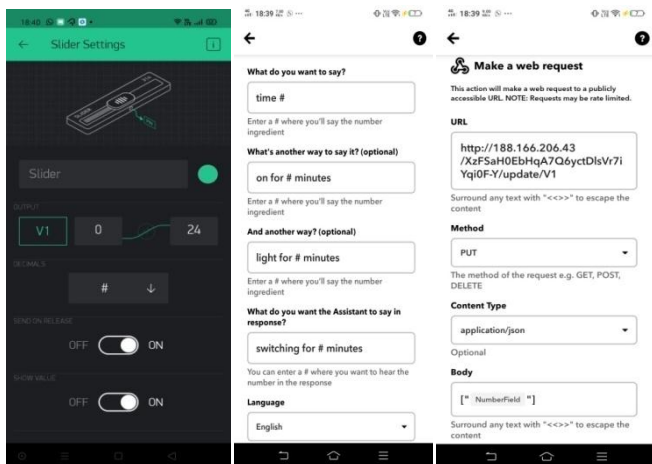


Fig -6: Setup for Blynk & IFTTT

4. WORKING AND CONCEPT

4.1 Working Principle

Virtual pin is concept invented by Blynkinc to provide exchange of any data between hardware and Blynk mobile app. We have used this concept very effectively in this project. First virtual assistant takes command from user (for eg- for how much time switch should be on) and with help of IFTTT data is send to Blynk app. Then slider gets operated on Blynk app and output of slider is send to node mcu. Node mcu operates relay and generates required delay according to slider data before turning it off again. Moreover since relay and switch are connected in parallel switch can be operated manually as well as using automation system.

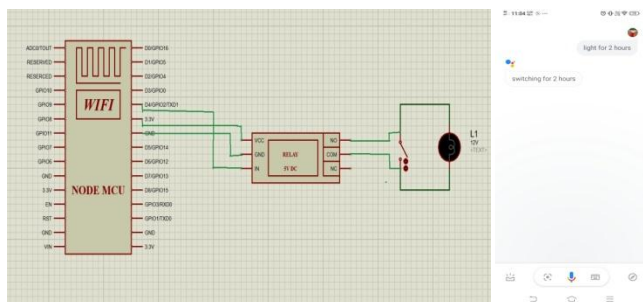


Fig -7: Connection Diagram

4.2 Coding Concept

Before Start the programming in arduinoide by importing ESP8266WiFi.h and BlynkSimpleEsp8266.h libraries. Now define pinValue and node mcu pin. Set integer variable named pinValue. Pass parameters of char authentication, ssid and password to blynk.begin. In void setup (), set pin 2 as output pin. Create subroutine name BLYNK_WRITE (V1) which will take data from slider.

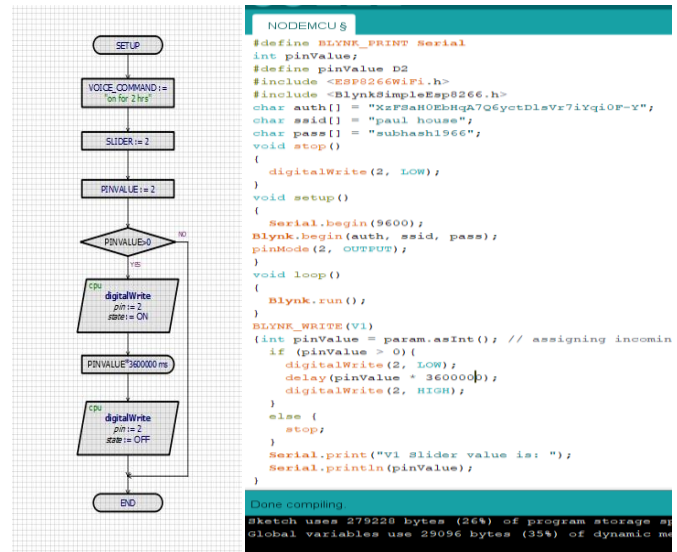


Fig -9: Program and Flowchart

The data given by the user from virtual assistant has been processed by IFTTT to blynk and the slider is operated. Output of the slider is stored in V1 pin. Then with help of "paras.asINT()" data from V1 is copied in to variable named pinValue. Further code checks whether the pinValue is greater than zero if yes then pin of the node mcu is operated which turns on the relay. After this node mcu generates the delay of ("pinValue*3600000") millisecond before turning of the relay.

Note that if you are using ARDUINOIDE debugger for programming; remember that it is defaulted for arduino. Therefore while programming for node mcu boards write the pin numbers as compared to the arduino boards (for eg- our project uses D4 pin of node mcu but while writing in program we have to write D2).

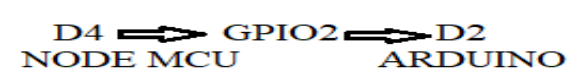


Fig -8: Relation Between Pins

5. SIMULATION

The figure 10 shows simulation of timer switch through proteus 8.9 simulation tool in which we used arduino uno instead of node mcu and led instead of relay and Bluetooth HC05 module instead of ESP8266 wifi module. As we can see in the figure TX and RX of Bluetooth module is connected to RX and TX of arduino respectively. RX and TX virtual terminal is connected to digital pins of arduino in order to send and receive data through port. We also connected the oscilloscope in order to observe results. This simulation can be operated from blynk app by adding Bluetooth and slider widget. First connect your mobile to laptop with Bluetooth. Then in HC05 properties in proteus add laptop Bluetooth adapter com port and set baud rate to 9600. Run the code in arduinoide select the hex file

location and paste it in arduino properties in proteus. By using Google assistant we have operated switch for 2sec and have observed result in oscilloscope.

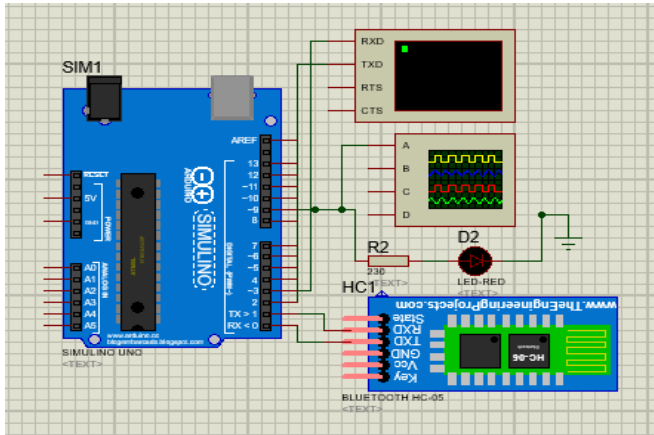


Fig -10: Simulation Done In Proteus 8.9

6. RESULT AND DISCUSSION

We carried out simulation for our project voice automated timer switch using AI powered virtual assistant with proteus 8.9 tool. We have successfully connected blynk app and Google assistant to arduino board on proteus software and operated our timer switch for 2sec. This process includes giving voice command using Google assistant to switch on for 2 second and during simulation it is observed that the led is turned on and there is a step-up in waveform of oscilloscope. After 2 second the led is turned off and the waveform of oscilloscope is back to zero. From the waveform we can conclude that the output of the pin is high for 2sec -0 and then it goes to zero.

Afterwards we carried out successful operation of our automated timer switch using AI powered virtual assistant hardware using node mcu. In this process we gave voice command using Google assistant to switch and operated it for 2 minutes. During operation we saw that the tube light was on for 2 minutes and then it turned off. Thus we saw successful operation of our voice automated timer switch using AI powered virtual assistant. It increases reliability of timer switches and can replace the high cost manually operated timer switches. This switch can be used for charging phones during night time; also it can be used to operate heater and many more appliances for specific period of time. Even though our experimental setup is for residential purpose but by using the components of higher rating we can use this same project for industrial purpose.

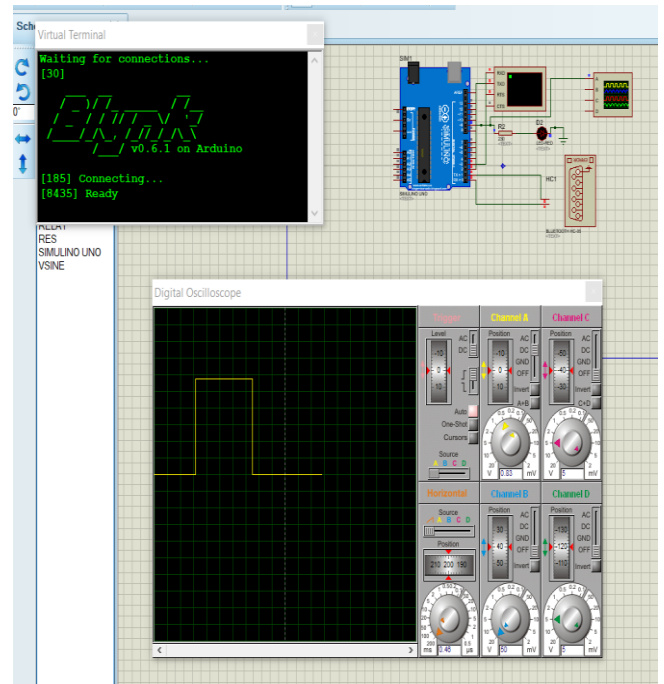


Fig -11: Result for Simulation

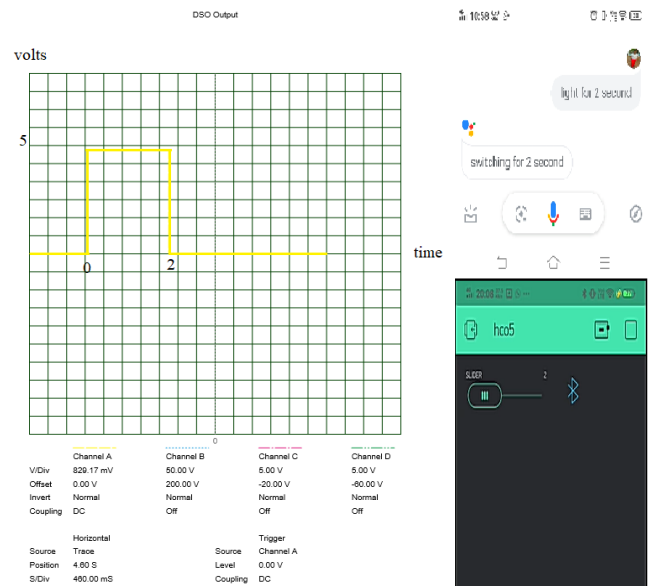


Fig -11: Operation & Waveform of Result

7. CONCLUSION

This paper present a low cost voice automated timer switch using AI powered virtual assistant under 300INR. This timer switch is operated by user remotely for specific period of time using voice command. In this technological world people prefer things should be performed with more ease. Since our timer switch can be operated by AI powered virtual assistance or remote they are more reliable than the manually operated timer switches. This hardware can also be used in industry for operating

machines from a far end as per his requirement. This advance timer switch should replace manually operated timer switch.

REFERENCES

- [1] Takeshi Yashiro, Shinsuke Kobayashi, Noboru Koshizuka and Ken Sakamura, "An Internet of Things (IoT) Architecture for Embedded Appliances", Electrical and Control Engineering (ICECE), 2011 International Conference, Yichang, IEEE, 2011, pp. 2578-2581.
- [2] Mircea Murar and Stelian Brad, "Monitoring and controlling of smart equipments using Android compatible devices towards IoT applications and services in manufacturing industry", Automation, Quality and Testing, Robotics, 2014 IEEE International Conference, Cluj-Napoca, pp. 1-5.
- [3] Weimei Zhang, "Study about IOT's application in Digital Agriculture construction", Electrical and Control Engineering (ICECE), 2011 International Conference, Yichang, IEEE, pp. 2578-2581.
- [4] Kumar Mandula, Ramu Parupalli, CH.A.S.Murty, E.Magesh, Rutul Lunagariya "Mobile based Home Automation using Internet of Things(IoT)", 2015 International Conference on Control, Instrumentation, Communication and Computational Technologies (ICCICCT).
- [5] R. Piyare and M. Tazil, "Bluetooth based home automation system using cell phone," Consumer Electronics (ISCE), 2011 IEEE 15th International Symposium on, Singapore, 2011.
- [6] YAN Wenbo, WANG Quanyu, GAO Zhenwei "Smart Home Implementation Based on Internet and WiFi Technology", Proceedings of the 34th Chinese Control Conference Hangzhou, China, July 28-30, 2015, pp. 9072-9077.
- [7] Dongyu Wang, Dixon Lo, Janak Bhimani and Kazunori Sugiura "AnyControl - IoT based Home Appliances Monitoring and Controlling", IEEE 39th Annual International Computers, Software & Applications Conference, 2015, pp. 487-492.
- [8] Jinhong Yang, Hyojin Park, Yongrok Kim, Jun Kyun Choi "IoT Gadget Control on Wireless AP at Home", The 11th Annual IEEE Consumer Communications and Networking Conference, pp. 1148-1149.

BIOGRAPHIES



Mr. Sanjiv S Paul, Department of Electrical Engineering, Mumbai university.



Mr. Mehul A Bhole, Department of Electrical Engineering, Mumbai university.



Ms. Ketaki L Bansod, Department of Electrical Engineering, Mumbai university.