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IOT Based Voice Control Home Automation System

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ABSTRACT: Internet of Things (IoT) is the idea of connecting and monitoring real world objects (things) through the Internet [1]. When it comes to our house, this concept can be used in our daily life to make it smarter, safer and automated. Our project focuses on building a smart wireless home security system which sends alerts to the owner by using Internet in case of any gas leakage or smoke detection and sends an alert email optionally. Besides, the same can also be utilized for home automation by making use of the same set of sensors. The leverage obtained by preferring this system over the similar kinds of existing systems is that the alerts and the status sent by the Wi-Fi connected microcontroller can be received by the user on his phone from any distance only condition that his mobile phone is connected to the internet. The microcontroller used in the current prototype is the ESP8266 NODE MCU board which comes with an embedded micro-controller and an onboard Wi-Fi shield making use of which all the electrical appliances inside the home can be controlled and managed. The user can control the appliances via three ways – first via manually in case of unavailability of internet, second via Google assistant by giving voice command and third by android application.

KEYWORDS : Blynk, NodeMCU, Sensors, Automation, Wi-Fi, Microcontroller

I. INTRODUCTION

Internet of Things (IOT) is a concept where each device is assign to an IP address and through that IP address anyone makes that device identifiable on internet. The mechanical and digital machines are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. Basically, it started as the “Internet of Computers.” The Wi-Fi shield needs connection to the internet from a wireless router or wireless hotspot and this would act as the gateway for the Node MCU to communicate with the internet. With this in mind, an internet based home automation system for remote control and observing the status of home appliances is designed. Home Automation Systems (HASs) includes centralized control and distance status monitoring of lighting, security system, and other appliances and systems within a house. HASs enables energy efficiency, improves the security systems, and certainly the comfort and ease of users. In the present emerging market, HASs is gaining popularity and has attracted the interests of many users. HAS comes with its own challenges. Mainly being, in the present day, end users especially elderly and disabled, even though hugely benefited, aren’t seen to accept the system due to the complexity and cost factors. Due to the advancement of wireless technology, there are several different type of connections are introduced such as GSM, WIFI, and BT. The capabilities of WIFI are more than enough to be implemented in the design. Also, most of the current laptop/notebook or Smartphone come with built-in WIFI adapter. It will indirectly reduce the cost of this system. Our proposed home automation system deals with controlling appliances wirelessly by google assistant and by android application. We have also included a security system in our project which can detect gas and smoke in case of emergency and send an alert notification to the user. We also included a LDR sensor and a PIR sensor which can switch on or off the particular bulb according to their functions.

II. METHODOLOGY

The proposed model has two major parts of the circuit design procedure i.e., software and hardware design. The block diagram as shown in Fig. 1 the hardware is designed by arranging microcontroller and sensors whereas software design includes programming codes that are written and uploaded in the microcontroller. The designed system incorporates microcontroller connected to sensor-modules for monitoring and controlling household devices. The system has been modelled to monitor data from three sensor-modules and control three loads by different output of sensor module. In the proposed circuit the NodeMCU (Microcontroller Unit) reads sensor data and sends them to microcontroller which



reacts according to the received data. It also receives command from mobile application to control home appliance through relay-module according to the user requirement. Internet server-Blynk mobile application in smartphone and NodeMCU communicates by using Blynk server. Bidirectional transfer of data between NodeMCU and mobile app occurs through this server. Google assistant has been used to use voice control in this project. Blynk account, a cloud based free IoT web server has been used to create virtual switches. It has been also linked to IFTTT (IF This Then That) website which is used to create if else conditional statements. Also, the voice commands for Google assistant have been added through IFTTT website. The output signal from NodeMCU activates and deactivates the relay to perform switching operation. In this paper we are designing an IoT based smart home which can sense the light intensity in the room, for this purpose we have used LDR sensor. According to the room light intensity sensor sends output to the NodeMCU which control the switching on and off of LED. Here a pull-up resistor of 10KΩ is used between VCC and data line to keep it HIGH for proper communication between LDR sensor and NodeMCU. We have also used PIR sensor for detecting human motion to turn ON or turn OFF the LED. An gas detecting sensor MQ2 have been used to sense the presence of smoke or gas in the room. If any smoke or gas is detected by the sensor, then it gives “0” and sends notification to the mobile and a mail to the attached mail address. The Blynk App has widgets in it that is 4 buttons which can control all the appliances. In the blunk app we have added a 5th button which can transfer control from all the sensors directly to the user to control them with the android app. The components required for the overall implementation of this project are NODEMCU, (ESP8266), LDR sensor, PIR Sensor, smoke Sensor, 4 LEDS, Relay Module, Mobile phone, Power supply board, Blynk (mobile application), IFTTT (Mobile application).

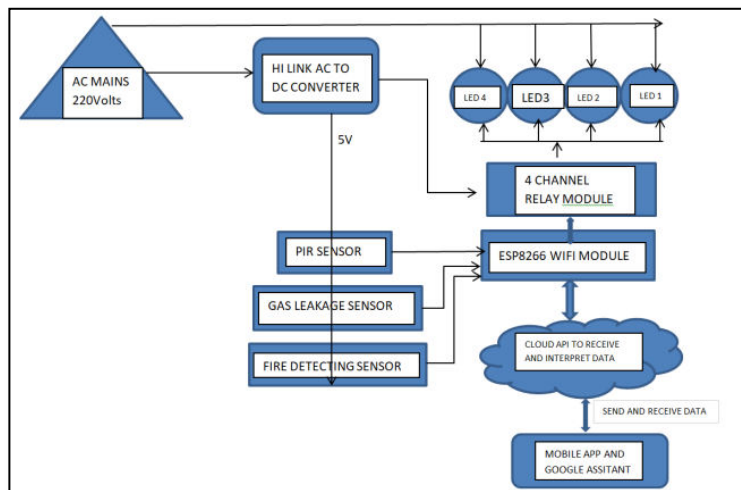


Figure 1 : Block Diagram

Circuit diagram mainly includes connecting specific digital pins of NodeMCU to the 4 relays on the relay module, and connection of various sensors to the specific pin on the Node MCU, including the connection of supply and ground pins. The main functional assemble in this prototype is simple. The further 4 relays are fit to be connected to any appliance desired to be controlled. The vital part in hardware assembly is taking into account the digital pin that corresponds to which relay. This connection is done as per the setup of Blynk application. The radio buttons on Blynk application are set up to switch a particular digital pin in Node MCU. It is made sure that the relay connections are physically made according to this set up. For example, we have assigned the radio button on Blynk application corresponding to relay 1 to work with “tx” pin of Node MCU. Then physical connection of relay 1 is made with “tx” pin of Node MCU.

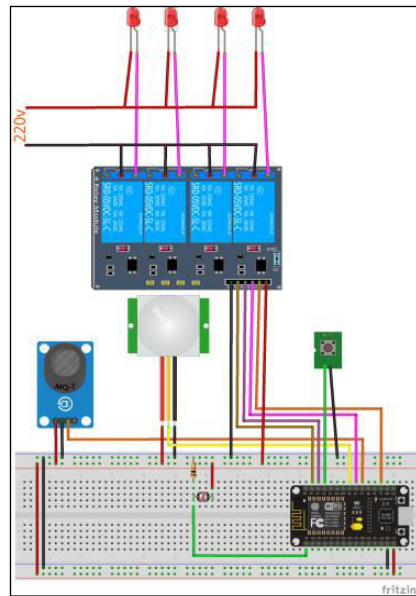


Figure 2 : Circuit Diagram

In this prototype instead of real home appliances, we connect the relays to LEDs, (according to circuit diagram) to just ensure the functionality of the prototype. The prototype is given a supply from a 5V Mobile charger and the appliances that are four LEDs of different colour (red, blue, green, yellow) are given power with the external 220 volts.

III. RESULT AND OBSERVATIONS

The main purpose of this project is to prevent unnecessary wastage of power and help elderly people to be able to control home appliance with all the comfort. In this paper, we present the design and implementation of a low cost but yet flexible and secure Internet based home automation system. As shown in Fig. 4 Display widget which shows all the control of home appliances. The voice commands are generally done by IFTTT which connects Google Assistant to the Blynk App, Then it is decoded and the commands given through the Google Assistant is sent to appliances through the Node microcontroller.

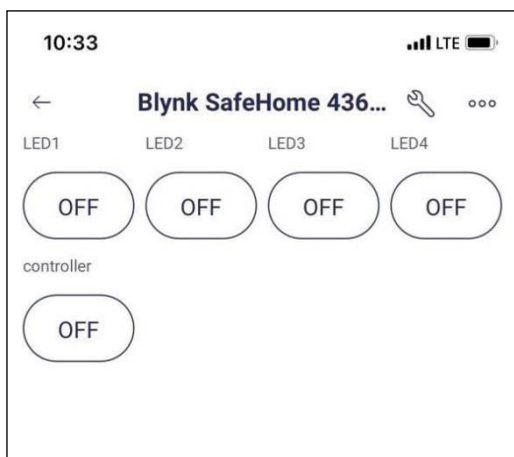


Figure 3 : Blynk App Widgets



Figure 4 : Smart Home Controls



The experimental model was made according to the circuit diagram and the results were as expected. The home appliances could be remotely switched over Wi-Fi network. Both the switch mode and the voice mode control methodologies were successfully achieved. The Blynk application was also successful in displaying the status of every application. And all the sensors were able to control their respective LED and also send the alert message to the user. One of the limitations is that only 100 alert notifications and emails can be sent in a particular day. And moreover we have used ESP8266 module which have a reaction with some delay about 1-2 seconds. The speed of the reactions also depends on the connectivity of the wifi network. If internet speed is good the reaction time is also less. After testing all the sensor and their working now we have programmed a one more button known as ‘controller’ which passes the control of all the LEDs from sensor to android application. Means if we switch on the controller button all the LEDs will stop responding to sensor output and will only be controlled directly by blynk application. Which allows user to operate all the four LEDs just by pressing the buttons on the android application hence all the bulbs can be turn on or off according to the users requirement.

IV. CONCLUSION

It is evident from this project work that an individual control home automation system can be cheaply made from low-cost locally available components and can be used to control multifarious home appliances ranging from the security lamps, the television to the air conditioning system and even the entire house lighting system.. This system is of utmost important to elderly people and disabled persons who finds difficulties in accomplishing their day to day tasks due to unavoidable problems. Scope of this project can be expanded to many areas by not restricting to only home, but to small offices, shops, malls etc.

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