Voice Recognition System Controlled Home Automation

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***Abstract*— In this paper Google assistant has been used to control light, fan and the water pump by saying Ok google, turn the light ON or OFF. Then IFTTT interpret the message and can send it to Blynk's dashboard as an understandable command to the created feed. The proposed prototype uses to control home appliances anytime from anywhere in the world and efficiently utilize power by controlling appliances properly by an Android OS smartphone. Blynk app has been used to analyze data about temperature, humidity, fire and water level to control home appliances. The voice commands for Google assistant have been added through IFTTT website linked with Blynk.**

***Keywords*— NodeMCU, Blynk app, Google Assistant, IFTTT website, DHT11 Sensor, PIR Sensor, Ultrasonic Sensor, Flame Sensor, and Relay Module**

I. INTRODUCTION

With the advancement of technology, the need for efficient controlling is more as it optimizes performance and saves unnecessary wastage of power. Home automation allows us to control household appliances like light, motor, fan etc. It also provides home security and emergency system to be activated. The proposed prototype uses NodeMCU board with internet being remotely controlled by an Android OS smartphone. Node MCU is the heart of this system and can perform as a micro web server and it acts as an interface for the wide range of hardware modules. It is also used for monitoring by sensing and analyzing data about temperature, humidity, water level, and fire. This paper explains the various possibilities of connecting home appliances and make it easier to the human life much easier. IOT plays a virtual role of creating smart environments by connecting to the internet. Here we can use Google Assistant to control our home appliances by giving common language voice directions and with the assistance of IFTTT (If This Then That) application the directions are decoded and afterward sent to the Node microcontroller. Blynk app which create virtual switches linked with IFTTT, used to analyzing data of all the appliances are connected over the internet using Wi-Fi which puts this system under the IOT. This system also works for the security purpose, if any inevitable incident happens, the user will immediately receive alert message/mail in their smart phone.

II. LITERATURE REVIEW

With the advent of smart systems day by day people are attracted to control home appliances. Numerous investigations carried out for better living experience. A system reported recently that used voice and gesture to control turning on/off the light, closing/opening of curtains, TV, and fan or AC within the living spaces. The system monitors the healthcare system for the elderly citizens like heart rate and body temperature and supports the real-time activity [1]. Internet-based smart remote-control system adapts power consumption to available power resources for home automation according to user comfort and cost criteria [2]. Fire detection systems have been reported with smart concept of fire alarm, that sends a notification to mobile and mail about the accident-prone area, and also the information needed to alert the fire station about the incident [3]. For home automation various approaches reported such as monitoring of important process variables from a distributed control system (DCS) [4], use of speech to interact remotely with the home appliances [5], sensor interfacing NodeMCU and Blynk app [6,9] Ultrasonic sensor interfacing [7]. Effort found to reduce the human intervention to reduce percentage water wastage in agricultural farms using a water level controller with wireless technology [8]. The user must be able to communicate directly with the board through an Internet web browser; the board communicates with the user using the browser and email/SMS messages [10]. Increasing advanced home networking infrastructures are giving rise to a multitude of new applications including home automation and home security [11]. IoT deals with large quantity of data received from different sensors which are deployed in the smart environment, sufficient care has to be taken for efficient maintaining, securing and for storing this collected data [12]. Remote monitoring through mobile phone involving the use of spoken commands. The spoken commands are generated and sent in the form of text SMS to the control system and then the microcontroller on the basis of SMS takes a decision of a particular task [13]. The design and implementation of a low cost but yet flexible and secure Internet based home automation system. The communication between the devices is wireless. The protocol between the units in the design is enhanced to be suitable for most of the appliances [14]. Effective use of IoT for Environmental Condition Monitoring and Controlling in

Homes. Here also provide fault detection and correction in any devices connected to this system automatically [15].

III. CIRCUIT DESIGN

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 four sensor-modules and control three loads by using a mobile application. In the proposed circuit the NodeMCU (Microcontroller Unit) reads sensor data and sends them to mobile application for processing. It also receives command from mobile application to control home appliances through relay-module according to the user requirement. Internet server-Blynk mobile application in smartphone and NodeMCU communicated 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. As shown in figure 3 the switching modules have been used for turning light on/off, turning the fan on/off and turning water pump on/off. The output signal from NodeMCU activates and deactivates the relay to perform switching operation. The circuit works on AC phase chopping principle to control fan speed. In this paper we are designing an IoT based smart fan module too. To sense the room temperature, we have used DHT11 temperature sensor. According to the room temperature sensor output the NodeMCU Microcontroller control the speed of fan, and also used PIR sensor for detecting human motion to turn ON or turn OFF the Fan. Here a pull-up resistor of 5KΩ between VCC and data line to keep it HIGH for proper communication between DHT11 sensor and NodeMCU. An ultrasonic sensor HC-SR04 have been used to sense the tank water level, which uses sound waves to calculate the distance as s=0.0343*(T/2), where 0.03430 is the speed of sound in air in cm/microsecond and T is time taken for transmission and reception of reflected sound wave. The Blynk App has widgets in it like a display for displaying messages or distance or any parameter, which can be done using NodeMCU command. The fire sensor is connected at one pin to give the digital input to the and Buzzer is connected at the other pin to get digital output from the NodeMCU. If fire is detected by the fire sensor, then it gives "0" turns on the buzzer, sends notification to the mobile and a mail to the attached mail address. The components required for the overall implementation of this project are NODEMCU, (ESP8266), DHT-11 Sensor, PIR Sensor, Ultrasonic Sensor, Flame Sensor, Buzzer, Relay Module, Mobile phone, Power supply board, Blynk (mobile application), IFTTT (Mobile application).

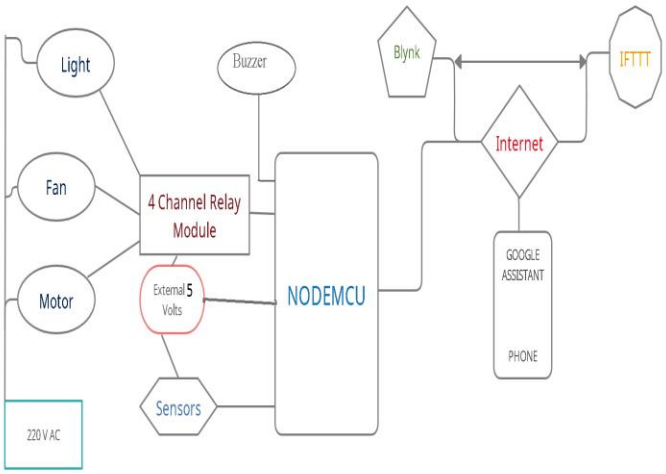

Fig. 1 Block Diagram

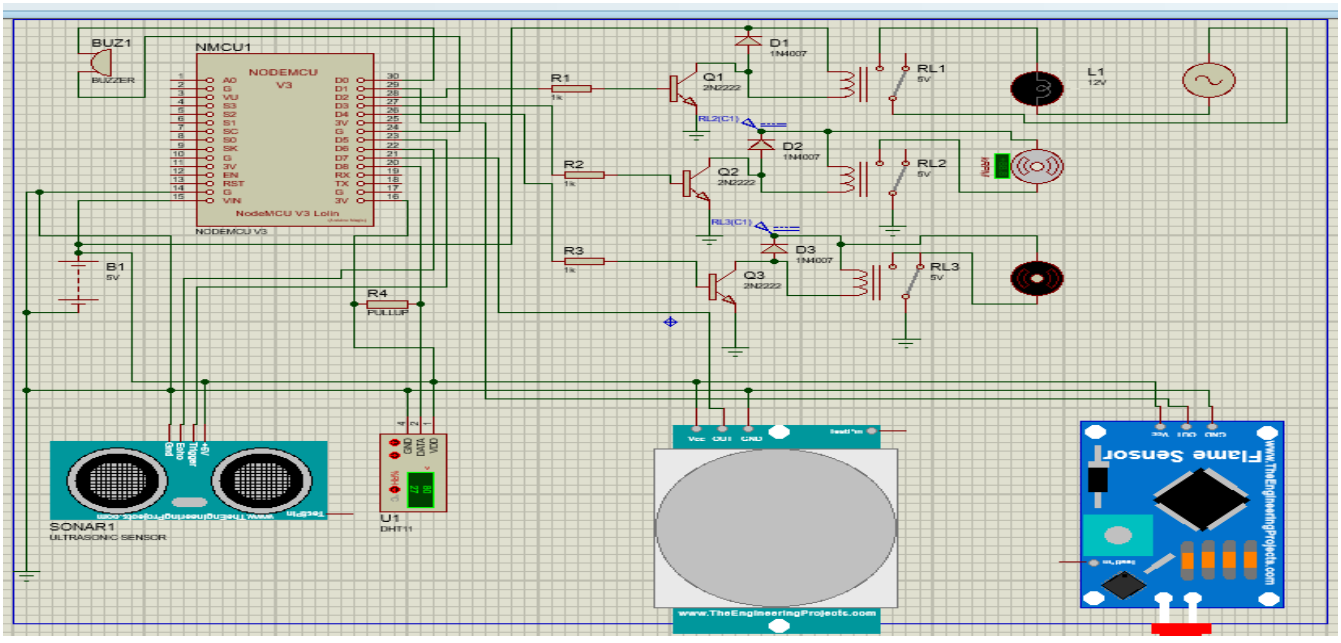

Fig 2: Circuit Diagram

IV. FLOWCHART

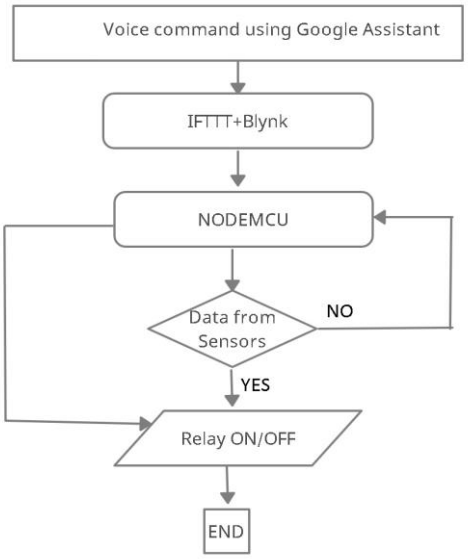

Fig. 3 Flowchart

Fig. 3 shows the flowchart of the software design part. Google assistant receives the voice command from the user. IFTTT converts the google command into suitable logic to be processed by the Blynk application. Resulting information processed by the NodeMCU. Relay is driven by the command from NodeMCU. On the other hand, sensor data processed by NodeMCU has been sent to the relay module for appropriate output generation.

V. RESULTS AND DISCUSSION

The main purpose of this project is to prevent unnessery wastage of power and water. 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 sensor reading presently fetched from NodeMCU via Blynk server and the button widget is clicked to change the state of 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. In case if the device has not been setup, Blynk App gives feedback through IFTTT to Google Assistant. When at home or outside, as shown in fig 5 Users can also turn the light, fan and motor on and off sending a voice message through the Google Assistant. All the persons in that family can share the Blynk app so that, when one person switches a device either fan, light, and motor, remaining persons will get this information and are aware of usage of the respective equipment. When the person enters into the room, the PIR sensor sends notification to the android mobile. In this way it is used to detect any suspicious action, providing security for the people in the home. In general, humidity in room temperature must be around 60% and temperature is taken in between 27°C and 30°C. Other than these range of temperatures will affect human health who live in that room. The DHT11 temperature sensor detects and provides temperature and humidity values in the room and quickly and adjusts the speed of the fan accordingly with the gradual increase and decrease of the temperature to maintain healthy atmosphere. To control the usage of water, the pump is on when water-level reaches a predefined height, user gets a notification in his phone which informs him about the high water-level. If the user does not switch off the pump and there is a further rise of water-level, then the pump is turned off automatically by NodeMCU when water-level rises to a certain height. Similarly, the motor turns on whenever the water level in the tank reaches below a certain prescribed level after making sure that the water level in the sump is sufficiently above prescribed level. To prevent a fire, a threshold value of 600 ppm was set and if it was exceeded it would notify the user on the Blynk app. The surroundings humidity and temperature values were obtained. The temperature ranges the device could measure was from 0°C to 50°C and humidity ranging from 20% to 90%. When fire will near up to a maximum range of 100cm Flame Sensor detected the fire and sends notification to the mobile and a mail to the attached mail address and the fire alarm responded.

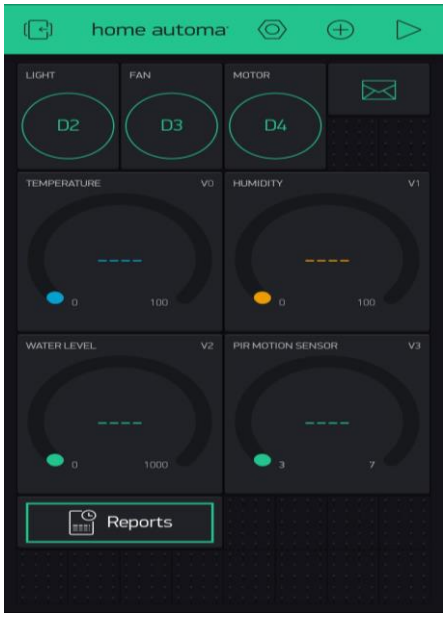

Fig. 4 Blynk Widget

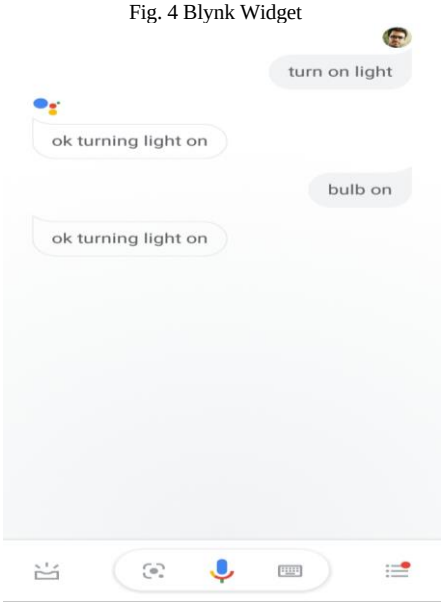

Fig. 5 Google Assistant

VI. CONCLUSION

The proposed prototype presented is a low cost, flexible to operate and monitoring system using Node MCU Board with internet and various sensors remotely controlled by Android OS smart phone. In this model, NodeMCU microcontroller has been used as an interface between user and hardware components. It has been programmed and connected to several components according to the requirements. A micro web server which is known as IFTTT has been used as an application layer for the communication between remote users and home devices, security systems. This entire system communication is enabled through internet. Notifications are sent to user through the app Blynk app installed in the smart phone. Users can operate wirelessly to control and monitor home appliances that can be automated by using several sensors like temperature sensor, PIR etc. It can further be upgraded by using different sensors for different home appliances. Since smart phones are widely used nowadays, this user-friendly system can be used for benefitting the mass. The circuit used for controlling AC fan speed can also be implemented in AC light dimming applications. The features of automatic turn off and sending emergency notification can be very useful. It can be automatically turned OFF and ON when room temperature is lowered to a specified value the fan can be turned off automatically. In the above case notifications can also be sent to user through users Blynk app. Users can even give voice commands through the Google Assistant which will connect with the IFTTT to the Blynk App. Mobile application development companies with dedicated teams are working extensively on IoT-based applications that are connected to the cloud. Not only old-aged or physically challenged people can be benefitted using this proposed model, but any person with a smart phone can monitor and control the electronic devices without any difficulties. So, by adopting the proposed system, we can alert the surrounding people and also inform the firemen regarding the accident along with the accurate location of accident area specified. Hence this is an era of automation using the proposed system for the environment that ensure the safety of all with reduced electrical power cons mptions.

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