Smart Home Using IoT

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Abstract- *In order to help maintain comfortable living conditions and energy saving within a home, home monitoring and automation are utilized. Due to the rapid development in the field of the Automation industry, human life is becoming more advanced and better in all aspects. Automation can be accomplished by using the Internet of Things (IoT). The proposed system consists of a hardware interface and software interface. In the hardware interface, the integration of ESP8266 Wi-Fi technology for controlling home appliances and sensors is manifested, and an application is provided for controlling to multiple users of home, with smart phones, tablets, and laptops form anywhere around the world. This system is one of the best methods for controlling home devices with ease with multiple users and one of the best methods for an energy management system. The system designed is economical and can be expanded as it allows connection and controlling of a number of different devices.*

Keywords- Smart Home, Internet of Things (IoT), Node MCU ESP8266 Wi-Fi Technology, Sensors, Relay, Blynk Application.

I. INTRODUCTION

A "Smart Home Using IOT" system is a system that allows users to control various appliance of the different kind used and also makes controlling of home appliances very easier and helps in saves energy. Since 2013 with the development of new technologies, the Internet of Things (IOT) has also emerged to make devices smarter. Earlier in the 1990's almost every home consisted of electrical appliances such as television, heater, air conditioner, washing machine, induction, electronic security systems and other electronic and electrical devices which were manually controlled. With the evolution of Internet of Things (IOT) all these manually controlled electrical and electronic devices can be controlled automatically. Nowadays automation system for home and building are used quite often. On the other hand, they increase the comfort particularly when everyone is busy with their work. "Home automation systems" installed in houses apart from allowing centralized controlling of ventilation, heating, air condition and lighting, increase comfort as well. Home automation systems using IoT consists of three major parts. The first part is the sensing and data acquisition part. The second part of the system is the data processing. The last part of IoT automation is the internet. The advantages of Smart Home Automation usually fall into the categories, including energy savings, home safety, user convenience, better control Comfortable Atmosphere and Provide Peace of Mind.

Fig.1. Prototype of Smart Home using IOT.

II. INTERNET OF THINGS (IOT)

The Internet of things (IoT) depicts the organization of actual items—"things" or articles—that are embedded with sensors, programming, and different advancements to associate and trading information with different gadgets and frameworks over the Internet.

Things have developed because of the intermingling of various innovations, continuous investigation, AI, product sensors, and inserted systems. Conventional fields of implanted frameworks, remote sensor organizations, control frameworks, mechanization (counting home and building robotization), and others all add to empowering the Internet of things. In the purchaser market, IoT innovation is generally inseparable from items relating to the idea of the "keen home", including gadgets and apparatuses (like lighting installations, indoor regulators, home security frameworks and cameras, and other home machines) that help one or more normal environments, and can be controlled by means of gadgets related with that biological system, for example, cell phones and brilliant speakers. IoT can likewise be utilized in medical services frameworks. There are various genuine worries about threats in the development of IoT, particularly in the space of protection and security, and thusly industry and legislative moves to address these worries have started including the advancement of worldwide guidelines.

III. SYSTEM ANALYSIS

In this paper the designed model of home automation fulfils the unique demands of the increasing population of today's world. The Smart Home system consists of hardware implementation which has the capabilities to control different home appliances of ratings 230V and 5A in users' home with the ESP8266 WiFi technology. Along with the controlling of appliances different sensors like PIR sensor, Temperature and humidity sensors are used for home safety purpose as well as home security purpose. If the user is not sure of weather switching off the lights, fans, the user may check the data on-line from the database present along with the main server and change the status accordingly. In there is any intruder the system automatically alerts the user with a message helping the user to take action as soon as possible. Altogether our home automation system provides 100% efficiency as it saves time, helps to manage energy consumption which in turn saves money and provide optimum security to the user making the user's home a safer and a smarter place to live in.

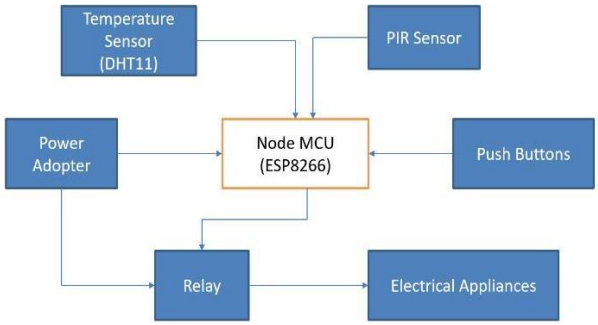

Fig.2. Block Diagram for Smart Home using IOT

TABLE.I. LIST OF COMPONENTS

S.No	Components	Voltage (Volt)	Current (Amp)	Quantity (No.)
1	Power Supply	12V	1A, 2A	1
2	Voltage Regulator	5V	-	1
3	Extension Board	230V	5A	1
4	ESP8266 Wi-Fi Module	3.3V	-	1
5	PIR Sensor	5V		1
6	Temperature & Humidity Sensor	5V	-	1
7	Relay	5V	-	1

IV. HARDWARE DESCRIPTION

A. Power Supply

A power supply is a thing which is responsible for supplying power to a load. The basic function of a power supply is to power the load by converting current from source to the valid current, frequency and voltage. Few power supplies are different standalone parts of equipment's, while some are made into load which they power. In the proposed system 12V, 2A is used for ESP8266-01 Wi-Fi module.

B. Relay

Relays are electric switches that use electromagnetism to convert small electrical stimuli into larger currents. These conversions occur when electrical inputs activate electromagnets to either form or break existing circuits. Relays are highly versatile components that are just as effective in complex circuits as in simple ones. The pin description of SPDT relay is shown in Figure 3.

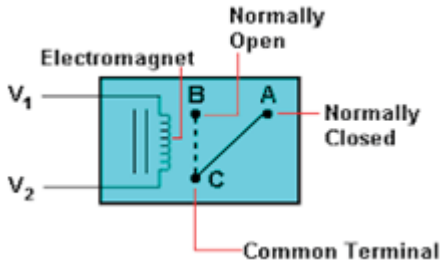

Fig.3. Pin Diagram of SPDT relay.

C. PIR Motion Sensor

A PIR Motion Sensor is "Passive Infrared Sensor" which is used in the system. PIR sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. They are small, inexpensive, low-power, easy to use. They are often referred to as PIR, "Passive Infrared", "Pyroelectric", or "IR motion" sensors. Figure 4, shows the working diagram for PIR sensor.

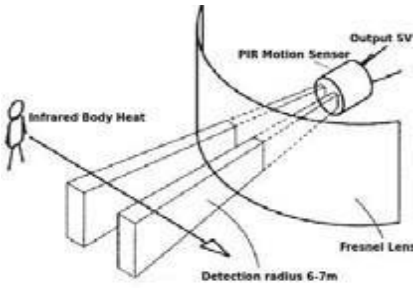

Fig. 4. PIR Motion Sensor Working.

D. Temperature and Humidity Sensor

DHT11 Temperature and Humidity Sensor is used in the developed system. It has a calibrated digital output signal with capability of temperature and humidity sensor. It has a supply voltage of 5 V, the temperature range of 0-50 °C error

of ± 2°C and humidity of 20-90% RH ± 5% RH error. The pin description of the sensor is shown in Figure 5.

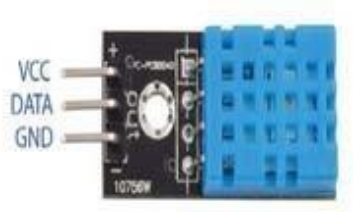

Fig.5. DHT11 Temperature and Humidity Sensor

E. Voltage Regulator

A voltage regulator which maintains a fixed voltage level automatically is used in this system. A voltage regulator may use a negative feedback or a simple feed-forward design. It may use electronic or an electromechanical mechanism. Based on the design, it can be used to operate one or more AC or DC voltage. The pin description for 7805 voltage regulators is shown in Figure 6.

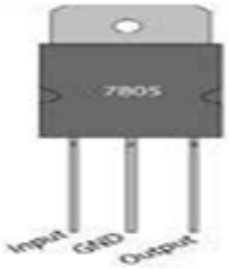

Fig. 6.7805 Voltage Regulator IC pin diagram.

F. ESP8266 Wi-Fi Module

The ESP8266 is a low-cost Wi-Fi chip developed by Espressif Systems with TCP/IP protocol.NodeMCU Development board is featured with wifi capability, analog pin, digital pins, and serial communication protocols. ESP8266 comes with capabilities of 2.4 GHz Wi-Fi (802.1b/g/n, supporting WPA/WPA2).

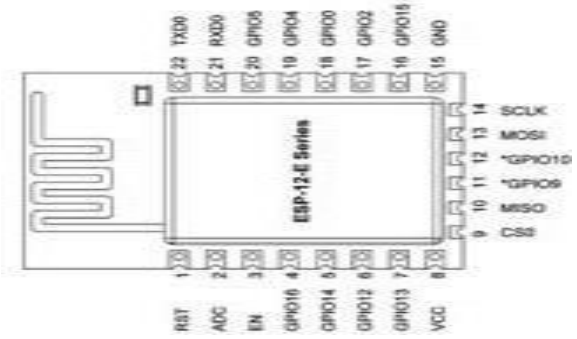

Fig. 7. Pin Diagram of ESP12 Wi-Fi Module.

TABLE. II. PIN DESCRIPTION OF ESP8266

Pin No.	Pin Names	Usage
1	Ground	Connected to the ground of the circuit
2	Tx	Connected Rx pin of the microcontroller
3	Rx	Connected Tx pin of the microcontroller
4	GPIO4	General purpose pin for input/output
5	GPIO5	General purpose pin for input/output
6	Reset	Resets the pin
7	Vcc	Connected to 3.3V
8	CH_EN	Chip Enable-Active high
9	GPIO12	General purpose I/O pin
10	GPIO13	General purpose I/O pin

V. SOFTWARE DESCRIPTION

In the presented system different Software for programming and controlling of Smart Home Automation is used. IDE which stands for the integrated development environment is an open-source software which is used for writing program and also for uploading code into ESP8266 Wi-Fi Module. An application named "Smart Home Using IOT" is created using ESP8266 and blynk app which provides a platform for controlling purpose. This will only work if the system is connected to Wi-Fi. The flowchart is shown in Figure 8 for Smart Home Using IOT application.

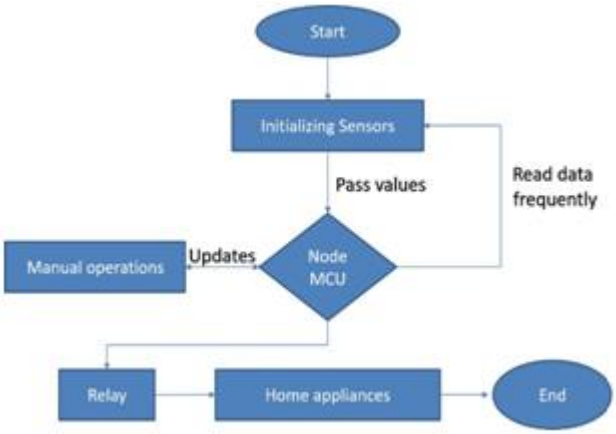

Fig. 8. Flowchart - Aome Automation System

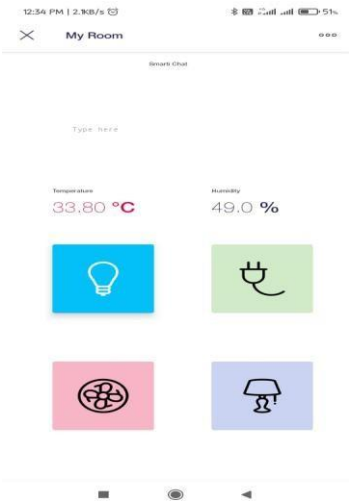

Fig 10. Blynk Application Screen

VI. IMPLEMENTATION SETUP

The implementation for the Smart Home Using IOT system is shown in the form of hardware. The implementation setup of Smart Home Using IOT system consists of different through ESP8266 Wi-Fi Module microcontroller for controlling home appliances as well as for home safety and security purpose through accidental fires, short circuits, etc.

Fig. 10. Connection of Smart Home Automation system

VII. RESULT

The IOT system we have developed is tested by installing smart sensor units and setting up a server in house. After installing the smart sensor units, the user needs to install the software to his/her laptop or smart android phone. After proper installation of the provided software the user needs to sign-up on the home automation server. Once the user is registered, a unique user id and a password is provided to the users of each house in which the sensor units are installed. After the user id and the unique password are obtained user can login from our android application. As soon as the user login, a home page will appear in which the user could keep a track of all the electronic and electrical devices which are connected with the server. Our designed model of home automation can also control by using any web browser. To operate home automation system user need to go to the web-page of home automation system then a login page will display. By signing in user can control all the electronic and electrical devices which are connected with the server. A threshold value is provided to each sensor connected. If the sensor parameter exceeds the threshold value provided the required operation will take place automatically. Once the user is notified that the value of a particular sensor has exceeded, the user can immediately change the status of that device from anywhere around the world with a computer, or with a laptop or with a smart android phone. In this paper we focus on the process of operating or controlling various equipment, machinery, and other electrical and electronic appliances using various control systems remotely. This method of operating or controlling such applications is referred to as automation which has become an integral part of everyday life for human beings. The working model we designed has its focal point on home automation providing 100% efficiency.

VIII. CONCLUSION

The home automation using Internet of Things has been experimentally proven to work satisfactorily by connecting simple appliances to it and the appliances were successfully controlled remotely through internet. The designed system not only monitors the sensor data, like temperature, gas, light, motion sensors, but also actuates a process according to the requirement, for example switching on the light when it gets dark. It also stores the sensor parameters in the cloud (Gmail)in a timely manner. This will help the user to analyse the condition of various parameters in the home anytime anywhere. For future work we would try to increase the number of networks under a single server making a whole city automation using IOT.

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