SCHOOL OF ELECTRONICS ENGINEERING

Department of Electronics and Communication Engineering

Smart Home Automation And Security Using Blynk app

Keshav Kumar
(20BEC0156)
Aryanshu Aman
(20BEC0263)
Debabrath Sarkar
(20BEC0430)
Sabyasachi Mohanty
(20BEC0401)

Project Report
of
ECE – Internet of Things Fundamentals

Fall Sem 2022-23

SCHOOL OF ELECTRONICS ENGINEERING

Smart Home Automation and Security Using Blynk App and Google Assistant

Keshav Kumar
20BEC0156

Aryanshu Aman
20BEC0263

Debabrath Sarkar
20BEC0430

Sabyasachi Mohanty
20BEC0401

Project Report
of
ECE – Internet of Things Fundamentals

Fall Sem 2022-23

Index

Abstract:

Today, we are living in the 21st century and automation plays an important role in human life. Home automation allows us to control home appliances such as Lights, Doors, Fans, Air Conditioners, Television. It also provides home security and emergency system activation. Home automation not only reduces human effort, but also means energy efficiency and time savings. A major goal of home automation and security is to enable disabled and elderly people to control home appliances and be alerted in critical situations. Home automation is a unique system that allows you to control and interact with almost every aspect of your home. It is a term used to describe all household appliances and their interaction. For example, the microcontroller's central panel can control everything from heaters to all household appliances. It involves remotely controlling various aspects of the home from a computer or mobile device, programming electronic devices based on conditions and scenarios, or controlling various devices in the home as one. Centralized management of the control center is possible. It is essential that the various managed devices communicate with each other and with each other. The main purpose of home automation is to control or monitor signals from various devices or essential services. In our project, we are using Wi-Fi and manual methods for controlling the Home Appliances like Lights, Doors, Fans, Air Conditioners, Tv, etc. We can use our smartphone to control or monitor our home automation system. On the phone we are using a blynk app.

Introduction:

Smart Homes is a term used for homes that could be controlled remotely using some kind of communication channel and communicating device and at the same time could be monitored from anywhere in the world without any human intervention. The motivation behind such project is that they are highly useful for people with disabilities or for old age people as through it they can control the various appliances around the home wherever they are so they don't have to go around the house to switch off a light that they by mistake left ON. This helps them greatly as going from one place to another is a real challenge for them. Also inclusion of intrusion detection and monitoring of house for hazardous conditions like gas leak and fire increase the usefulness of these systems. The hardware part of the developed system is programmed using Arduino IDE and the android application is programmed using Android IDE. The hardware components have been programmed to communicate directly wit the Firebase database. All the values of the sensors and the current status of each and every electrical appliance is continuously updated on the Firebase database using pre-configured Wi-Fi device. The use of android application is to download these values on demand by the user and display it to the user and also the application could be used to control the electrical devise by altering the values in Firebase Database.

Related Work/Literature Study:

Over the years many home automation systems have been developed with many different technologies. With the advancement in technology, there has been a great deal of improvement in the level of sophistication and features of a home automation system. One of the earliest systems developed used the DTMF receiver as a communication interface and the authentication of the user was done by ringing a line. Recently many systems have been proposed which are GSM based with different microcontrollers such as Arduino microcontrollers or PIC microcontrollers. These systems have the advantage that they could be implemented easily and don't need an internet connection. They could be operated by using a SIM card and text messages. Also, systems have been developed using Raspberry Pi as the microcontroller, and E-Mail is used to carry the message unlike text messages in GSM-based systems.

These systems do have some advantages but have a disadvantage first the Raspberry Pi in itself is very costly secondly you have to write an E-Mail every time you want to do something which is very tedious.

Also, attempts have been made to make a smart power management system using sensors and mobile technology which is a quite useful approach to smart management of homes and could be further developed into making smart homes that could run by themselves without need of anyhuman intervention. Also, Bluetooth technology has been used to develop smart homes which is a wireless technology just like Wi-Fi but the Bluetooth technology has a disadvantage that it does not offer a long range as is the case with Wi-Fi technology and also only one node could be connected at a time which is a big disadvantage as we need to connect multiple devices at home and also it doesn't support mesh technology as of yet. Also some have tried to incorporate speech recognition tech along with Bluetooth technology which really increases the usefulness of the system. The best advancement in field of home automation came with the use of Wi-Fi technology as it offers long range, in free so no licenses are required, could be used from anywhere in world and also could be used to connect to multiple devices at a time

Block Diagram
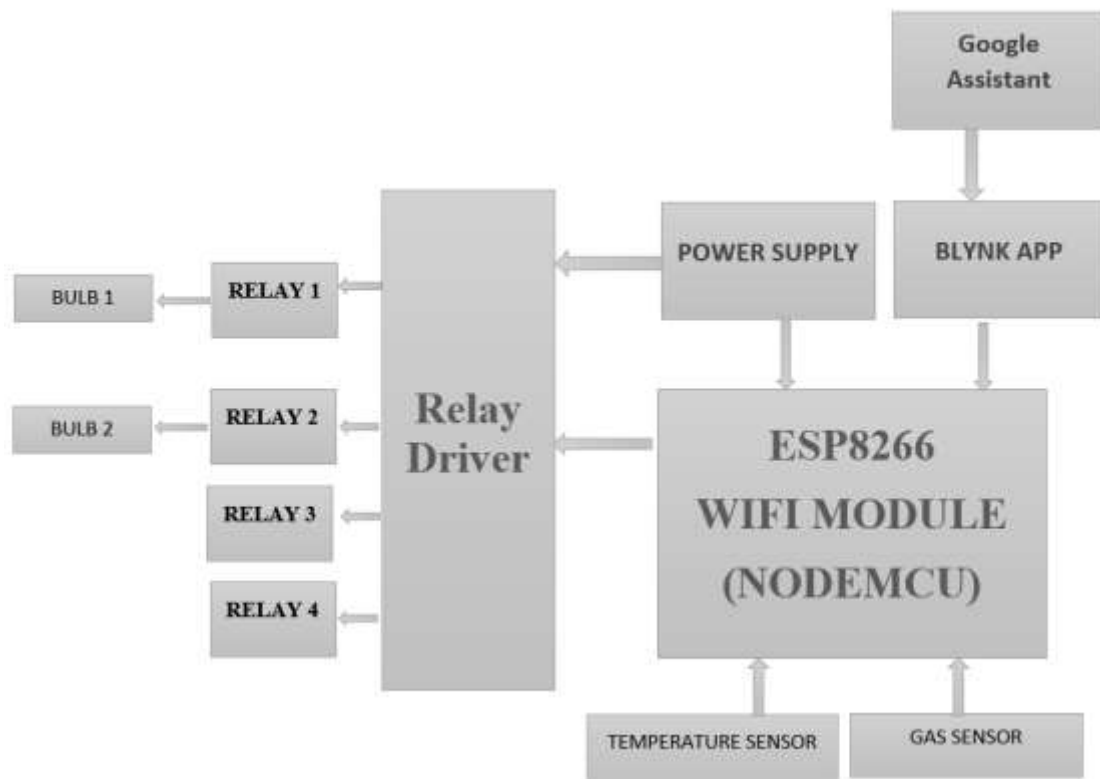
Components Used

NODEMCU ESP32(Fig. 1) is used as Wi-Fi chip and as central controller. It is better version of generic ESP 8266. The most obvious and useful feature of it is that it could be powered via a USB type B rather than batteries. It's recommended for beginners as it is easier to use and is more durable. Also, it works on 5V power supply rather than the latter option which works on 3V so it becomes quite easy to connect different sensors to it as some of them works on 5V. In this project I decided to use ESP instead of Arduino UNO or Raspberry pi as it's cheaper than these boards. Also, one of the objectives of my system was to make it cheap so that everyone can afford it also it was required that the system could be accessible from anywhere in the world. Though it has only one analog sensor port so to connect multiple analog outputs you will have to use a switch.

Fig.1 NODEMCU ESP 32

B. **Temperature sensor (Fig.2):** We have used DHT 11 for sensing temperature values. DHT 11 sensor belongs to the DHT sensor family. The reason to use DHT 11 was that it also takes humidity value readings along with temperature which is a big plus as this way I can calculate how it really feels also in case of fire as the humidity level drops so this reading combined with the reading of increased temperature could be used as an indicator of a fire break out.

Fig.2 DHT 11

Google Assistant: Google assistant along with IFTTT is required for the Voice Command feature of the system. Google assistant is used to take the voice input from the user and than IFTTT is used to take appropriate action based on the given voice input. The application[6] could be used to turn various lights in the house ON or OFF. The main advantage of using Google assistant was that by doing this I can integrate my system along with commercial home automation systems so that both the systems could be controlled from one place. Also it's highly useful for the old age or elderly people as it makes using the system very easy for them.

5V 4-channel relay module: 5V 4-channel relay interface board, and each channel needs a 15-20mA driver current. It can be used to control various appliances and equipment with large current. It is equipped with high-current relays that work under AC250V 10A or DC30V 10A. It has a standard interface that can be controlled directly by microcontroller.

Fig.3 Relay module

System Description:

   In our project the system is divided into 3 parts Android application, Firebase database and hardware components. The communication channel used is Wi-Fi. All the exchange of information takes place via internet so it is necessary that there is always an active internet[8] connection for the working of the system. The advantage of using Wi-Fi is that you don't need to be in direct line of contact for performing the operations like in Infrared and also it offers larger range unlike Bluetooth communication. The user interface was developed using Android studio and currently app is available only for android devices as android is the more widely used than iOS.

Node MCU ESP32, MQ 5 and DHT 11: The connection between Node MCU ESP 32, DHT 11 and MQ 5 is such that as DHT 11 has a digital out so it could be directly connected to the one of the digital In of the ESP and the MQ 5 could be connected to the Analog In of the ESP.
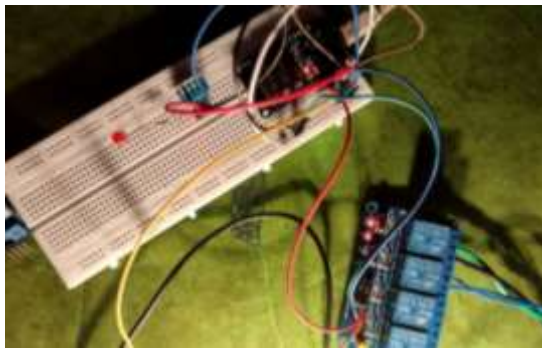

Fig. 5 Circuit

The connection between Esp and Blynk is enabled via the internet. ESP via pre-configured Wi-Fi connects to the Blynk server. And the google assistant is working with IFTT which is connected to Blynk.

The Blynk app hides the complexity and the inner working of the system and provides the user with a very simple interface through which the user can effectively interact with the system. On opening the application the application provides the user with multiple options such as:

☐ Kitchen Lights control
☐ Dining room lights control
☐ Temperature and Humidity status activity
☐ In case of Fire, it will display a fire alert
☐ In case of a Gas leak, it will display a gas leak alert

Functionality

1. Lights control activity: By using this activity we can control the lights of one room at a time or of all the rooms at the same time.

Depending on what option is chosen the appropriate action will happen.

☐ If you click on the option to turn the kitchen lights ON only the kitchen lights will turn ON same as the Dining room lights.

☐ Also if you are going out then there is one more useful feature in which if we press the Away system then it will automatically turn the lights of the house ON at fixed timings like in the evening and also turn them OFF at fixed times. Also, it will turn other appliances like the TV ON.

2. **Temperature and humidity status activity:**

Through this activity, we can check the status of temperature and humidity in the house. This activity connects to the firebase database and then downloads and displays the temperature and humidity values in the recycler view. The activity is created in recycler view so it could be updated anytime, whenever a new value is added to the database a card is created for that data and is added at the top of the android application and displayed to the user.

3. Gas Leak alert:

This is also not an activity but a dialog box that is created whenever the android application detects that the downloaded or you can say newly added value in the firebase database is a sudden increase in the voltage value from the MQ 5 sensor or is above a pre-specified limit of the voltage value.

4. **Voice Control:**

This makes life easier and simpler if someone elderly is at home then they don't need to always go to switches and turn on or off the lights, simply by giving the command to google assistant it will send the necessary command to Blynk, and from there switches can be controlled.
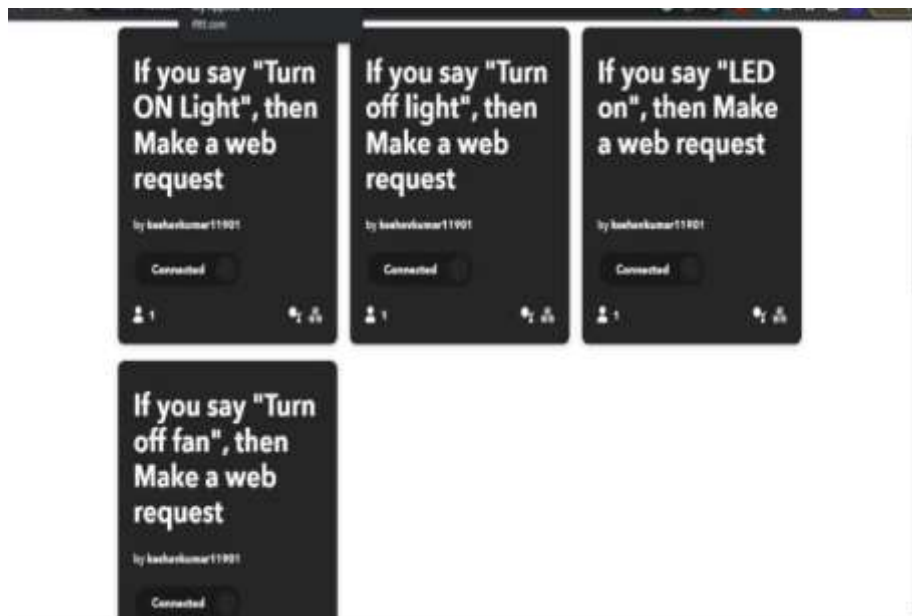
Fig.7 IFTTT Screenshot

Fig .8 Applets for google assistant control.

V. ADVANTAGES OF SMART HOME

- ☐ Can reduce the physical effort that the aged or disabled people have to do.

- ☐ Can save time since the user can operate the system from wherever they are.

- ☐ Saves energy as this way people will not feel too lazy to switch off the light they left ON.

- ☐ Energy consumption could be managed more effectively.

- ☐ Decreases the workload especially on working with professional

VI. RESULT

The implemented system draws on the advantages of Wireless Fidelity technology. It has advantages like a longer range, flexibility to add new devices simply, and efficiently and also has simple UI. Also, it offers quicker implementation of commands using technology such as

Firebase which is a real-time database used as the back end and offers real-time execution of commands. Also to make the UI of the system simpler voice commands could be used to control the system. This is especially useful for elderly or handicapped people.

Fig.9 Turning the appliance on/off.

Conclusion:

The implemented system is developed using ESP 8266 12E and by using Wi-Fi as mode of transmission. The implemented system design specifications are chosen in such a way that it is flexible in terms of number of devices that could be controlled and at the same time could be controlled from anywhere in the world. In the future home automation system would be smarter, faster and offer more ease to scale them. Also a lot of work is being done to incorporate Artificial Intelligence technology into this field. This will have drastic effect on this field and hopefully we will than have a fully capable smart home system.

ACKNOWLEDGMENT

References:

[1] Singh, H., Pallagani, V., Khandelwal, V., & Venkanna, U. (2018). IoT based smart home automation system using sensor node. 2018 4th International Conference on Recent Advances in Information Technology (RAIT).

[2] Pavithra, D., & Balakrishnan, R. (2018). IoT based monitoring and control system for home automation. 2015 Global Conference on Communication Technologies (GCCT).

[3] Sirsath N. S, Dhole P. S, Mohire N. P, Naik S. C & Ratnaparkhi N.S Department of Computer Engineering, 44.

[4] Vidyanagari, Parvati, Pune-411009, India University of Pune, "Home Automation using Cloud Network and Mobile Devices"

[5] Asadullah, M., & Raza, A. (2017). An overview of home automation systems. 2016 2nd International Conference on Robotics and Artificial Intelligence (ICRAI).

[6] Singh, U., & Ansari, M. A. (2019). Smart Home Automation System Using Internet of Things. 2019 2nd International Conference on Power Energy, Environment and Intelligent Control (PEEIC).

[7] Carducci, C. G. C., Monti, A., Schraven, M. H., Schumacher, M., & Mueller, D. (2019). Enabling ESP32-based IoT Applications in Building Automation Systems. 2019 II Workshop on Metrology for Industry 4.0 and IoT (MetroInd4.0&IoT).

[8] Kodali, Ravi Kishore, Vishal Jain, Suvadeep Bose, and Lakshmi Bopanna. " IoT based smart security and home automation system." In Computing, Communication and Automation (ICCCA), 2017 International Conference on, pp. 1286-1289. IEEE, 2017.

[9] Rukmana, F. I., Akmaliyah, Mulyana, E., Kusnawan, A., Kamelia, L., & Darmalaksana, W. (2020). All-in-One Application For Smart Home System Base on Telegram Controlled. 2020 6th International Conference on Wireless and Telematics (ICWT).

[10] Bhatnagar, H. V., Kumar, P., Rawat, S., & Choudhury, T. (2018). Implementation model of Wi-Fi based Smart Home System. 2018 International Conference on Advances in Computing and Communication Engineering (ICACCE).