Design of IOT Based Smart Monitoring and Control System for Electrical Appliances

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Abstract: This project presents the application of "Implementation of IoT-based Home Control and Monitoring System using Micro controller and NodeMCUs". The purpose of the presented application is an efficient implementation for IoT (Internet of Things) used for monitoring and controlling the home appliances via World Wide Web. Home automation system uses the portable end devices as a user interface. They can communicate with home automation network through an Internet gateway, by means of low power communication protocols like MQTT, Wi-Fi etc. The system is running with Micro controller as a server and NodeMCU as a client node. User can easily control many appliances like light switches, electronic devices Etc., and inform the status of load to the user through android app. The server is directly connected with relay-hardware circuits to control the home appliances. This system makes easier by implementing automation and security along with the Internet of Things to create a system which will enable someone to remotely monitor and control some areas of a house remotely and securely from anywhere with minimum cost.

Keywords: Microcontroller, WIFI module, Smart phone

I.   INTRODUCTION

Today, technology plays very important role in our daily lives. We cannot livewithout technologies such as televisions, smart phones, computers, Internet and others. Because these technologies influence as an essential part in our day-to-day lives. Communication is thus enhanced, and people can communicate more easily with each other. With the help of technologies, we can easily communicate with our friends and store personal data such as photo, documents, music and movies. To simplify daily life of people, we connect many devices to Internet. The main advantage of the Internet is its ability to connect billions of end devices from different places to create link between them. So, we can connect from any places to get access and information of devices we need. During this progress we can saving time, energy and money.

Home automation refers to control appliances, activity, and features of home. By using end devices from any where in the world Home automation can give you access to control devices at your home [1]. In this system all the main parts are connected wirelessly and Message Queuing Telemetry Transport (MQTT) is used tocommunicate between them. MQTT is mainly designed for automation, it has a low foot print to send and receive data. So, very less amount of data is used between MQTT server and clients . It also uses three Cloud services IFTTT, Remot3.it and Weather Underground. IFTTT

service is used for send notifications, G-mails and messages to user.Remot3.it service supports user remotely accesses to the system from anywhere.

II. BACKGROUND OF PROPOSED SYSTEM

The smart home concept started with the invention of remote controls or mobile applications unveiled by Nikola Tesla in 1898.The technology is used to make all devices to act smart. A smart home allows home owners to control appliances, thermostats, lights and other devices remotely using a smart home or tablet through an internet connection.
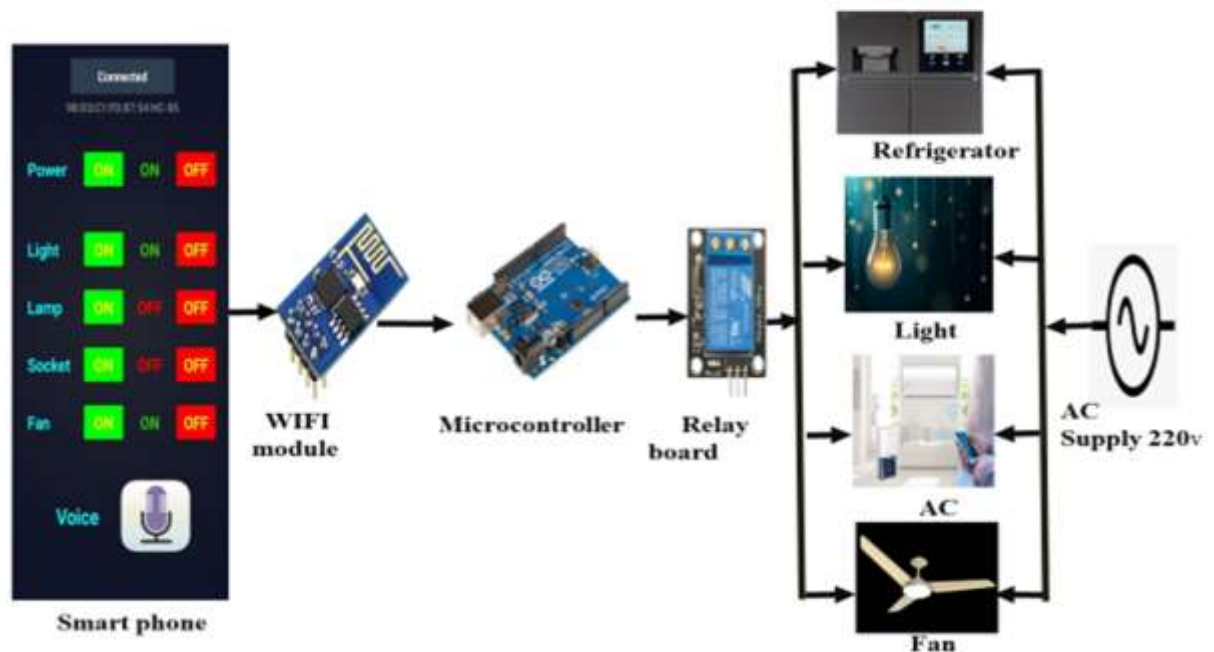

Figure:1 Proposed system of home automation

Here we can observe in figure 1 the smart phone is connected to wife module which is transfer the data into server and sending to one type of microcontroller is Arduino UNO. Arduino UNO is a open source platform based on easy to use hardware and software.It is connected to one type of switch is electro magnetic relay board. This switch is connected to the different types of loads and it is connected to ac supply.

III. IOT IMPLEMENTATION

An IoT device is any device that is able to be connected to an internet network in order to Gather sensor data, process it, and send it through the Internet to its designated endpoints. Receive commands through the Internet in order to control actuators

Fig-2: IoT for Various Applications

The internet of things helps people live and work smarter, as well as gain complete control over their lives. In addition to offering smart devices to automate homes, IoT is essential to business.

Fig-3: IoT for Various Appliances in Home

IV.   HARDWAREIMPLEMENTATION

The designed model shows the implementation of IoT based Home Monitoring and controlling module. In the presented model there is a manual control in the board to control the loads in home. Which is having two led indications for power supply this proto type is designed for 4 various loads (light, fan, ac, fridge).
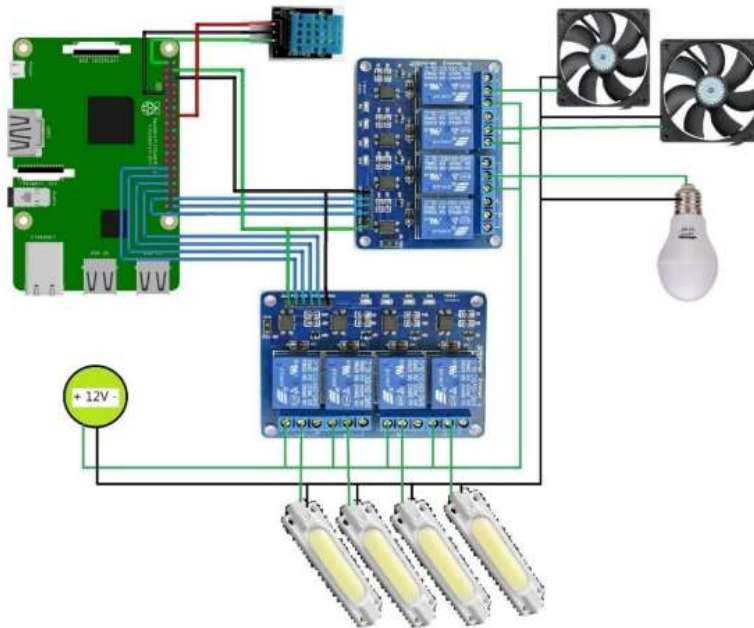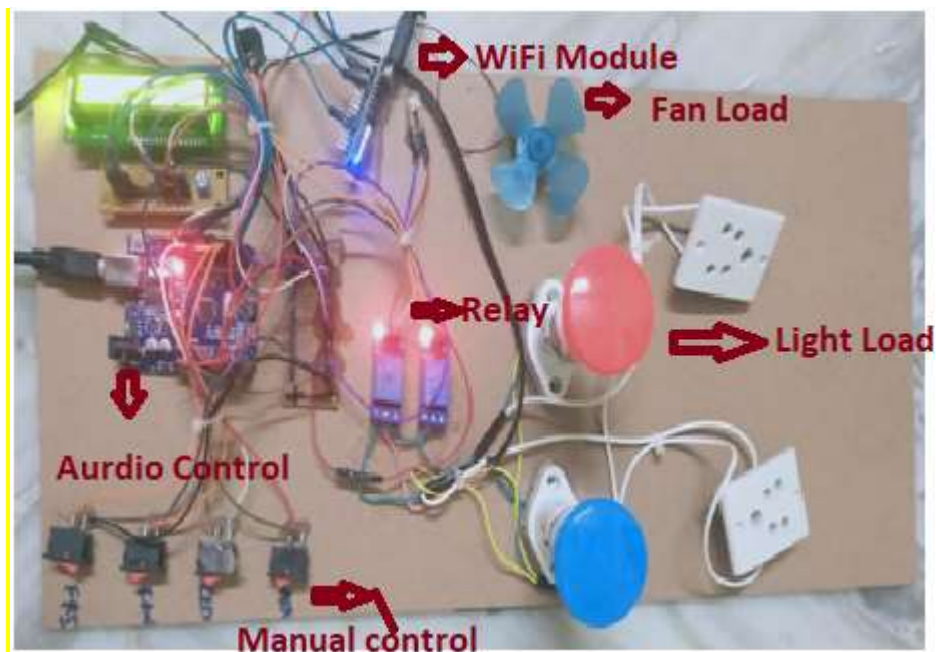
Fig-4:Board Design

Fig:5 Prototype of Proposed Model

In this hardware implementation we are showing that all the loads are connected to relay board, microcontroller, Wifi module, LCD module and input modules to turn on/off in this system.Here we can see relay board ,LCD module is on position because we connected to the laptop.

V.   OUTPUT OF THE PROPOSED SYSTEM

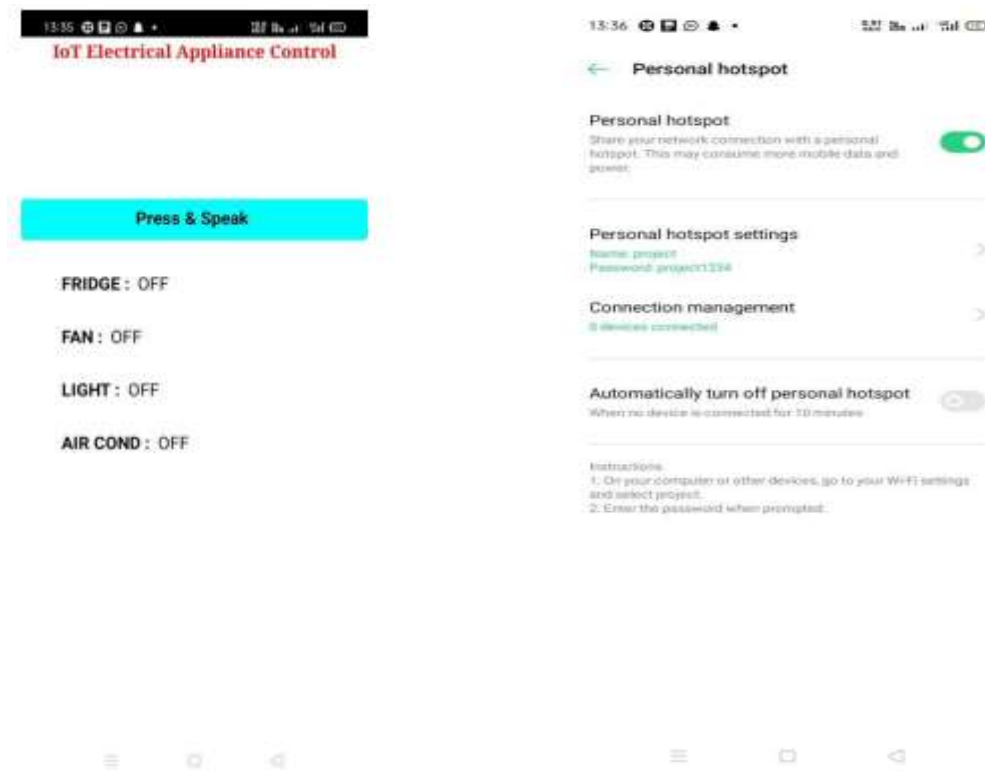### 5.1 working software for the System

Fig:6 a)Load Updation in software   b) internet interface credentials

Fig 6a.shows the updation of load status in the software. where at initially all four loads are in OFF condition. To get that updation in the software we need to set the Internet interface through WIFI for the The system It can be shown by figure.6b. One of the great benefits of the system is that the devices and appliances at home can be controlled and monitored from any end devices that can access web-service. And user also get notification with real-time information about home when someone forget to off the light. Figure 4.21 describe updation in the app received by user. The control of various home appliances, and monitor of the devices can be done by using end devices from Home Assistant UI through

Fig:7a) Updation in the app   **b) Both FAN and LIGHT load is ON**

- Here we can observe in the above slide we just speak and turn on the fan and light in IOT mobile application app.

- Even When it is turn ON/OFF manually then it is automatically update in the proposed system through IOT instruction.

VI.   ADVANTAGES OF THE PROPOSED SYSTEM

The advantages of the system presented in this Project areas follows:

- Being very low cost and low power consumption
- Using Computer Control theory concept and Wireless Communication Technology in this IoT-based Home control and monitoring system
- Using Web User Interface (browser running on any end devices) to control and monitor the entire system easily
- Being able to turn on or off switches that connected with home appliances

VII.   LIMITATIONS OF THE PROPOSED SYSTEM

In this Project, the backbone of the system is the Wireless Network that support Internet because all of the parts of the system are connected to that Wireless Network. If the Internet Connection loses from it, the system will go offline and users cannot access the system from any places. This home control and monitoring system is just small size prototype of house. Instead of using low voltage DC output lights and fans, the higher voltage DC or AC lights, fans and real home appliances can be used to control at home where we live.

- Security issues

- Helplessness if technology fails

- Reliable internet connection is crucial

- Reduced mental and physical activity

- Cost is high

VIII.   APPLICATIONS OF THE PROPOSED SYSTEM

- IOT based home automation over the server.

- IOT based home automation under WIFI through android apps from any smart phone.

- IOT based home automation by android application based on the remote control.

IX.   COMPARISON FROM OTHER HOME AUTOMATION SYSTEM

The benefits of home automation can be a separate into few categories, including savings, control, safety and convenience. To support all of the above benefits in home automation system will cost alot. But my system will give consumers all of above benefits with very low cost. The main building block of Home Automation System consisted off our basic elements: communication, the sensor unit, processing unit and power units. Some automation system sensor unit is running with Arduino UNO and ESP8266 module to sense data through connected sensor, sometime used Raspberry Pi as a sensor node just collecting sensor data and send to the main server. And the processing unit is running with high end PC to communicate with sensor units connected wired or wirelessly. In my system sensor unit is running only with NodeMCU to reduce cost and complexity of hard ware implementation because it contains built-in ESP8266 Wi-Fi module. The processing unit in my system is operating with Raspberry Pi because it is cheap, flexible, fully customizable, low power and programmable small computer board with built-in GPIO pins. Also, very powerful and easy to implement with many

sensors and Compatible Boards. For end user control part other systems are platform dependency, the control and monitoring home only work on Android or IOS App. One advantage of my system is end user can easily control and monitor through browser that install on any device and platform like Android, IOS, Linux, Mac and etc. And my system can easily be extended by adding many sensor units running with NodeMCU [12][13]. Table 4.1 shows Modules involved in Home Automation System

Serial no.	System	Controller	Communication On Interface	User Interface	Applications	Merits
1	Wi-Fi based Using Arduino Micro controll er through IOT	Arduino	Wi-Fi	Web Application And android App	To control and monitor the Electrical appliances in home	Low cost Secure, Remotely controlled

Table:1 Modules involved in Home Automation System

X.   CONCLUSION

In this system, the circuit design and prototype structure of the IoT-based Home control and monitoring system has been successfully constructed and experimented with many end-devices to control. If users want to control and monitor the devices and appliances at home, they have to get access to the main server part form local network or Internet. All main parts run separately to do their tasks, these parts are connected to Wireless Access Point and they communicate each other wirelessly through MQTT Protocol to exchange information.

The system is very suitable for monitoring real-time situation of home environment and remotely control all the appliances connected to system using any end devices that can accept WUI. The system can be used in many places like schools, offices, shops, departments etc. and any where that users want to control and monitor of their environments.

Further Extension

IoT is having tremendous attention recently and its various applications are growing, changing the way we live and work. As there are various appliances that can be controlled and automated while being away from home, the same approach implemented

for this system will be used to enable control over various appliances before reaching home, saving time and effort. Such application examples can be monitor temperature and humidity, and being able to control them, controlling stoves and microwaves, locking and unlocking doors autonomously depending on the visitor face recognition, controlling all the home appliances and devices very easily using voice commands, monitor and manage the running large Industrial automation system through Internet, combine the automation system AI. This system can reduce the weak points of security problems in restricted areas and combination of IoT with many other devices will be used as smart appliances autonomy.

XI. REFERENCES

1. AlAli A.R.,Rousan M.A.,MohandesM., "GSMbased Wireless Home Appliances Monitoring & Control System", IEEE International Conference, ISBN:0-7803-8482-2, (2004) 237-238 MQTT-S

2. A publish/subscribe protocol for Wireless Sensor Networks, Hunkeler, U.;IBMZurichRes. Lab., Zurich;Hong LinhTruong; Stanford-

3. Clark, A, Communication Systems Software and Middle ware and Workshops,2008.
   COMSWARE2008. 3rd International Conference "Cloud based low-cost Home Monitoring and Automation System", Shruthi Raghavan and Girma

4. S.Tewolde, 2015 ASEEN orth Central Section Conference "IoT-based Smart Security and Home Automation System" (2016), Ravi Kishore Kodali, VishalJain, Suvadeep Bose and Lakshmi Boppana, International Conference on Computing, Communication and Automation(ICCCA2016)

5. "A Low Cost Smart Security and Home Automation System Employing an Embedded Server and a Wireless Sensor Network", Semanur Karaca, Dr. AlperŞİŞMAN, İbrahim SAVRUK, 2016 International Conference on Consumer Electronics.

6. Eclipse Mosquitto. (2016, Feb. 12). [Online]. Available: http://mosquitto.org/-Communvol. 4, no. 11, pp. 13121324, Jul. 2011.

7. S.K.Shriramoju, J.Madiraju, and A.R.Babu,"Anapproach towards publish/subscribe system for wireless networks, "International Journal of Computer and Electronics Research, vol.2.,pp. 505-508, August 2013.

8. "Wireless Home Security and Automation System Utilizing ZigBee based Multi-hop Communication", Mohd Adib B. Sarijari, Rozeha A. Rashid, Mohd RozainiAbdRahim,NurHijaMahalin,IEEE20086th National Conference on Telecommunication Technologies.

9. Ahmed ElShafeeandKarimAlaa Hamed (2012),"Design and Implementation of a Wi-Fi Based Home Automation System", World Academy of Science, Engineering and Technology,Vol.6.