Home Automation

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Abstract— Home automation is derived from two different words "Home" and the "Automation" where home is the place where we live inside the four walls and "Automation" means the act of implementing the controls of equipment with advance tech usually involving electronic hardware. Therefore "Home automation" gives the sense of smart house. A home automation system is an automating the bulk of electronic and electrical tasks within a home. It uses a combination of hardware and software to enable control and management over appliances and devices within a home.

Keywords: Smart Home, WiFi, Bluetooth, Soc & Blynk App, Domotics, Automation, Arduino

I. INTRODUCTION

Home automation is anything that enables you to use your home's lighting, heating and appliances more conveniently and efficiently. It can be as simple as remote or automatic control of a few lights, or it can be a complete system that controls all major parts of your home, custom set to your own personal preference.

Home automation not only refers to reduce human efforts but also energy efficiency and time saving. Here we are performing home automation by using ESP8266 – WiFi SoC and Blynk Play store App.

Early home automation began with labor-saving machines. Self-contained electric or gas powered home appliances became viable in the 1900s with the introduction of electric power distribution.

In 1975, the first general purpose home automation network technology, X10, was developed. It is a communication protocol for electronic devices. It primarily uses electric power transmission wiring for signalling and control, where the signals involve brief radio frequency bursts of digital data, and remains the most widely available. By 1978, X10 products included a 16 channel command console, a lamp module, and an appliance module. Soon after came the wall switch module and the first X10 timer.

As per research firm Statista more than 45 million smart home devices will be installed in U.S. homes by the end of the year 2018

1) Lighting

Among the popular applications of home automation is lighting. Not only can you tweak the lighting controls and personalize their output to your needs, but it's also possible to save money by using the lighting more efficiently.

2) Maintenance

Not only does home automation make your home more efficient and easier to operate, it can also help you keep it maintained. Appliances may be connected to devices that monitor their activity; so that a self-monitoring furnace, for example, will remind you when it needs cleaning, and your air conditioner will report that it needs a new filter.

3) Safety

Home automation can also be used to effectively protect you and your loved ones. Beyond traditional smoke detectors and security systems, you can interconnect the technology in your home to awaken you with lights and sounds if a smoke alarm goes off, no matter what room you're in. In addition, the same system is capable of shutting down all other audio and video devices in the home to eliminate distractions, and have it notify the fire department at the same time – all without you doing a thing.

4) Costs

Because home automation has virtually limitless possibilities, it's difficult to put a price tag on it. So it varies from person to person according to their choices i.e. from $5000-$10000 to $5-$10 per square foot.

II. PROBLEM DEFINITION

The fundamental purpose of monitoring electronics appliances in the modern world by using Internet of Things (IoT) is to control them based on situational demands. With the advancement of technology, the need for efficient controlling is more as it optimizes performance and saves unnecessary wastage of power.The basic home appliances are fan, light and water pump which consume maximum power.Unnecessary wastage of power and resources by turning on lights duringdaytime or high speed fans in winter season or water pump during overflow of water from tank can be avoided in this way.

A system has been proposed to control home appliances anytime from anywhere in the world and efficiently utilize power by controlling appliances properly. Blynk app has been used to read data from sensors located in home environment and user controls home appliances based on these data. Being busy in hectic schedule of daily life user may not be able to read sensor data continuously to take some action through app. So the designed system sends an emergency notification in user's mobile app.

III. METHODOLOGIES

Real Time clock based home automation in an advance project to control the devices in timely and systematic manner. The devices can be controlled wirelessly from other places using wireless technology. RTC with EEPROM can record all the working parameters in the devices or appliances. Basically the project is a concept to bring automation in the industry or home. All the home appliances will be controlled by mobile app. The appliances in the industry or home will be interfaced with centralized micro controller NODE MCU for the systematic working. The inbuilt RTC and EEPROM present in the controller will be activated for the operation. The controller also interfaced with WIFI to receive the control commands from Wi-Fi

shield (Wi-Fi hotspot). The operator will be provided with Mobile app having Wi-Fi in that. If operator wants to switch the Light to turn on or off he needs to switch control button provided in app. Once he switched the Wi-Fi will send the data to Wi-Fi present at microcontroller. As and when the request is received the microcontroller activates the RTC and EEPROM and as per request received the operation will be done. In the same way all other appliances can be controlled.

A. Bluetooth based home automation system using cell phones

Home automation can be done using Bluetooth technology. It is cost effective, fast and also provides security. For home automation it uses arduino Bluetooth board. In Bluetooth based home automation cell phone is use as user interface which is based on python. Bluetooth board and relays has input-output port on which home appliances is connected which we want to control. Bluetooth based home automation provides a password based features which make it secure and also avoid intruders. It has low range (10 to 100 meters). Bandwidth used by it is 2.4GHZ and speed is 3 Mbps.[9] Feedback system can be used. Bluetooth takes long time to discover and access device in it vicinity. Real time access is not possible using Bluetooth technology and also it doesn't provide energy conservation way. The access of device is limited to the bluetooth range. Mobile phone and microcontroller is connected using Bluetooth module. microcontroller also connected with sensor and actuator. Based on the received command and sensor data controlling is done.

B. Home automation using RF module

The important goal of Home Automation System is to build a home automation system using a RF controlled remote. Now technology is accelerating so homes are also getting smarter. Modern homes are deliberately relocating from current l switches to centralized control system, containing RF controlled switches. Todaytraditional wall switches situated in various parts of the home makes it laborious t for the end user to go near them to control and operate. Even further itturnsinto moreproblematic for the old persons or physically handicapped people to do so. Home Automation using remote implements an easier solution with RF technology. In order to accomplish this, a RF remote is combined to the microcontroller on transmitter side that sends ON/OFF signals to the receiver where devices are connected. By operating the stated remote switch on the transmitter, the loads can be turned ON/OFF globally using wireless technology.

C. GSM based home automation system using phones

Home automation is based on real time monitoring, in GSM based home automation GSM is used as control medium [5]. It is used as a communication medium between server and pc which connect the server and pc using SMS. GSM based home automation is used where there is not proper internet connectivity. This consists of transmitter, receiver, microcontroller and i/o devices. GSM provide the M2M communication which includes DTMF (Dual Tone MultiFrequency), SMS (Short Message Service), and GPRS (General Packet Radio Service). Using GSM we can control the mechanical devices, but we have to use sensor that can convert the mechanical energy into the electrical energy. GSM doesn't provide any feedback mechanism because of this, it become less reliable and required PC ON all the time. GSM module allows the user to monitor and control the home appliances because the server is based on the SMS/GPRS mobile cell module and a microcontroller.[6] GSM also allow the control of home appliances using voice which help for elder and disabled people, communication is through the GSM module. In voice control system two mobiles are used, one mobile is used to receive voice signal then convert it into text and send this text to another mobile using SMS. Second mobile receive this SMS and send it to the Bluetooth module.[7] Bluetooth module is connected to the microcontroller and send the appropriate signal using text command and microcontroller performs the required function. If required the system can also send the feedback which alert the user about command. This way to control the home appliances is unreliable and also required two phones. Different microcontroller can be used i.e. PIC, AVR, and Atmel etc. use of AVR has a advantage that it has a standardized AVR code that can be easily interpreted by the microcontroller. GSM module is used to receive the command using SMS send it to AVR. AVR is connected with the driver circuitry and control the function in real time according the command.

D. Wi-Fi based home automation system using phone

Wi-Fi based home automation system mainly consist three modules, the server, the hardware interface module, and the software package. The figure shows the system model layout. Wi-Fi technology is used by server, and hardware Interface module to communicate with each other. The same technology uses to login to the server web based application. The server is connected to the internet, soremote users can access server web based application through the internet using compatible web browser. Software of the latest home automation system is split to server application software, and Microcontroller (Arduino) firmware. The Arduino software, built using C language, using IDE comes with the microcontroller itself. Arduino software is culpable for gathering events from connected sensors, then applies action to actuators and preprogramed in the server. Another job is to report the and record the history in the server DB. The server application software package for the proposed home automation system, is a web based application built using asp.net. The server application software can be accessed from internal network or from internet if the server has real IP on the internet using any internet navigator supports asp.net technology. Server application software is culpable of, maintain the whole home automation system, setup, configuration. Server use database to keep log of home automation system components, we choose to use XML files to save system log.

E. ZigBee Based Home Automation

ZigBee is a wireless technology for home automation which provides high security. It also uses PIC microcontroller and voice recognition. ZigBee uses two microcontrollers, one in transmitter section and another in receiver section. In

transmitter section, voice signal is received using mike which is connected with microcontroller which compared the voice with the original voice and if it matched with original voice then it send it to the transmitter. Transmitter sends it to ZigBee using serial interface, and then using ZigBee it is transmitted to the receiver. Receiver also contains another microcontroller which processes the received signal, and performs the required operation with devices connected through relay. It provides a low range communication and also has the inbuilt smoke detector.

F. Home Automation using IoT

Home automation using internet also increasing the building automation which helps us a easier and safer life[4]. The automation can be used in home, office, school, or in colleges also. We can control lighting, heating, ventilation, conditioning, locks for security purpose etc. It increases the comfort, flexibility, security, convenience. IoT for home automation include two part server and client. Server part includes the user interface coded in HTML language. Client includes the microprocessor like arduino, raspberry pi etc. server and client communicates using internet. [5][6]

G. Mixed Type Home Automation

All above technique can also be combined for home automation.GSM, Bluetooth, ZigBee, and IoT can be combine to achieve the home automation. User interfacing is done by android app. If we are combine all the techniques then advantages and disadvantages of all technique is also included.[20]

IV. BLOCK DIAGRAM

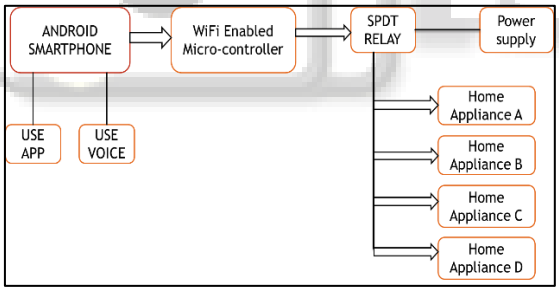

Figure 1: Smart control system to control appliances remotely by phone

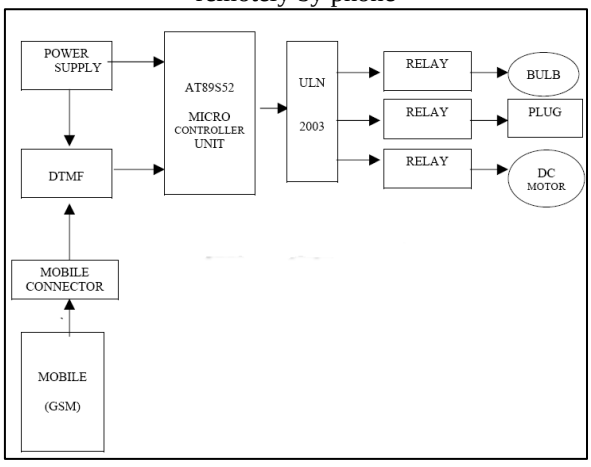

Figure 2: GSM based HAS[8]

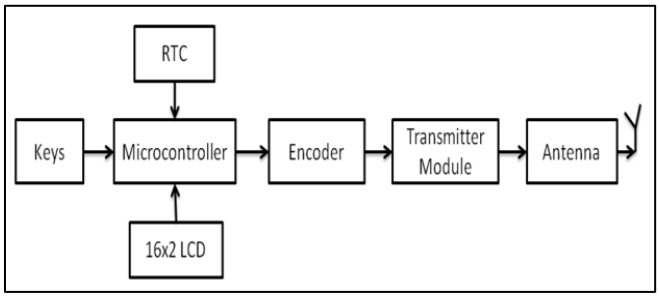

Figure 3: Block Diagram of Transmitter Section[9]

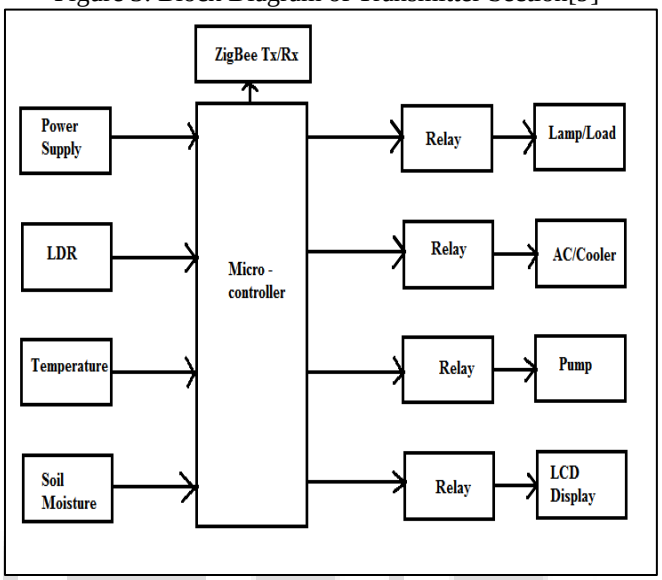

Figure 4: Home automation using ZigBee [10]

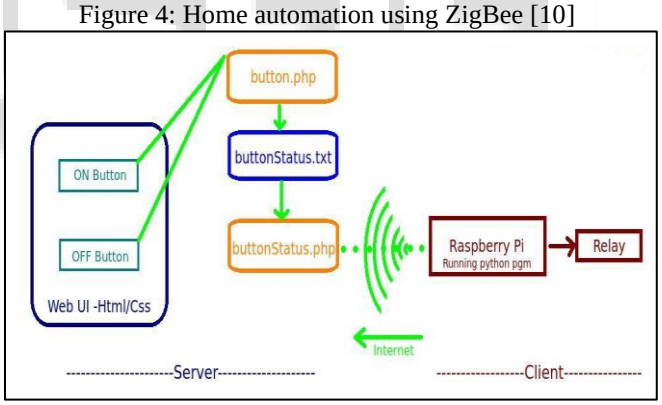

Figure 5: Block diagram of Home Automation using IoT

V. RESULTS

The Blynk application provides the facility to read sensor data and control appliances easily. For three appliances there are three different tabs namely light, motor (for water pump) and fan. In each tab there is a 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 present state (on/off) of appliance appears on the button widget. The screenshots captured in mobile while using the application show the results of controlling different appliances

VI. CONCLUSION

There are various techniques for home automation with their advantages and disadvantages. Different method is used for different application. The fastest method is IoT which also

provides access of home appliances from anywhere. All method work for energy saving also useful for old aged and handicapped persons. ZigBee technique has low bandwidth whereas GSM has huge bandwidth. GSM has wastage of bandwidth. SMS may carry the charges which make the system costly

VII. FUTURE SCOPE

All the technique may be updated to the new one such as WiFi (wireless-fidelity) is converted into the LiFi (LightFidelity). It takes a little bit time to change the WiFi into LiFi. LiFi work with presence of light so in night time the speed may be affected. Light from LED can be used for internet this will overcome the above problem. We can control the camera, PDA, and other appliances using it. Camera module can be used for security purpose also which store the images in cloud.

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