

SMART HOME SYSTEM USING IOT

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Abstract - Mobile devices are the part of our day-to-day life from last few years. Consequently, providing facilities and security are becoming increasingly prominent features on mobile devices. In this paper, we have to develop a home automation system that interfaces with Android mobile devices. The mobile device and system can communicate with each other via Wi-Fi. The mobile application can be loaded and interfaces with system from any compatible device. Commands to ON/OFF electrical equipment like lights, fans, air conditioners etc. and setting timer at home or any organization can be sent easily and quickly from the mobile devices via a simple and comfortable GUI application, which is easy to use for the any normal users. The system then acts and respond to these commands by taking actions per commands and gives the result to the user. The user can also see the result on Android mobile application within the range of Wi-Fi. Therefore, it's a good choice to design a home automation for luxurious life that aims at designing an advanced home automation system using Wi-Fi technology.

1. INTRODUCTION

In nowadays, development and changes of technologies is happening daily as well as continuous improvement of people's living standards are increasing. The mobile phones are the inspirable part of human lives today. The mobile phone is the most important part of human lives today. With the help of this smart gadgets human can do many works with or without internet like here we can make our home as well as organization smarter or more luxurious. Here we proposed a new technology, so that mobile phones can be used to communicate with and control electrical appliances like Fans, A.C., Lights etc. using Android App and Wi-Fi module. The transmitter of Wi-Fi transmits the data given by the application using radio waves technology. The Wi-Fi works on radio waves technology, as the data to be passed through Wi-Fi is converted into the electromagnetic signal which is then sent using the antenna. This signal is passed to the Arduino controller. The Arduino further operates the received information and performs operations. This controller can be connected to the Relays of different switches to pass the current after generating the magnetic field. In future, we can use router for a wide range access like for the Smart City projects. New appliances can be added anytime to the system, which provides for the reliability of the system.

Automation is the most frequently spelled term in the field of electronics. The hunger for automation brought many revolutions in the existing technologies. These had greater importance than any other technologies due to its user-friendly nature. These can be used as a replacement of the existing switches in home which produces sparks and also results in fire accidents in few situations. Considering the advantages of Wi-Fi an advanced automation system was developed to control the appliances in the house.

2. LITERATURE SURVEY

Papers we referred for literature survey,

- "Home Automation and Security System" (Surinder Kaur, Rashmi Singh, Neha Khairwal and Partyk Jain)

Easy Home or Home automation plays a very important role in modern era because of its flexibility in using it at different places with high precision which will save money and time by decreasing human hard work. Prime focus of this technology is to control the household equipment's like light, fan, door, AC etc. automatically. This research paper has detailed information on Home Automation and Security System using Arduino, GSM and how we can control home appliances using Android application. Whenever a person will enter into the house then the count of the number of persons entering in the house will be incremented, in Home Automation mode appliances will be turned on whereas in security light will be turned on along with the alarm. The count of the number of persons entering the house is also displayed on the LCD screen. In Home Automation mode when the room will become empty i.e. the count of persons reduces to zero then the appliances will be turned off making the system power efficient. Moreover a person can control his home appliances by using an android application present in his mobile phone which will reduce the human hard work. At the same time if anyone enters while security mode is on a SMS will be sent to house owner's mobile phone which will indicate the presence of a person inside the house. The alarm can be turned of using SMS or Android application.

- **“Home Automation using Internet of Things”** (Pooja Patel, Mitesh Patel, Vishwa Panchal and Vinit Nirmal)

The main aim of the project is to develop a system that will provide remote control of home appliances and also provide security against the mishaps when the home host is not at home. This paper is mainly concerned with the automatic control of light or any other home appliances using internet. It is meant to save the electric power and human energy. This project is made with the help of controller and raspberry pi. The various appliances connected to the micro controller and sensor is connected using wireless network.

- **“A Survey on Internet of Things Based on Home Automation”** (Pooja N.Pawar, Shruti Ramachandran, Nisha P.Singh and Varsha V.Wagh)

A low cost and user friendly smart home system, which uses an Android application to communicate with the cloud and provides switching functionalities, is presented. The System eliminates the use of Personal Computer (PC) and other Computer Peripherals which leads to overall reduction in the cost of the system. Unlike the similar system which uses either of the Bluetooth module network, the proposed system uses Internet of Things (IoT) for monitoring and controlling the Electrical/Electronic Appliances, remotely. Switches of Electrical /Electronic appliances are integrated to the system in order to demonstrate the effectiveness and feasibility of the system.

- **“Review Paper on Home Automation Using Internet of Things”** (Aarti and Pooja Mittal)

It is Internet of Things (IOT) which allows objects to be sensed & controlled remotely across existing network infrastructure, creating opportunities for more direct integration of physical world into computer-based systems, & resulting in improved efficiency, accuracy & economic benefit. End-to-end health monitoring IoT platforms are coming up for antenatal & chronic patients, helping one manage health vitals & recurring medication requirements. In this paper we use IOT for energy efficient Environmental Conditions sensing and in Home Automation. We have discussed the roles of IOT in automation in this papers and we have also discussed that integration of solar based energy system with IOT for home automation. Integration of sensing & actuation system by connecting to internet is discussed here. Efficient power balance and generation & energy usage is the objective of research.

3. SYSTEM DESIGN

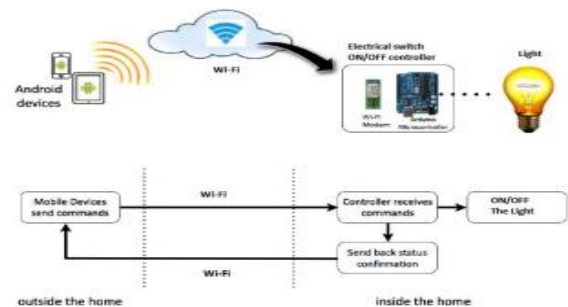


Fig.1: System Architecture In this proposed system

Fig.1 illustrates the overall control function of the system. The projected system works using the smart phone Android application, which is the main source for giving the instruction to the Wi-Fi module.

From user side, user can select the option, which switch he/she wants to switch ON/OFF or set timer from their Android smart phone Application. This command goes to the Wi-Fi module. Wi-Fi modules transmitter convert it into signals and send that command to the receiver of the Arduino Uno microcontroller. After that controller activates that particular I/O pin on the board and send input to the Relay. In that Relay, which has already 230V power supply, after receiving current it generates electromagnetic field in coil and passes the 12V current to switch ON the light. User can select the option from anywhere in remote access area network, which is near about 100 m from Wi-Fi module.

4. SOFTWARE DESIGN

4.1 Wi-Fi on Android Mobile Device:

Wi-Fi is a local area wireless computer networking technology that allows electronic devices to connect the network and intended to replace cables on devices such as a phones and other mobile devices. The first version of the Wi-Fi IEEE 802.11 protocol was released in 1997, and provided up to 2 Mbit/s link speed. This was updated in 1999 to permit 11Mbit/s link speed. Wi-Fi technology features long range security, low power consumption which increases battery life of mobile devices. The Wi-Fi signal range depends on the frequency band, radio power output, antenna gain and types as well as modulation technology. An access point compliant with either 802.11b or 802.11g, using stock antenna might have a range of 100 m. The same radio with an external semi parabolic antenna might have a range over 20 miles. A Wi-Fi signal occupies 5 channels in 2.4 GHz band, large apartments complexes or office building can create problems in access of Wi-Fi network.

Android is an Operating System for smart phone devices on which we can run our application. Android provides healthy array of connectivity options including Wi-Fi, Bluetooth and wireless data over a cellular connection. Android provides access to a wide range of useful libraries and tools that can be used to build rich applications. To design our system we use Android latest version which supports Application of our system without creating any problem. It is design with increased use of different layouts, responsive animations and transitions, padding, depth effects such as lighting and shadows. It provides some major new platform features for developers, with over 5,000 new APIs added for use by applications.

4.2 Arduino UNO

The Arduino Uno is a microcontroller board based on the AT mega 168 or 328. It has 14 digital input/output pins and 6 Analog input/output pins. We generally use 8 to 13 pins for input/ output. It needs 5V operating voltage and 7 to 12V input voltage. It simply connect with a DC battery to get started. It also have a reset button, to reset all previous connections.

4.3 Wi-Fi Module

The module is based on the Institute of Electrical and Electronics Engineers 802.11 standards. It supports transparent transmission mode and multiple network protocols. The Wi-Fi module is embedded based on the universal serial port, Ethernet, wireless network interface between the conversions. The modules integrate all of the RF components required, removing, the need to perform expensive RF design and test. It simply connects sensors and switches to the module I/O pins or UART interface. In this project we had used ESP8226 Wi-Fi module. The ESP8266 is a low-cost Wi-Fi chip with full TCP/IP stack and microcontroller unit capability produced by Shanghai-based Chinese manufacturer, Espressif Systems.

5. WORKING

5.1 Connecting the ESP8266 to an Arduino

The steps you need to take are simple. This is written for the ESP8266-01 but you can find the pin out for other models easily and use the same pins. First we will connect the Arduino UNO to a breadboard:

Connect the Arduino's 3v3 (3.3V) output to the red line on a breadboard. The ESP8266 works with 3.3V and not 5V, so this is necessary. If you want to connect other components that use 5V, you can connect the 5V output to the other red line of the breadboard, just make sure you don't connect the two.

- Connect GND (ground) to the blue line.
- Connect the RES or RESET pin to the blue line. When you ground the reset pin, the Arduino works as a dumb USB to serial connector, which is what we want to talk to the ESP8266.
- Connect the RXD pin of the Arduino to the RX pin of the ESP8266 (yellow color in the picture).
- Connect the TXD pin of the Arduino to the TX pin of the ESP (green color in the picture). Usually, when we want two things to talk to each other over serial, we connect the TX pin of one to the RX of the other (send goes to receive and the opposite). Here we do not have the Arduino talk to the ESP8266 though, our computer is talking to it via the Arduino.
- Connect the GND pin of the ESP to the blue line and the VCC pin to the red line.
- Finally CH_PD goes to the red line, supposedly it will not work if you do not connect this. According to a discussion I found:

ESP-01 and ESP-03 were initially meant to be used as an Arduino Wi-Fi module. In that aspect it made sense to break out CH_PD so that the user could disable the device when not in use (to save power).

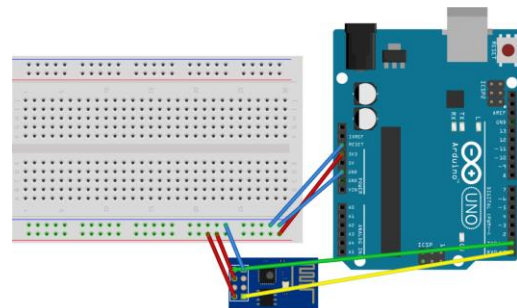


Fig.2: Arduino connection.

5.2 USING ARDUINO IDE

In the Arduino IDE, you don't need to choose a board, as we're not uploading anything to the ESP8266. Just choose the right port in the Tools menu and go to Tools → Serial Monitor. Then simply set your baud rate to 115200 (the default ESP8266 firmware uses it) and your line endings to Both NL & CR.

If you type AT in the message field and press enter, it should respond with OK.

And since we talked about the CH_PD pin, remember that if you want to flash the ESP8266 you should connect the GPIO0 pin to GND (blue line), which puts the ESP into flash mode.

6. CONCLUSION

The proposed Home Automation System enhances mobility and supports monitoring and control of devices from any remote location within Wi-Fi range. Being a simple and user friendly application it serves as an application of great help to the old aged or physically disabled people. Thus, the Internet of Things based Home Automation System is better than all traditional existing Home Automation Systems.

7. SCOPE OF FUTURE ENHANCEMENT

This application can be further developed into system with the following enhancements:

- Bill functionality can be added to the home automation system which can predict bill of any selected period.
- Gas leakage and light dimming functionality can also be added in near future.

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