Home Automation System Using Arduino and Gsm

Shrey Aggarwal[1], Sunny Verma[2]

[1]Student, Dept. Of computer Science and Engg., Manav Rachna University, Haryana, India,
[2]Student, Dept. Of Electronics and Communication Engg., Manav Rachna University, Haryana, India,

---

Abstract- *Home Automation System is used to control home appliuances remotely. With the use of computers and electronics technology electrical appliances can be controlled from any part of the world. Consequently, greater amount of energy will be saved and hence the natural resources. This can be achieved by using the mobile phone. This system is designed using RS232(Relays) , a Microcontroller nad GSM module. The electrical appliances are controlled by sending a text message from any mobile located in any part provided it has a GSM connectivity. There are many existing Home Automation Systems in the market like Z-WAVE, INSTEON etc. But every system has its pros and cons . Our proposed system is easy to implement and understand.*

Keywords- Automation, Arduino, GSM Module, Relays, GUI, AT commands, Appliances.

1. Introduction

We are in the midst of an era where the technology has solved most of our problems. With depleting resources there has been a strong urge to save energy and find alternatives. The proposed home automation system allows user to switch ON and OFF the lights, fans etc. From any part of the world since this system is controlled using GSM module. The concept behind this is to receive the sent message string from mobile and then processing it to perform the desired function. This is most useful for people living alone since it allows them to remotely monitor their appliances.

2. Related works

There are some existing home automation systems present in the market some of which are discussed below[1].

A. Zigbee[2]

Zigbee is an IEEE 802.1 standard used in home automation technology and similar to wifi and Bluetooth technology. This technology uses radio frequency(Rf) for controlling and signaling.

B. EnOcean[2]

EnOcean is the newest technology in the home automation system It is more energy effecient than other existing technologies. It's main aim is zero energy consumption through energy harvesting.

C. Z-Wave[2]

Z-Wave is most widely used technology in home automation system. It offers good network reliability and stability. The each device has a unique network id and each network has a unique identification thus making the system secure.

D. INSTEON[2]

INSTEON is used to integrate power line system with wireless system, was developed to replace X10 standard. The transmission of data occurs at 1131.65 Khz for power line devices and 904 Mhz for wireless devices.

2. Proposed System

The proposed system is GSM based home automation system. The Home Automation System suffers through many problems which are discussed in paper[3]. Although, this system can be implemented with other communicating modules like Bluetooth module, WI-FI module etc but they have range limitation i.e. They can operate up to a certain distance depending on the range . But GSM based system allows the user to control the device from any part of the world provided that he should be subscribed to a service provider. The system will also give the current status of appliances.

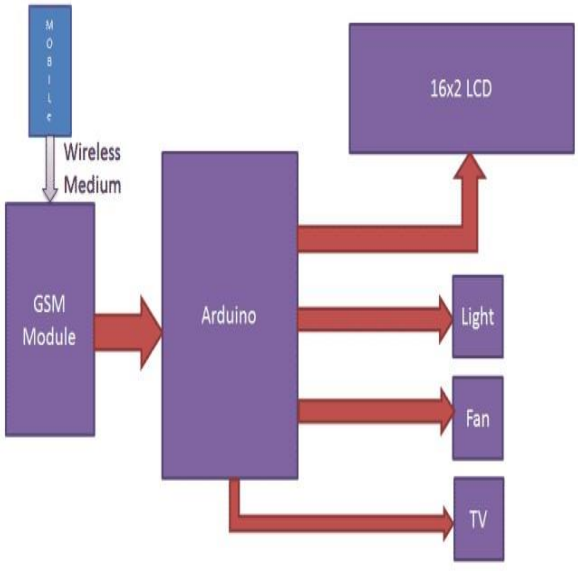

Fig 1. Block diagram of home automation system

3. Components used

3.1 GSM module[4]

Fig 3. A GSM module

GSM stands for GLOBAL SYSTEM for MOBILE COMMUNICATION. A GSM module is a chip or circuit that is used to establish communication between a mobile device and a GSM system.

3.2 Arduino Board

Fig 2. Arduino Uno board

The Arduino Uno board is a microcontroller based on the ATmega328. It has 14 digital input/output pins in which 6 can be used as PWM outputs, a 16 MHz ceramic resonator, an ICSP header, a USB connection, 6 analog inputs, a power jack and a reset button

3.3 Relays[6]

A relay is an electromagnetic switch operated by a relatively small electric current that can turn on or off a much larger electric current. A relay has NO and NC states. When a relay is energized it switches from NO to NC or from NC to NO whatever its previous state be.

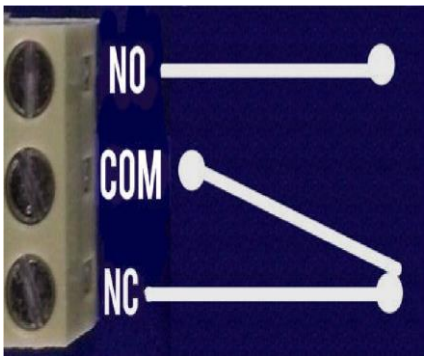

Fig 4. A Relay

4. Connections

4.1 Arduino and Relay Interfacing -:

- Connect GND of Arduino to Gnd of Relay
- Connect IN1 of Relay to pin 7 of Arduino.
- Connect 5V of Arduino to VCC of Relay.

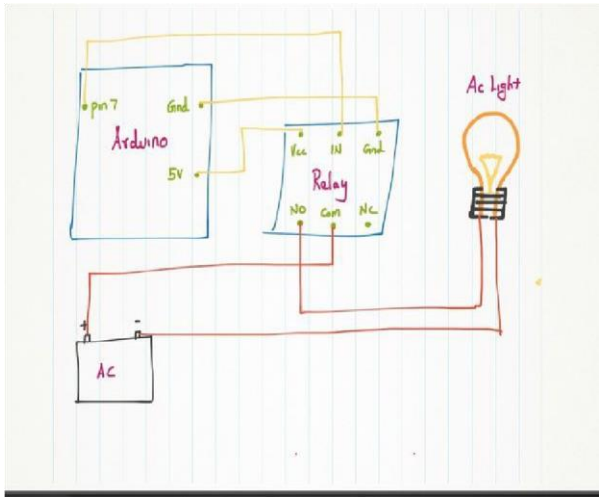

Fig 5. A picture showing connections of Circuit.

4.2 Arduino and GSM module Connections

- GSM RX --> Arduino TX
- GSM TX --> Arduino RX

4.3 Relay connections -:

- Com is connected to the battery or power source.
- Connect the appliances to NO since initially there is no conatact between NO and COM. When the relay is triggered COM gets connected to NC and the connection is complete.

5. Implementation and Results

After the connections are made and checked properly the system is now ready for use. The system works by sending a predefined text string from a mobile phone which can be present in any part of the world. The string is then received by the Arduino which decodes it and checks if it matches with the already stored string in command. If it matches the Arduino drives the relay which further switches ON and OFF the electrical appliances. The sending and receiving of the strings from/ to the Arduino can be achieved by AT commands. AT commands can be studied at .

The following piece of code shows how Arduino reads commands and drives the relays[7].

```
#define TV 5  if(!(strncmp(str,"tv on",5)))
  {
   digitalWrite(TV, HIGH);
   lcd.setCursor(13,1);          lcd.print("ON       ");
delay(200);
          }
```

In this piece of code value '5' is given to tv in the macro defined at the starting of the code. The command checks the condition that if the received string and predefined string matches then It sets the pin 5 of Arduino to high which is further connected to relay and drives it.

6. Conclusion

With the help of proposed system we can control the connected electrical appliances remotely. This helps in reducing power consumption. This result of this project shows that microcontroller is a very power device for building smart electronic projects/devices like Home Automation System that can control the devices remotely.

7. Future scope

There are several drawbacks of this system which can be further improved. Using GSM module and sending text message may cost charges so an interface can be developed for communication of Arduino with a mobile phone. A GUI can be made which shows a blueprint of the room in which appliances like lights and fans can be controlled by touching them on the screen. A feedback mechanism or a power consumption mechanism can be added which shows the current status of appliances and power consumed by them.

For a small demonstration purpose a Lcd screen is attached which shows the status of appliances i.e ON or OFF. Further, an acknowledgment SMS can be sent from Arduino to Mobile which tells whether the appliances are ON or OFF.

8. References

[1] Singh, Pawan, et al. "A Review Paper on Smart GSM Based Home Automation System." (2016).

[2] J. Walko, “Home Control,” Computing & Control Engineering Journal, vol.17 (5), pp.16, 19 Oct-Nov

[3] Delgado, A. R., Picking, R., & Grout, V. Remote-controlled home automation systems with different network technologies. Proceedings of the 6th International Network Conference (INC 2006), University of Plymouth, 11-14, pp. 357-366, July 2006 5. C

[4] GSM Modems, http://www.nowsms.com/doc/configuring-smscconnections/gsm-modems

[5] Arduino IDE, http://arduino.cc/en/main/software

[6] Darlington Transistor Array, Texas Instruments, http://www.ti.com/lit/ds/symlink/uln2803a.pdf

[7]https://create.arduino.cc/projecthub/avinesh/ gsm-based-home-automation-fe5e57#code

Websites:

- www.arduino.cc
- www.instructables.com
- www.circuitdigest.com
- www.circuitstoday.com