SMART HOME AUTOMATION USING ANDROID APPLICATION

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ABSTRACT

Today is a world of advanced mobile applications which are used exhaustively to save time and energy. These applications ease day-to-day life of a common man. Based on these technologies and applications, we have designed a Home Automation System. In this paper, we propose design and implementation of home automation system that uses Bluetooth and GSM technology and Android operating system. An attractive market for Home Automation System is for busy families and individuals with physical limitations. Users can control electrical appliances in home or office via smart phone. This project aims at providing security and controlling every happening at home or office on your fingers.

KEYWORDS: - Bluetooth, Arduino Uno board, Android, Temperature Sensor, Microcontroller, Relays, GSM Module, DC Gear motor, Push Pull Solenoid etc.

I.   INTRODUCTION

The current scenario is such that people have to manually operate various kinds of appliances which at times is not feasible for busy families and individuals with physical limitations. Also there is no effective means of automatic controlling of window curtains, door lock, lighting and temperature in our house according to our requirements.

Home automation refers to providing the capability to control as well as monitor various household activities. Theses may include lighting, heating and air conditioning, security locks on the doors, multimedia, and various appliances. Our system will provide proper notifications to users for such incidences when some unwanted person enters in our house by sending messages on our mobile phone. Smart home is a very promising area, which has various benefits such as providing increased comfort, safety and security to people. It is rational use of energy and other resources thus contributing to a significant savings in terms of time and more secure. Such system will be affordable, portable and scalable so that new devices can be easily integrated in to systems. The technology is easy to use and targeted for people without technical background.

II.   THEORY

The main objective of this project is to design and implement a cheap and open source home automation system that is capable of controlling and automating most of the house appliances. This application is an easy and manageable web interface for user to run Home Automation System.

In this project we have integrated technologies like Android with Wi-Fi or bluetooth to execute Home Automation System. We designed user Interfaces using Android because Android operating systems are capturing most of the mobile market. It has technical advantages of scalability, flexibility, availability, security and its ease of use for users.

The aim to take Android as platform is because people are familiar as many applications are launched in Android. Android provides interactive graphical user interface which makes an application easy to use for users.

In this application we embedded features like window cutains and appliances control by phone, password based door lock and room temperature controlling. One other main feature is to alert user by sending simple text message on user's phone to protect our house from thieves. If an unwanted person tries to enter in the house by inserting some random passwords at password door lock system, our system will prevent this unwanted entry by not opening the door and will also report us immediately about this incident by sending text message on our mobile phone through a GSM module. User can take immediate action on receiving SMS from the system.

We have selected Bluetooth technology to be used in this project because it will keep Home Automation System active and user can interact with the system from anywhere in the house.

III.   PROPOSED SYSTEM

The Entire project consists of two main phases i.e. Hardware and Software. User has the central control over home appliances by using Android phone application. User commands through Android application whose signal is given to microcontroller via Bluetooth. Microcontroller has some programs deployed on it and appliances are controlled according to this program.

As per user's command particular appliance is operated (ON/OFF). Temperature sensor keeps the record of room temperature and as the room temperature reaches below 25^0C, all fans get switch off. In case, if an unwanted person enters in our house, GSM will send notifications to user about it, so necessary actions could be taken and hazards can be avoided. Through Bluetooth, system and user application is connected. Bluetooth is chosen to improve increase system mobility and scalability. We can control appliances even when we are not in the room, thus saving electricity and increasing reliability.
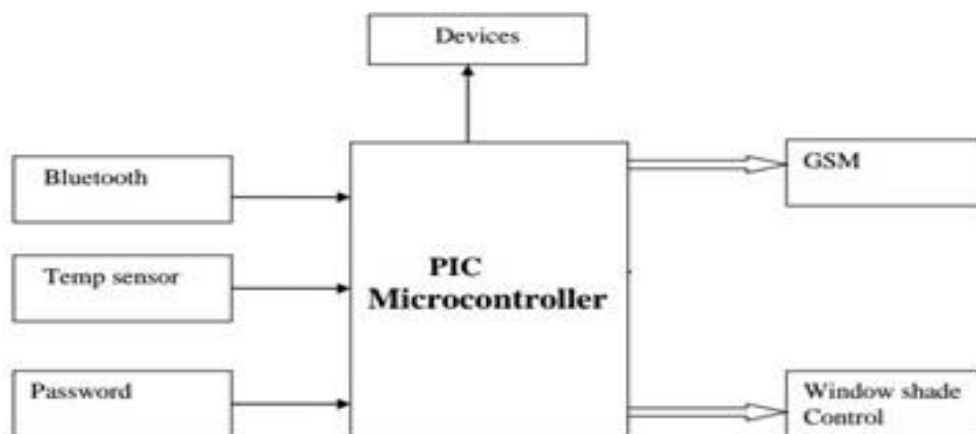

Figure 1: - Block Diagram

- **Hardware Design**

The hardware part of this system consists of two separate circuits. One circuit is used to control the appliances and window curtains and the other one is used as password protected door lock system. The first circuit consists of a PIC series microcontroller (PIC16F877A), Darlington driver IC (ULN2803), Bluetooth module (HC-06), GSM module (SIM 900A), temperature sensor (LM35), crystal oscillator and SPDT Relays. This microcontroller is a 40 pin IC having 8 I/O pins. At pin 6-7& 35-40, ULN2803 IC is connected which is used to run appliances using relays. Relays act here as switches to control appliances. The temperature sensor (LM35) along with LM358 IC is connected to pin 33 &34. LM358 IC acts as a comparator here. Two Relays are connected at pin 29 & 30 and these two relays are connected with two DC gear motors to control the window curtains. Bluetooth is connected to pin 26 and GSM is connected to pin 25.

The second circuit of the system enables password protection for door lock. It consists of an Arduino Uno R3 controller, a 16*2 LCD display, a push pull solenoid and a 4*4 matrix keypad. A program is

deployed on Arduino to control solenoid which acts as a door lock. Matrix keypad allows us to enter the password.

When we switch ON AC power supply of 230V, the Bridge rectifier converts it into DC. To get a constant output voltage of 5V DC, voltage regulator 7805 is used. Capacitors, (electrolytic or ceramic) and resistors with their specific values are mounted as per the requirements. Crystal Oscillator provides frequency of 11.0592 MHz for microcontroller working. LED's mounted on the circuit indicates whether the circuit is working properly.

- **Software Design**

The software design is nothing but designing of graphical user interface on Android application. Using this GUI, user interacts with the system to control devices. For interaction, user initially has to establish connection between Android application and microcontroller via bluetooth. On successful establishment of connection, user can either operate devices (ON/OFF) or acquire log information (energy consumed by each device) about devices. Further, temperature reading will be constantly notified to user via Android application. In case of emergency situations like entry of unwanted person, user will be given immediate notification in the form of simple text message.
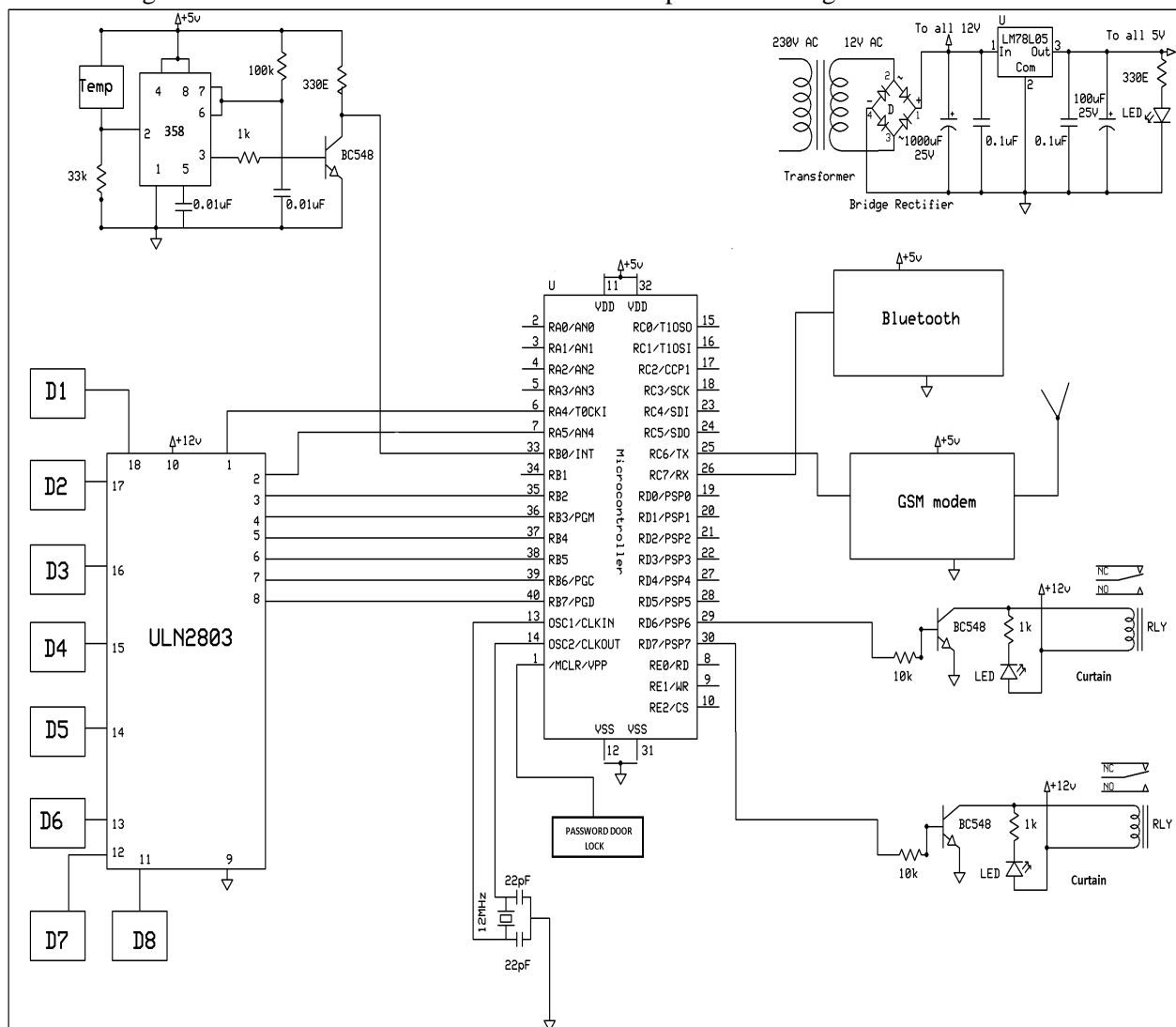

Figure 2: - Circuit Diagram

IV. RESULTS & DISCUSSION

This paper proposes a low cost, secure, ubiquitously accessible, remotely controlled solution for home automation which has more features then previous systems and its cost is also low in compare to them.

Smart Home Automation completes the demands of Smart India very efficiently. It provides smart work, energy consumption control, security and ease at the same time. The approach discussed in the paper is novel and has achieved the target to control home appliances remotely using the Bluetooth technology to connect system parts, satisfying user needs and requirements. Looking at the current scenario we have chosen Android platform so that most of the people can get the benefit.

V.   FUTURE SCOPE & CONCLUSION

As people want to make their life more reliable, more comfortable and more energy efficient, so demand of home automation systems is increasing day by day. Many houses will incorporate some aspect of automation in the home, from lighting, security of HVAC elements. Home Automation will be as commonplace as having a fridge or TV in the house. Big companies like Philips, Siemens & Schneider will eventually bring out fairly mass market automation products with appealing user interface but at a lower price point than today.

The Home Automation technology is easy to use and targeted for people without technical background. This technology also provides great assistance to handicapped and aged old people. The proposed system is better from the scalability and flexibility point of view than the commercially available home automation systems.

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