

# Home automation and Security using Android, Bluetooth and PIC Microcontroller

Shivshankar K. Jayswal, Akshay D. Jamsandekar, Pratham R. Desai, Pooja P. Kumbhar, Prof. Nileema Pathak  
Dept. of Information Technology, Atharva college of Engineering, Malad (w), Mumbai, Maharashtra

**Abstract**— This paper presents the design of Home Automation System which is less expensive and secure. This system is designed to provide assistance and support to elderly and disabled at home. Also, the smart home concept in this system improves the standard of living. To provide remote access from the smart phone the main control system implements Bluetooth technology. The design is similar to electrical switches but provides safer control on the switches activating phenomenon. The GUI shows the real time status of the switches. The system is designed to control electrical devices and appliances in the house with relatively low cost and user-friendly interface.

**Keywords**— Smart phone, Home automation, Smart home, home appliances, Bluetooth, Android.

## I. INTRODUCTION

The concept of “Home Automation” has existed for many years. The term “Smart Home” is used to present the concept of networking devices and electronic appliances in the house. Home automation Systems provides great opportunity in creating new fields in engineering and research. HASs is becoming popular nowadays and has entered in this emerging market .Since the Home Automation systems are complex the elderly and disabled people hesitate to accept the system.

Over the years wireless technology has made a great advantage which has given rise to the technology such as GSM, WIFI, ZIGBEE, Radio Frequency and Bluetooth. The above mentioned connection has their own unique specifications, applications and features. Among these popular wireless connections that are implemented in home automation system projects, Bluetooth is chosen due to its capability which is suitable for the system. Bluetooth has the frequency of 2400Hz and so it provides connectivity at speed of up to 3Mbps up to 100 meters depending on its class. The Bluetooth technology has certain capabilities which are enough for the implementation of the design. Also, the current smart phones come with built-in Bluetooth adapter which reduces the cost of this system.

In the [2] reference a GSM module was used for controlling the home appliances which proved very costly and troublesome to use. So in this project we used a Bluetooth module which is less expensive. [3] In this paper we got the idea of using wireless technology instead of traditional wired technology. The rapid expansion of the Bluetooth and of the android smart phone, there is the potential for the remote control and monitoring of such network enabled devices. [4] In this paper android application was used for controlling the home appliances which is very user friendly and it is very much popular. Project [6-10] are Bluetooth based HAS design architecture. In this paper a computer was used for controlling the home appliances which require external power supply and also it is not a portable device therefore the home appliances can be controlled from one place itself.

## II. SYSTEM OVERVIEW

Fig 1 illustrates the control function of the overall system. In this system the user will access the Android GUI i.e. the Android Application installed on a smart phone. The Smartphone and the Main Control Board communicates wirelessly with the Bluetooth of the smart phone and with the Bluetooth module that is fixed on the main control board. If the user taps on Fan on button a signal from the smart phone will be sent to the Main Control Board through wireless connection and the message is sent to the PIC Microcontroller which will in turn activate the corresponding Relay Circuit and the Fan will get turned on.

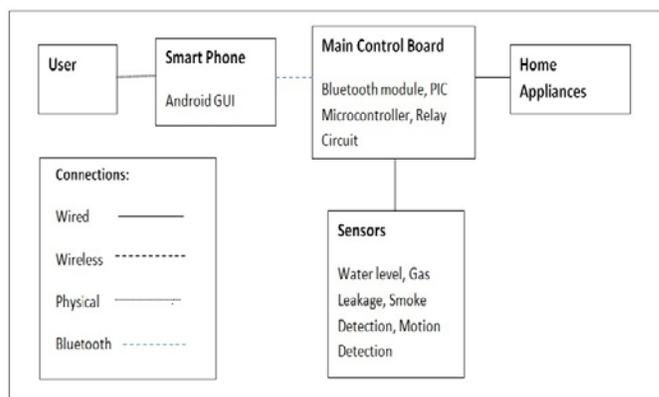


Fig. 2.1 Functional Block Diagram

The System consist of four sensors which are mentioned in Fig 1 whenever a particular sensor triggers its corresponding LED glows and the particular relay circuit gets turn on/off the user is alerted via Bluetooth on his/her smartphone indicating that the particular sensor is triggered in case of a gas sensor the alert or the message is also sent to the gas company via a GSM module.

III. HARDWARE DESIGN

The hardware construction of the main control board is discussed in this section. Fig 2 represents the block diagram of the main control board. PIC Microcontroller PIC16F72 (28 Pin) is chosen because of its small instruction set and is easy to interface it to Bluetooth module. The following sensors Smoke detector, Water Level Sensor, Gas leakage Sensor, Motion detector is chosen.

Bluetooth module has been chosen to establish serial communication between the main control board and the smart phone on the other hand GSM module is used to send SMS to the user when the gas sensor is triggered.

The main control board is given power supply through an adaptor which has an inbuilt transformer which converts 220volt AC to 12volt AC. A voltage regulator is used to convert 12volt DC to 5volt DC. Rectifier and regulator circuit is used to fulfill the voltage requirement of specific components.

The PIC microcontroller PIC16F72 is connected to Crystal oscillator which creates clock pulse on which the microcontroller operates. Relay and Buzzer operates on 12volt AC.

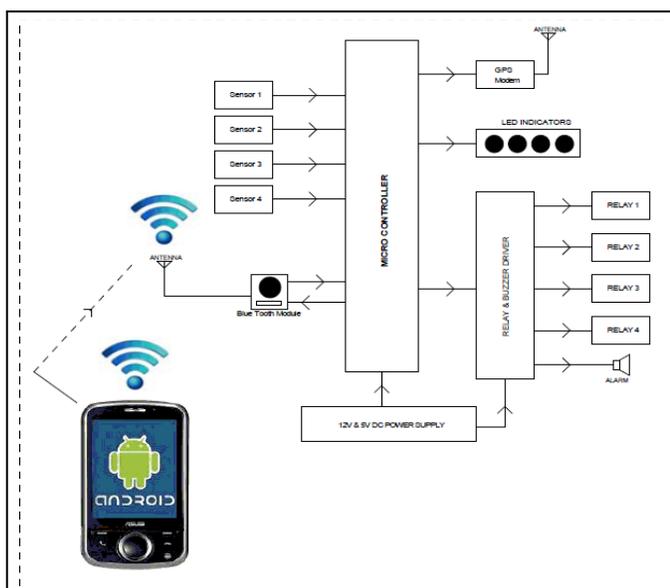


Fig. 3.1 Hardware Block Diagram

IV. SOFTWARE DESIGN

This section includes the design for android GUI which is easy to use. This android application contain buttons to control the appliances, if the user want to turn on the light the user have to simply tap on the light on button. This application has capabilities to show the current status of the device.

The previous systems required a dedicated server or a remote controller for controlling the home appliances which was expensive and troublesome to carry. so this system contains an android app which is installed on an android smart phone which is easy to use and also the earlier application which were based on symbian or java technology which were only compatible with java and symbian supported mobile phones. Now a day's android phones are widely used and available in the market.

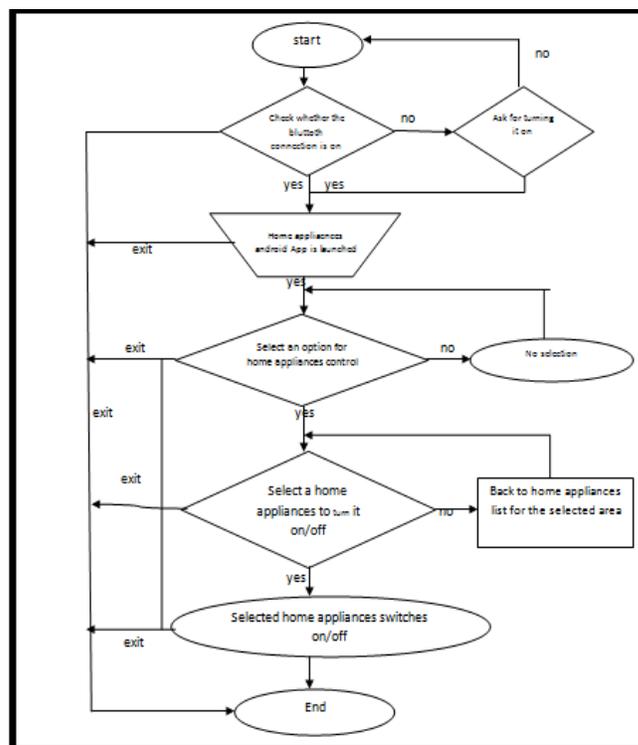


Fig. 4.1 Activity Flow Diagram

When the user starts the Home Automation application on his/her Android mobile phone, the app will first check whether the blue-tooth connection of the phone is on or not if it is not it will ask the user to turn the blue-tooth on and will launch the home appliance control centre .

The users will now select the desired option, the application will remain in a static mode until the user selects the particular option, when the desired option is selected the particular device will get turn on/off.

After selecting one option the app will redirect the user to main control centre for selecting the other options which allows the user to select other options or devices as well.

#### BLUETOOTH COMMUNICATION:

Bluetooth is a wireless technology which is used for transmission and reception of data over short distances from mobile devices. It is a technology that is simple, secure, and everywhere. It is used as a replacement for cables which are used for connecting the devices, while providing improved security. The main features of this technology is low power, robustness, and low cost.

#### V. CONCLUSION

In conclusion, the main purpose of designing this system is to improve the standard living in home. The remote control function by smart phone helps in providing assistance especially to disabled and elderly people in the house. It also provides safety protection to the user because the system has a low voltage activating switches which is replaced by current electrical switches. Moreover, it is very much easy to implement wireless Bluetooth connection in control board which allows the system installation in much simple way. Besides the electrical board the control board is installed and the switching connection is controlled by relay. Also Flexible types of connections are designed to provide the backup to the system. The connected GUI is connected to the control board in synchronization which indicates the real-time switches status. The system has user-friendly interface. The ease of use interface on these GUI provides simple control to the elderly and disabled people.

#### REFERENCES

- [1] The official Bluetooth website from Bluetooth SIG: <http://www.bluetooth.com>
- [2] Development of a GSM Based Household Power Management System: British Journal of Science, 1 September 2011
- [3] Android based appliances and control: International Journal of Emerging Technology and Advanced Engineering
- [4] Sachin Kishor Khadke, "Home Appliances Control System Based On Android Smartphone".

- [5] IOSR Journal of Electronics and Communication Engineering, (IOSR-JECE, May - Jun. 2014),
- [6] Baris Yuksekkaya, A. Alper Kayalar, M. Bilgehan Tosun, M. Kaan Ozcan, and Ali Ziya Alkar, "A GSM, Internet and Speech Controlled Wireless Internet Home Automation System", IEEE Transactions on the Consumer Electronics, AUGUST 2006.
- [7] R. Piyare and M. Tazil, "Bluetooth Based Home Automation System using Cell Phone," in Consumer Electronics, 2011.
- [8] N. Sriskanthan and Tan Karande, "Bluetooth Based Home Automation Systems," Journal of Microprocessors and Microsystems, 2002.
- [9] Kwang Yeol Lee & Jae Weon Choi, "Remote-Controlled Home Automation System via Bluetooth Home Network" in SICE Annual Conference in Fukui, 2003.
- [10] Sandeep Kumar & Mohammed A Qadeer, "Universal Digital Device Automation and Control", in IEEE, 2009.
- [11] Hiroshi Kanma, Noboru Wakabayashi, Ritsuko Kanazawa & Hirimichi Ito, "Home Appliance Control System over Bluetooth with a Cellular Phone", in IEEE, 2003.