Automate and Secure Your Home Using Zigbee Technology

Nausheen Belim[1], Harshada Bhambure[2], Priyanka Kumbhar[3], Simranjit Tuteja[4]

Students, Department of Computer Engineering, KJ College of Engineering & Management Research, Pune, MS, India[1,2,3,4]

Abstract: The purpose of this paper is to design an automation system that is used to switch ON, OFF and get to know status of the home appliances by using computer using Zigbee wireless technology. ZigBee is a new technology, whose goal is to eliminate wired connections between electrical appliances and computer. Instead of connecting with wires, every electrical appliance has small zigbee. The home appliances are connected to the ports of the microcontroller board and their status are passed to the home server. The combination of NetBeans and EmbeddedC is used for monitoring and controlling software. The home Appliances can be monitored and accessed remotely by user via SMS or EMAIL where GSM Modem comes into use. Multi-vendor appliances can be added to the system with no major changes and hence system is scalable. Password protection is one of the functionality of the system so that unauthorized user can be denied from accessing home appliances. Another important feature is the security system that will continuously monitor the status of home appliances and take adequate actions if required.

Keywords: Home Automation, Zigbee, Micro-controller, GSM Modem.

I.   INTRODUCTION

In recent years, mans work and life are increasingly tight with telecommunication and information. The informationized society has changed human beings way of life as well as challenged the traditional residence. Followed by the rapid economic expansion, living standard keeps raising up day by day that people have a higher requirement for dwelling functions. The intellectualized society brings diversified information and safe, comfortable and convenient life has become the ideal for every modern family.
The system will carry out the goal of modernized home integration system of automation control and management, house burglarproof and security and remotely control the household electric appliances through internet. The basic target of intellectual home automation system is to provide people a comfortable, safe, convenient and high efficient life environment and a humanistic service.

II.   RELATED WORKS

Neng presented architecture for home automation [1] the work focused on how an integrated system controlled home appliances. Moreover, the system only shows how to solve home automation problems at the software level; hardware aspects were not considered. Sriskanthan proposed system that could control electrical appliances using Bluetooth [2].The drawback of this system was that it was unable control system remotely through the dedicated network. Another system was proposed for controlling home appliances Bluetooth that was discussed by Shepered[3] but no implementations were successful. Wong proposed hardware-based remote controller that could be controlled through phone-based system[4]. Communication takes place not through Internet but via dedicated telephone line. A similar system has been proposed by Coskun and Ardam for controllibg home appliances through telephone system[5].

III.   SYSTEM OBJECTIVE AND GOALS

The Objective is to develop a smart home system monitored by Personal computer, to design a smart home system based on Zigbee wireless technology and 89c51 and to develop a system that can reduce the waste of electricity, saves human energy and makes human life easier. The Goal is to continuous monitor the devices, to change the status of devices conveniently and remotely access the home appliances.

IV.   SYSTEM ARCHITECTURE

The overall system is partitioned into two parts. The first part is focuses on the development of hardware where all electronic components are connected on microcontroller board. Input would be given by the user through his personal

computer while lamp and fan would be the output components which are controlled by controller circuit. Wired connections between electrical appliances and user's computer can be eliminated using ZigBee technology. The next part is focuses on programming to interface with the hardware components. The system is built using two languages. Embedded C language is used for 89c51. Java is used for creating GUI for user's computer .The security system is added to achieve better home automation system.
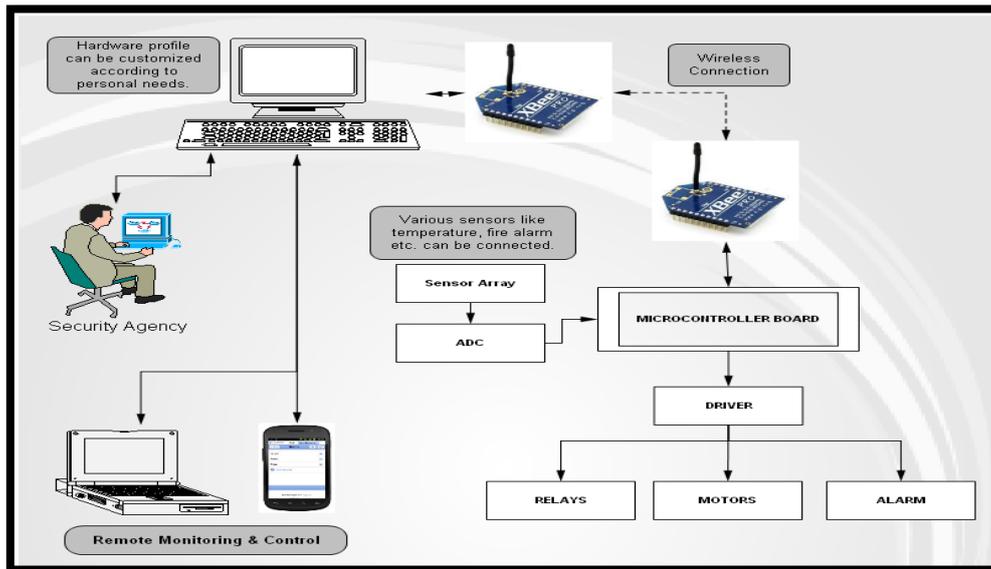
Fig.1: System Architecture

The core of the home automation system consists of two hardware components: the home server and the microcontroller board. The home server is a high-end PC that hosts the Java-based management and control algorithm that enables the user to access the home appliances through SMS. It communicates with the microcontroller board through ZigBee. If the user wants to access the home appliances remotely, he will send a SMS through his phone example Device1 ## ON ,which will then be processed by the GSM modem at the Home Server side. This interpreted command is then sent by the server to the microcontroller board where the devices will respond as per the commands (i.e. switch ON or OFF).
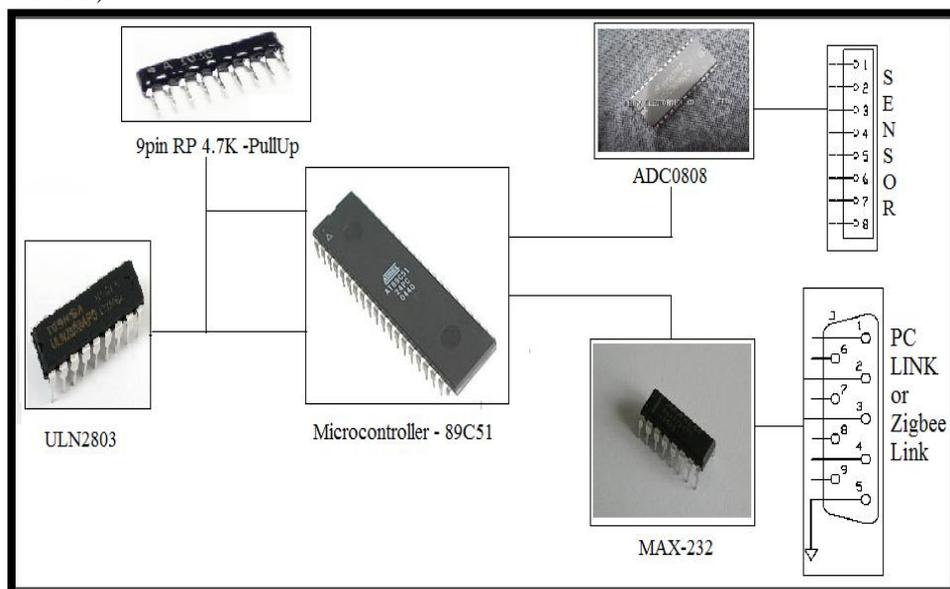
Fig. 2:Hardware and Software Architecture:

Hardware Description Table

SR.NO.	COMPONENT	DESCRIPTION
1.	Microcontroller-89c51	The AT89C51 is a low-powered, high-performance 8-bit microcomputer with 4K bytes of Flash (PEROM).
2.	ADC0808	It is a monolithic CMOS device with an 8-bit analog-to-digital converter, 8-channel multiplexer and microprocessor compatible control logic.
3.	MAX232	It is used for converting signals from an RS-232 serial port to signals suitable for use in Transistor-transistor - logic which are compatible to digital logic circuits. The MAX232 is a dual receiver and converts the TX, RX, RTS and CTS signals.
4.	ULN2803	It is an Integrated Circuit (IC) chip with a High Voltage/High Current Darlington Transistor Array. The chip takes low level signals switching on or off a higher level signal on the opposite side.
5.	Pull-Up Registers	Whenever that high impedance or external devices are disconnected they ensure inputs to settle at expected logic.
6.	ZigBee	A technology that eliminates the wire connections and makes system compact.

V.   MATHEMATICAL MODEL

Assumption	Initial state	Final state
S: Set of activities through home server S={P,Q,D} Q:Set of responses Q=q0,q1,q2,………………qn P:Set of requests P=p0,p1,p2,………………pn D:Set of devices D=d0,d1,d2,………dt	P= {Ø} Q={Ø} D=status of devices D:d0,d1,d2,………,dt	Q=q0 v q1 v q2,………qn D:d0,d1,d….,dt

Fig.3: Proposed System

VI.   RESULT

At the client side user can monitor the status of the home appliances via computer or through cell phone by getting instant messages. The security personnel would continuously monitor home appliances as soon as the value of any home appliances crosses the threshold value necessary actions can be taken in order to prevent any damage.

VII.   CONCLUSION

Controlling home appliances with wireless technology has revolutionized our way of living. Home owners can come to an ideal environment coming from their daily activities. Technique used in this system is not complex. In this proposed home automated system remote access to home appliances is possible via mobile or email. Status of devices can be monitored by remote user and security agent. Using ZigBee we can reduce the wiring between the different components in the system making it compact and cost effective. In future many more features can be added in it like home appliances can be controlled by using voice call by implementing more secure and efficient techniques.

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BIOGRAPHY

Priyanka Kumbhar is pursuing B.E.(Computer Engg.),KJCOEMR, Pune University, Pune, MS, India.

Harshada Bhambure is pursuing B.E.(Computer Engg.),KJCOEMR, Pune University,Pune,MS, India.

Simranjit Kaur, is pursuing B.E. (Computer Engg.),KJCOEMR, Pune University, Pune, MS, India.

Nausheen Belim, is pursuing B.E. (Computer Engg.),KJCOEMR, Pune University, Pune, MS, India.