International Journal of Trend in Research and Development, Volume 2(5), ISSN 2394-9333
www.ijtrd.com

GSM Based Home Surveillance System

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Abstract: With advancement of technology things are becoming simpler and easier for us. Automation is the use of control systems and information technologies to reduce the need for human work in the production of goods and services. By using proper security systems, billions of naira spent on departments like fire brigade, police, etc. can be brought in control. Home automation indicates the computerization of daily tasks with electrical devices used in homes. This could be the control of lights or more complex chores such as remote viewing of the house interiors for surveillance purposes. Thus users getting off his home do not need to think of his home security over and over. This paper discusses the analysis, design and implementation of home automation. It presents an absolute, low cost, prevailing and consumer friendly way of 24 of daily real –time monitoring and remote control of homes.

Keywords: GSM, Automation, Surveillance, Home

I. INTRODUCTION

The idea of remotely controlling and monitoring of different devices and home appliances in a unified system is flourishing day by day with the use of latest technologies. Modern technological driven homes are expected to perform tasks such as temperature control, lightning and entertainment control, security and emergency response and many such others. They are expected to be controlled and automated from near or from a distance. User can take advantage of the technological advancement in such a way that a person getting off his home does not need to think of his home security again and again.

Home appliance control system is based on GSM network technology for transmission of SMS from sender to receiver. SMS sending and receiving is used for ubiquitous access of appliances and allowing breach control at home [1].

In this paper we present SMS based Smart Home with feedback response. This system interfaces the mobile phone with embedded microprocessor PIC18F4520 and sensors which is based in the intelligent home. The user can use SMS for monitoring and controlling lights, home appliances and security sensors and get feedback on the same mobile phone about the status of different appliances. The entire system is password protected which can only be changed by the user.

The system proposes two sub-systems. Appliance control subsystem enables the user to control home appliances remotely whereas the security alert subsystem provides the remote security monitoring. The system is capable enough to instruct user via SMS from a specific cell number to change the condition of the home appliance according to the user's needs and requirements. The second aspect is that of security alert which is achieved in a way that on the detection of intrusion the system allows automatic generation of SMS thus alerting the user against security risk [2].

II. RELATED WORK

Delgado et. al consider the problems with the implementation of home automation systems [3]. Furthermore the possible solutions are devised through various network technologies. Several issues affecting home automation systems such as lack of robustness, compatibility issue and

acceptability among the old and disabled people are discussed

Al-Ali & Al-Rousan introduced a low cost Java-Based Home Automation systems [4] based on PC-based home server. Various devices are connected to the input/output ports of the microcontroller and their status is send to the server whether they are on or off. The monitoring and control software engine is based on the combination of Java Server Pages, JavaBeans, and Interactive C. The system is scalable and that is any number of devices can be added with no major changes to its design. Password protection is used to stop unauthorized users from accessing the appliances at home. If the Internet connection or the server is not working, the embedded system board still can control and operate the appliances locally.

Wijetunge et. al. [5] proposed remote controlled systems that can control home appliances from a PC using Bluetooth technology. In this work, a general purpose controlling module is designed which has the capability of controlling and sensing up to five devices simultaneously. The Bluetooth module can manage both analog and digital devices provided with suitable interfaces designed by the manufacturer.

Khushwinder Gill [6] proposed a Zigbee based Home Automation System. The system allows home owners to monitor and control connected devices in the home, through a variety of controls, including a ZigBee based remote control, and any Wi-Fi enabled device which supports Java. Additionally, users may remotely monitor and control their home devices using any Internet enabled device with Java support.

Jawarkar etal [7] propose remote monitoring through mobile phone involving the use of spoken commands. The spoken commands are generated and sent in the form of text SMS to the control system and then the microcontroller on the basis of SMS takes a decision of a particular task.

A.Alheraish [8] proposed a design of Home Automation System based on GSM. To enable its use in several applications, this design integrates the device to be controlled, the microcontroller, and the GSM module. It is intended for use in 900/1800 and 850/1900 MHz GSM bands respectively. The module is used to make a connection to the GSM network and send and receive SMS and GPRS services and to make a voice calls as well.

Wael M El-Medany [9] et. al. proposed a GSM-Based Remote Sensing and Control System using FPGA. The system is based on designing and implementing an FPGA chip that is interfaced with a GSM modem to work together as a remote security and control system at the same time. The hardware of the chip has been designed using VHDL and has been tested using Xilinx FPGA. First a synthesizable VHDL code has been written and simulated using Xilinx ISE 6.2i tools, and then implemented on a Xilinx Spartan 3 FPGA. The design has been successfully simulated and tested for both sensing and controlling purposes at different frequencies (4800 KHz, 9600 KHz, and 19200 KHz). The system works as a remote sensing for the electrical appliances at home to check whether it is on or off, at the same time the user can control the electrical appliances at home by sending SMS. It also works as automatic and immediate reporting to the user in case of emergency for home security. The advantages of using FPGA as a controller is multi inputs/outputs and low cost, where the used FPGA chip has 256 inputs/outputs that achieve the multi inputs and outputs. Since many components can be integrated into the FPGA chip that has 200 k Logic Gate, a low cost is also achieved.

Work has also been done to design monitoring and control system for the home automation with three alternate control mechanisms: GSM, Internet and Speech [10]. PC is used as a monitoring station and consists of main control program, database and speech recognition program and home server. It communicates with

the transceiver via a RS232 interface and the microcontroller in the transceiver then communicates with the devices. GSM modem is connected to the home automation server to receive the SMS from the control unit for controlling and checking the status of the various elements. The GSM and internet are used by the users when they would like to remotely access the devices in the house whereas the voice is used for communicating while they are inside the house. The speech module of this system is highly beneficial for physically impaired people. The system is secured using a login password authentication.

Autors in [11] propose a Zigbee-GSM based Monitoring and Remote Control System. These systems use both Zigbee and GSM for communicating between user and devices. This system allows user to monitor and control devices in the home through a number of controls, including a Zigbee based remote control. Users may remotely monitor and control their home devices using GSM.
Authors in [12] proposes a scalable water monitoring system capable of estimating water flow rate using wireless sensor network technology. The design combines the pre-installed inline flow meter with non-intrusive inexpensive vibration based sensors in order to provide an accurate per pipe flow rate. Another application using wireless sensor network is given in [13]. The main contribution of this paper is the design of a sensor network optimized for rapid deployment during periods of volcanic unrest and provides real-time long term volcano monitoring.

III. METHODOLOGY

The security system tool is developed to enhance the security features of our home. With the presence of this tool, the crime rate that is rising year by year is hoped to be reduced. Hardware of the system contains sensors, Atmega644p microcontroller, sim548c (GSM module), Buzzer, in system programmer and relays to control the appliances. The block diagram of the system design is shown in Figure 1.

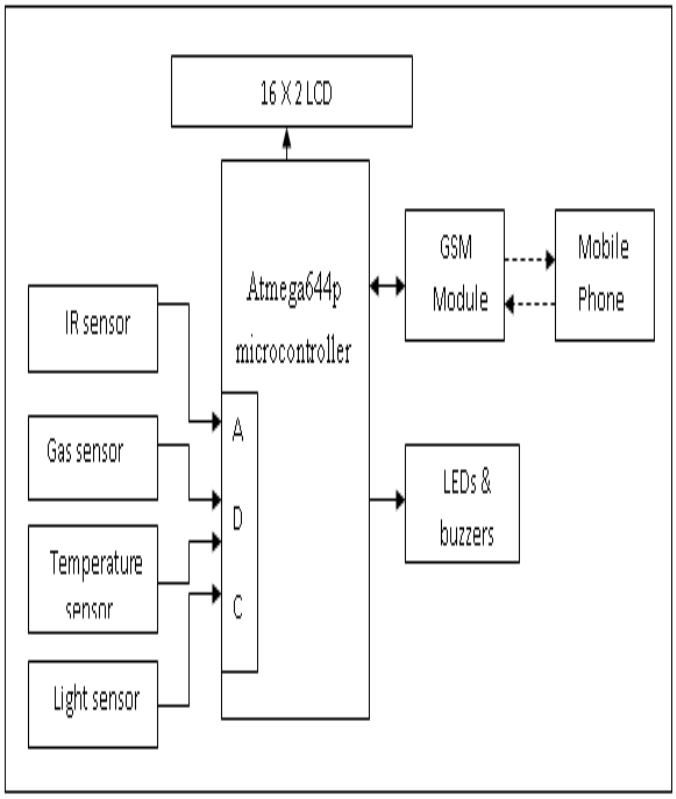

Figure 1: The Block Diagram Of The System Design

A. The 8051 Microcontroller

Microcontrollers are computers that are designed to carry out a specific function. They are embedded in other computer or machine. They carry out their functions by taking inputs from the devices they are incorporated into. They have the ability of turning the appliances ON and OFF based on the SMS sent to the phone connected to the microcontroller [14]. In this design, an Atmega644p micro-controller is employed. It comes in a 40-pin dual in-line package (DIP) with internal peripherals. The 40 pins make it easier to use the peripherals as the functions are spread out over the pins. Figure 2 shows the Atmega644p pin diagram.
Some of the features of 8051 microcontroller are:
1. It has 64 kB of on-chip memory.
2. It has 128 bytes of chip data memory.
3. It has 4 register banks

4. It has 128 user defined software flags
5. It has 8-bit data bus
6. It has 16-bit address bus
7. It has 32 general purpose registers each of 8-bits
8. It has 2 16-bit timers
9. It is equipped with 3 internal and 2 external interrupts
10. It has 4 8-bit ports
11. It has a 16-bit program counter and data pointer

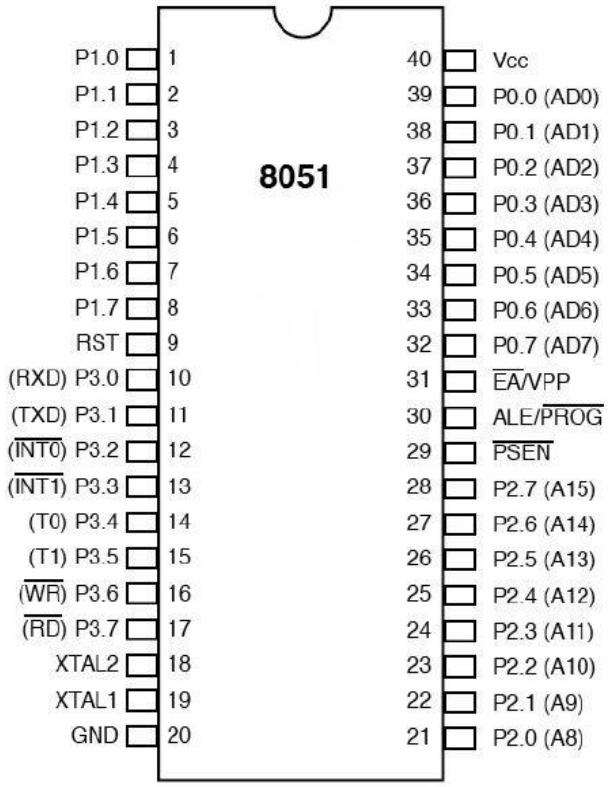

Figure: 2 Pin Diagram Of 8051 Microcontroller

B. GSM Module Unit

A SIM548C based quad band GSM module which supports GPS technology for satellite navigation is used. It provides GPRS multi-slot class10 / class8 capabilities and supports GPRS coding schemes CS-1, CS-2, CS-3, and CS-4. This module takes care of all your GSM- GPRS based communication requirements as well as provides live GPS data. There is an attached FT232RL USB interface for serial communication with PC or other serial devices. This USB port is also interfaced with the microcontroller. When connected to a PC, the port presents itself as a virtual serial (RS232) port. An HD44780U based LCD is embedded onboard (operates in 4-bit mode) interfaced with the microcontroller. A 10-pin programming interface is used to transfer (flash) the programs (in form of .HEX files) to the microcontroller. Another 10 pin header is attached to serves as the interface to external input sources (sensors) or output devices (LEDs).

C. Sensors Used In the System

Infrared (IR) sensors are used to detect the intruder. They are used at doors and at windows. The IR pair that is IR transmitter and IR receiver detects the obstacle within the range of 5-6 feet. The LM35 is used as temperature sensor whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. It gives linear output 10.0 mV/0 C as scale factor. Light Dependent Resistor (LDR) is used as a light sensor to sense the light intensity in the room. LDR gives the output voltage corresponding to the light intensity.

D. Mobile Phone

Mobile device communicates with the GSM Modem via radio waves. The mode of communication is wireless and mechanism works on the GSM technology. Cell phone has a SIM card and a GSM subscription. This cell phone number is configured on the system. User transmits instructions via SMS and the system takes action against those instructions.

E. LCD

We used 16x2 alphanumeric Liquid Crystal Display (LCD) which means it can display alphabets along with numbers on 2 lines each containing 16 characters.

Figure 3 shows a comprehensive circuit diagram of the system, while Figure 4 shows the Flow Chart of the system

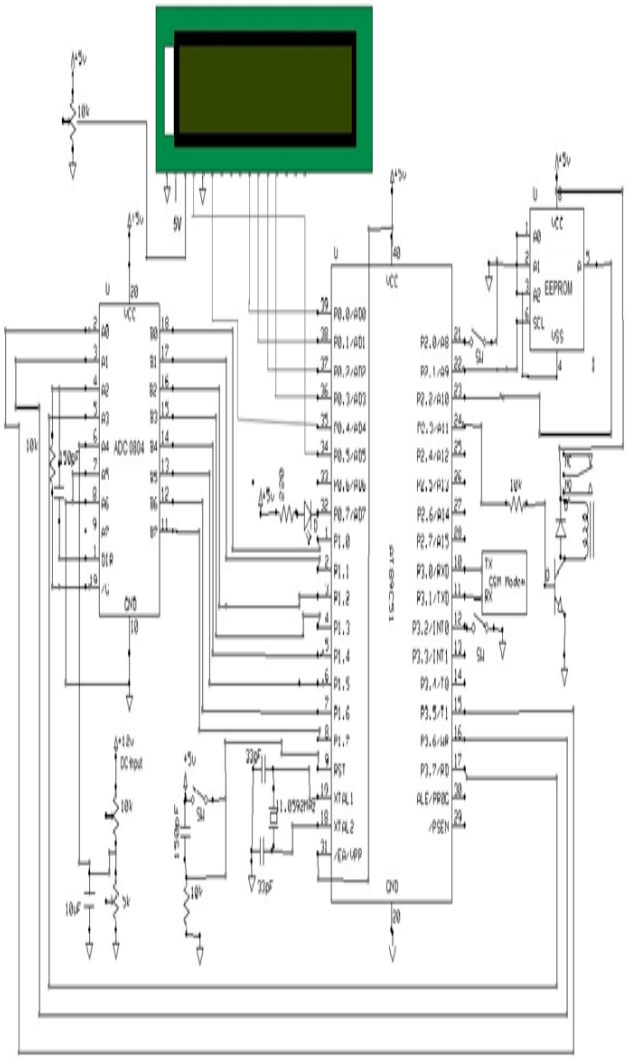

Figure 3: Circuit diagram of the system

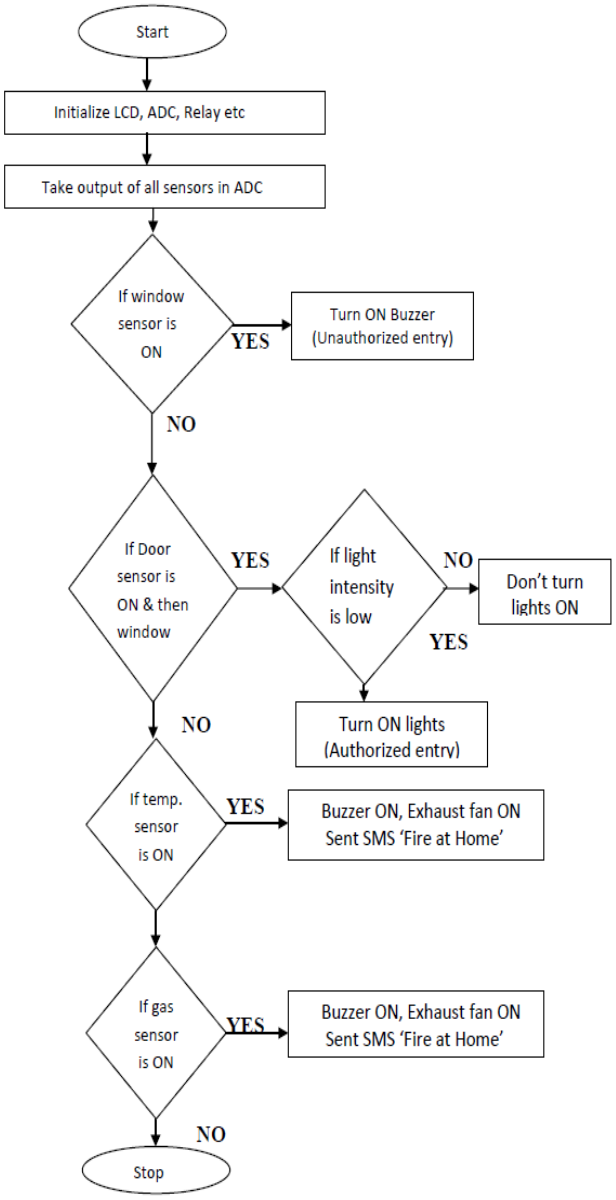

Figure 4: System Flow Chart

Some of the descriptions of the behaviour of the system are shown in table 1.

Table 1: Descriptions of the system

Process description	Expected result	Actual result
Gate opening with RFID card	Gate Opening	Gate Opening
Gate closing after some delay	Gate Closing	Gate Closing
Turn ON Fan if count>0	Turn ON fan	Fan ON
Turn ON light if count>3	Turn ON light	Light ON
Turn OFF Light if count< 4	Turn OFF light	Light OFF
Turn OFF Fan if count is 0	Turn OFF fan	Fan OFF
Send SMS to user if Temperature exceeds 35ºC	Send SMS	SMS "High Temp." received
Send SMS to user if Gas is detected	Gas detected	SMS "Gas detected" Received

IV. CONCLUSION

We have presented low cost, safe, universally available, auto-configurable, remotely controlled solution for automation of homes has been introduced. The method discussed in the paper is novel and has achieved the target to control home appliances remotely using the SMS-based system satisfying user wishes and necessities.

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Research & Technology (IJERT) Vol. 2 Issue 9, September - 2013ISSN: 2278-0181

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