

HOME AUTOMATION AND SECURITY SYSTEM

B Ameer.Suhail¹ D Sindhu² Pooja Kumari³ Snehi.Singh.Rathore⁴ Ekta.Maini⁵

1, 2, 3, 4-Students of Department of Instrumentation Technology, DSCE Bangalore-78
5-Asst. Proff., Department of Instrumentation Technology, DSCE Bangalore-78

Abstract- In recent years, the home environment has seen rapid introduction of network enabled digital technology. This technology offers new and exciting opportunities to increase the connectivity of devices within the home for the purpose of home automation. Mobile devices are ideal in providing a user Interface in a home automation system, due to their portability and their wide range of capabilities. This paper evaluates development of a low cost surveillance system using different sensors built around the microcontroller. This surveillance system has a better percentage of security with respect to other security system available. Apart from this it is fast processing less expensive and better probability, alter and copy of information between source and database. . It also controls the power delivered to fan and light according to temperature of room and natural daylight intensity .This system has simpler features designed with the objective of low cost and effective with less power consumption using sensors for remote monitoring and controlling devices which are controlled via SMS using GSM. A traditional communications based security systems provides enhanced security as whenever a signal from sensor occurs, a text message is sent to a desired number to take necessary actions.

Keywords: Home automation, GSM, LPC2148 PROCESSOR, SMS, Sensors

I. INTRODUCTION

Smart Home can be also known as Automated Home or intelligent home which indicates the automation of daily tasks with electrical appliances used in homes. This could be the control of lights, fans, viewing of the house interiors for surveillance purposes or giving the alarm alteration or indication in case of gas leakage The demand for home automation products has been increased rapidly, which promise a potential market trend in near future.The home automation refers to domestic environment that improves the quality of the resident's life by facilitating a flexible comfortable, healthy, and safe environment. The remote controlling and monitoring of a house using internet requires computer, which is large in size and heavy to carry around. The most available home

automation systems use different wireless communication standard to exchange data and signaling between their components, like Bluetooth,Zig bee, Wi-Fi, and finally the Global System for Mobile Communication (GSM) . Wireless based home automation systems decrease installation cost and effort, and enhance system flexibility and scalability. In Home automation systems there are collections of interconnected devices for controlling various functions within a house. Mobile devices are ideal in providing a user interface in a home automation system, due to their portability and their wide range of capabilities. When far from the house, the user might want to check its current status or even schedule actions for his return. Home Automation is becoming an inevitable thing in our fast developing environment and current life style.In a situation where there is high level of theft, there is need for better security system. This tends to utilize the availability of GSM network, mobile phone and electronics circuit to achieve an automated system which is programmed to work as a thinking device to accomplish this purpose. To secure it against theft, crime, etc a powerful security system is required not only to detect but also pre-empts hazards. In this paper the alerting sensors with low-power consumption are placed where an intruder must pass through. According to the sensor's signals received by microcontroller, a call is established to mobile station through a GSM modem and thus warns the presence of unauthorized user in the home to owner-occupier. Security is an important aspect or feature in the smart home applications. Remote monitoring has always come as a challenge in modern era of technology. Remote monitoring and fault detection have been widely used, as they are

capable of more accurate decision making support. Here the proposed system can monitor various environmental parameters like temperature, smoke, fire, etc. Monitoring as well as controlling of all the above parameters in any undesired situation is a prime area of concern in every application. The new and emerging concept of smart homes offers a comfortable, convenient, and safe environment for occupants. However, a smart home security system offers many more benefits. The security system is SMS based and uses GSM technology to send the SMS to the owner. The proposed system is aimed at the security of Home against Intruders and Fire. In any of the above cases happens while the owners are out of their home then the device sends SMS to the emergency number which is provided to the system. The system is made up of three components: sensors, GSM Module, arm7 processor, relays to control the device and buzzers to give security alert signal in terms of sound.

II. BLOCK DIAGRAM OF PROPOSED PROJECT

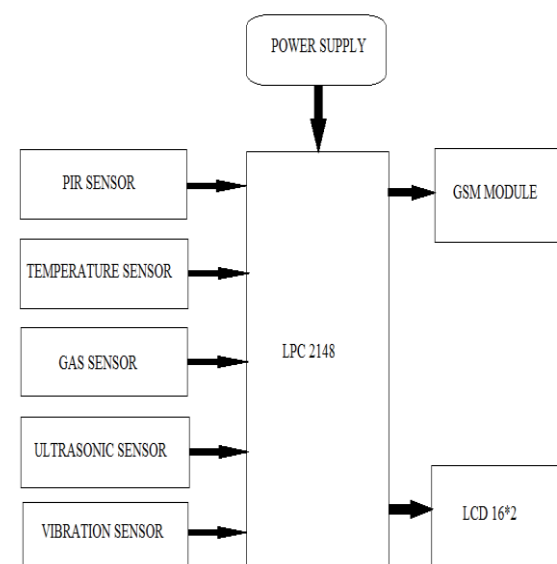


Fig.1 Block Diagram of the project

This paper evaluates development of a low cost surveillance system using different sensors built around the microcontroller. Fig.1 illustrates the block diagram of the proposed project. The low power PIR detectors take advantage of pyro electricity to detect the change in environment temperature through human temperature in our experiment. Also we are using Ultrasonic sensors and vibration sensors. Ultrasonic sensor (Obstacles detection) detects the intruder on their physical presence. Vibration sensors detect sound of breaking or senses vibration signal. This surveillance system has a better percentage of security with respect to other security system available. The security system is SMS based and uses GSM technology to send the SMS to the owner. The proposed system is aimed at the security of Home against Intruders and Fire. In any of the above cases happens while the owners are out of their home then the device sends SMS to the emergency number which is provided to the system. The system is made up of three components: sensors, GSM Module, arm7 processor, relays to control the device and buzzers to give security alert signal in terms of sound.

III. HARDWARE IMPLEMENTATION

Detailed description of some of the components used in the project is as follows.

A. POWER SUPPLY:

Fig 2 depicts the structure of the power supply used. This is a small +5V regulated power supply circuit. In that case here we used 7805 Voltage Regulator IC. 7805 is a +5 Volt regulator IC from 78xx chips family. The circuit has internal current limiting and thermal protection capacity. A 9V 2A steps down transformer is used to convert 230V to 9V from mains. Here used a bridge rectifier made by four 1N 4007 diode to convert AC-DC. 470uF 50v as C1 is used for filtering. This circuit is very easy to build. For good performance recommended input voltage 8V-18V.

If over 400mA current is needed at output then use a heat sink with the 7805 IC.

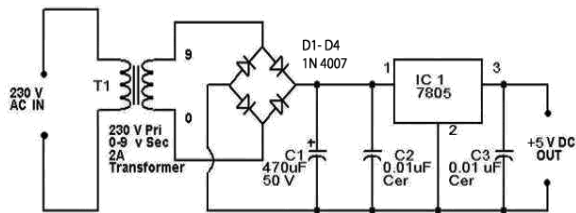


Fig-2 Regulated power supply schematic

B. ARM LPC2148:

Key features

- 16-bit/32-bit ARM7TDMI-S microcontroller in a tiny LQFP64 package.
- 8 kB to 40 kB of on-chip static RAM and 32 kB to 512 kB of on-chip flash memory. 128-bit wide interface/accelerator enables high-speed 60 MHz operation.
- In-System Programming/In-Application Programming (ISP/IAP) via on-chip boot loader software. Single flash sector or full chip erase in 400 ms and programming of 256 B in 1 ms.
- Embedded ICE RT and Embedded Trace interfaces offer real-time debugging with the on-chip Real Monitor software and high-speed tracing of instruction execution.
- USB 2.0 Full-speed compliant device controller with 2 kB of endpoint RAM. In addition, the LPC2146/48 provides 8 kB of on-chip RAM accessible to USB by DMA
- One or two (LPC2141/42 vs. LPC2144/46/48) 10-bit ADCs provide a total of 6/14 analog inputs, with conversion times as low as 2.44 µs per channel.
- Single 10-bit DAC provides variable analog output (LPC2142/44/46/48 only).
- Two 32-bit timers/external event counters (with four capture and four compare channels each), PWM unit (six outputs) and watchdog.
- Low power Real-Time Clock (RTC) with independent power and 32 kHz clock input.

- Up to 45 of 5 V tolerant fast general purpose I/O pins in a tiny LQFP64 package.

C. GSM:

Fig 3. Shows a snapshot of GSM module. GSM

Modem Features :

This GSM modem is a highly flexible plug and play modem based on tri-band SIM300 GSM module.

- **Industrial quality PCB** with adequate grounding for better performance and noise immunity.
- RS232 Interface with **Hardware Flow Control Support**. (5 wire Serial interface with TX, RX, RTS, CTS & GND signals).
- **Power ON/OFF control pin** for auto-reset by Micro-controller. It will be useful for Auto-Reset functionality in Self Monitoring Applications running 24x7x365.
- **Antenna connector has separate ground plane** for additional safety. It will isolate modem circuit ground plan in case antenna connector is exposed to inappropriate voltages. Modem Circuit ground plan and antenna ground plan can be connected simply by solder jumper, if required.
- Supports features like voice, data / fax, SMS, GPRS and integrated TCP / IP stack.
- Control via AT commands (GSM 07.07, 07.05 and enhanced AT commands).
- AC/DC 9-12 V /1.5 A Power Input.
- 4 Pin 0.1" connector for Speaker & Mic connectivity.
- RTC Battery holder (Optional).

Average Current consumption in normal operation 250 mA, can rise up to 500-700mA during Voice and GPRS connections. Current pulse can be high as 1.5-2 A



Fig 3 SIM300 GSM GPRS Modem

LCD: It is used in a project to visualize the output of the application. We have used 16x2 LCD which indicates 16 columns and 2 rows. So, we can write 16 characters in each line. So, total 32 characters we can display on 16x2 LCD. LCD can also be used in a project to check the output of different modules interfaced with the microcontroller. Thus LCD plays a vital role in a project to see the output and to debug the system module wise in case of system failure in order to rectify the problem.

D. Temperature Sensor (LM35):

The LM35 is applied easily in the same way as other integrated-circuit temperature sensors, with an output voltage linearly proportional to the Centigrade temperature. Thus the LM35 has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient Centigrade scaling. This sensor is shown in Fig 4.

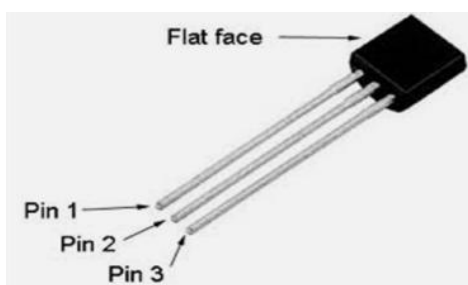


Fig 4. LM35 Temperature Sensor

E. PIR Sensor (DYP-ME003):

DYP-ME003 is a Passive infrared Motion sensor module, and its sensitivity is adjustable and based on BISS0001 PIR motion detector IC which was widely used in security Products, human body sensor toys the human body sensor lighting industrial automation and control, etc. Fig 5 shows PIR sensor

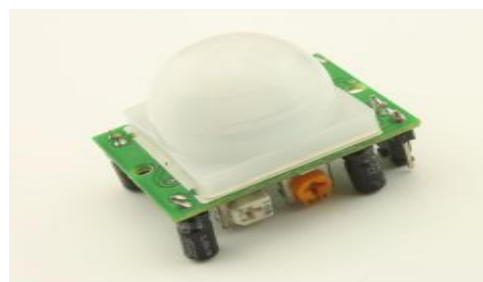


Fig.5 PIR sensor

F. Gas Sensor:

A natural gas sensor is an electronic device which Detect dangerous gas leaks in the Industry or near the gas heater. This unit detects 300 to 5000ppm of Natural Gas. Ideal to detect dangerous gas leaks in the kitchen. Sensor can be easily configured as an alarm unit. The sensor can also sense LPG and Coal Gas. A LPG SENSOR Ideal sensor for use to detect the presence of a dangerous LPG leak in your car or in a service station, storage tank environment. This unit can be easily incorporated into an alarm unit, to sound an alarm or give a visual indication of the LPG concentration. The sensor has excellent sensitivity combined with a quick response time. The sensor can also sense iso-butane, propane, LNG and cigarette smoke.

IV SOFTWARE IMPLEMENTATION

a) KeilmicroVision4 IDE:

The keilmicroVision4 IDE (integrated development environment) combines project management, make facilities, source code editing, program debugging, and Complete simulation in one powerful environment. TheµVision

development platform is easy-to-use and helping you quickly create embedded programs that work. The μ Vision editor and debugger are integrated in a single application that provides a seamless embedded project development environment

b) *Flash Magic* .:

NXP semiconductors produce a range of microcontrollers that feature both on-chip Flash memory and ability to be reprogrammed using in-system programming technology. Flash Magic is Windows software from the Embedded Systems Academy that allows easy access to all the ISP features provided by the devices.

The features include:

1. Erasing Flash memory (individual blocks or whole device).
2. Programming the Flash memory.
3. Modifying the boot vector and status byte.
4. Reading Flash memory.
5. Reading signature bytes.
6. Reading and writing security bits.

Flash Magic only obtains access to the selected COM Port when ISP operations are being performed. This means that other applications that need to use the COM Port, such as Debugging tools, may be used while Flash Magic is loaded.

c) *Embedded C* .:

Embedded C is a high level language, which includes many aspects of the ANSI (American National Standard Institute) C programming language. Extensions for the Programming language C to support embedded processors, enabling portable and efficient application programming for embedded systems. *Embedded C* is a set of language extensions for the C Programming language by the C Standards committee to address commonality issues that exist between C extensions for different embedded systems. Historically, embedded C programming requires nonstandard extensions to the C

language in order to support exotic features such as fixed point arithmetic, multiple distinct memory banks, and basic I/O operations.

V. RESULTS

Some of the snapshots of the results are shown in Fig.6.1, 6.2 and 6.3

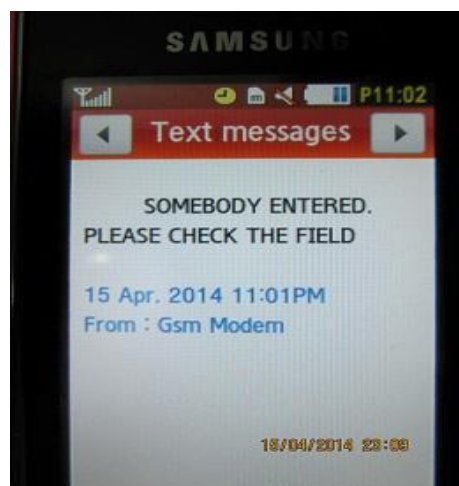


Fig. 6 Outputs for PIR Sensor on Mobile phone



Fig.7. Outputs for LM35 Sensor on LCD

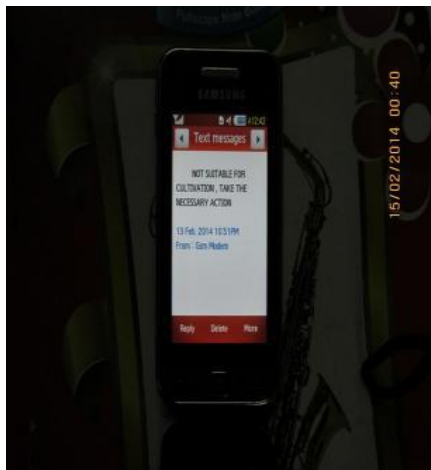


Fig.8 Outputs for LM35 Sensor on mobile

VI. CONCLUSION

All home appliances which are connected to ARM controller were successfully controlled from different wireless android mobile devices. Internet is compulsory required to establish communication between transmitting and receiving android phones. This project will provide convenience to the common working man by enabling them to monitor home appliances from anywhere. From the results obtained it is clear the proposed approach provides very high accuracy. Thus the approach is very much secured. This approach can be enhanced to higher level in order to further improve the security. This common wireless security system can be extended in future by using several different types of required database that will be very hard to break by the attackers, by using another advanced sensors and thus it can provide better security. Sensors are used as a reliable solution in providing remote monitoring and controlling for vulnerable monitoring systems. The features of GSM/GPRS are explored to design the system for long communication. As the ARM processor has been specifically designed to be small to reduce the power consumption and extend the battery operation for portable devices applications, the proposed system itself is a low cost, portable and also flexible with the increasing variety of devices to be controlled.

REFERENCES

- [1] DhirenTejani, Ali Mohammed A. H. Al-Kuwari and VidyasagarPotdar "Energy Conservation in a Smart Home" 5th IEEE International Conference on Digital Ecosystems and Technologies (IEEE DEST 2011), 31 May -3 June 2011, Daejeon, Korea.
- [2] Zamshed Iqbal Chowdhury, MasudulHaiderImtiaz, Muhammad MoinulAzam, Mst. RumanaAktarSumi, NafisaShaheraNur "Design and Implementation of Pyroelectric Infrared Sensor Based Security System Using Microcontroller" Proceeding of the 2011 IEEE Students' Technology Symposium, 14-16 January, 2011, IITKharagpur
- [3] Ying-Wen Bai, Zi-Li Xie and Zong-Han Li "Design and Implementation of a Home Embedded Surveillance System with Ultra-Low Alert Power", 0098 3063/11/\$20.00 © 2011 IEEE
- [4] MuhammadIzharRamli, MohdHelmyAbdWahab, Nabihah, "TOWARDS SMART HOME: CONTROL ELECTRICAL DEVICES ONLINE," Nornabihah Ahmad International Conference on Science and Technology: Application in Industry and Education (2006)
- [5] David E. Simon, An Embedded Software Primer, fifth edition, 2007.
- [6] www.keil.com
- [7] <http://en.wikipedia.org/wiki/GSM>
- [8] Jadhav G.J "Design and Implementation of Advanced ARM Based Surveillance System Using Wireless Communication"
- [9] Debidatta Acharya, Surya Narayan Pradhan, Soumyashree Mongaraj "Real Time Automation of Agriculture System Using ARM7"