

Interfacing of Sensor Network to Communication Network for Disaster Management

Sanjay Patel, O. P. Vyas, Hansa Mehra

Abstract-This paper deals with the sensor network and communication network for disaster management, in which the concerned authorities dealing in disaster management get the message on their mobile phones about disaster information. Now a days number of small disasters like fire, chemical leakage, pollution etc, happen frequently and need immediate relief action. In this paper the authors have developed a technique for immediate information release for quick action to such events. In this technique, we have used sensors which sense the disaster information and transfer this information to the mobile user using GSM RS 232 Modem and MDE 8051 development board.

Key words: GSM, MDE851 board, KEIL, AT command

I. INTRODUCTION

Now a day's every system is automated in order to face new challenges. Automated systems have less manual operation are flexible, reliable and accurate. Due to these demands every field prefers automated control systems. Especially in the field of electronics automated systems are giving good results. The main aim of this paper is to keep track of fire by using fire sensors, leakage of chemical using a chemical detector sensor, leakage of gas using a gas sensors in any industry, building and home, if the leakage exceeds, it alerts through the SMS message to users mobile using GSM modem. The MDE 8051 Development board gets the information regarding the leakage of any gas through the gas sensor, leakage of chemical using a chemical detector sensor, any fire using a fire sensor and gives an alert about the condition being sensed using GSM modem to the mobile phone. Using this way we can take the preventive measures steps before occurrence of major accidents and we can avoid the human losses and financial losses. The application program for the MDE 8051 development board is written in embedded 'C' and stored in the flash memory of the microcontroller.

KEIL software is used for development of codes. AT commands are sent to the GSM modem by the MDE 8051 development board itself.

The AT commands are used to check the communication with module. It returns a result code all correct (OK) if the module and the controller are connected properly. If either of the module or SIM is not working, it returns a result code ERROR.

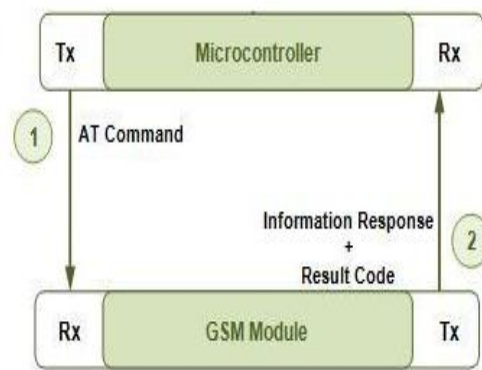


Fig.1 Interfacing of GSM modem with Microcontroller

II. SYSTEM OVERVIEW

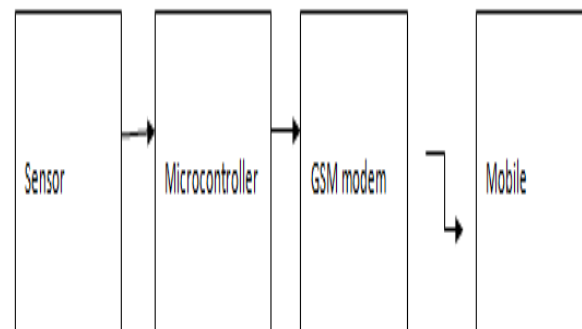


Fig.2 General block diagram

Initially, when the power is switched on, the configuration of GSM modem takes place and is indicated by the blinking of LED. Now, the user send the message "status" to the GSM modem, the GSM modem in return sends the message informing about the normal conditions as an acknowledgement to the user and also sets the user's

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number as a default number for sending any emergency message to it. To reset this number either we reset the circuit or send the message “status” from the new number to the GSM modem. Now, if any mishap occurs like fire or leakage of LPG, leakage of chemical etc, it is sensed by sensors which are connected to the MDE 8051 development board and when the output of sensors exceeds the threshold level which is checked by MDE 8051 development board and generates the required message of emergency like “fire, leakage of gas, leakage of chemical” and transfers it to GSM modem which in turn send this message to the user. On receiving the message user takes appropriate action. All this transferring and receiving of messages is shown by the blinking of the LED.

III. MDE 8051DEVELOPMENT BOARD [1, 10]

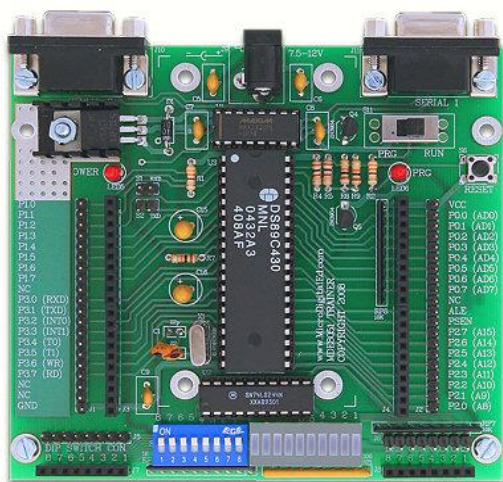


Fig.3 Development board

The 8051 board is a useful tool for embedded control and robotics projects. Its versatile design and microcontroller lets you access numerous peripheral devices and program the board for multiple uses. The board has many I/O connectors and supports a number of programming options including 8051 assembly and C. The 8051 trainer board has 8 switches and 8 buffered LEDs for connection to the microcontroller, bread board or peripheral devices. It provides access to pins of the 8051 through sip male and female connectors for wiring to bread board or attaching Digilent Pmod™ peripheral modules. Digilent peripheral modules include H-bridges, analog-to-digital and digital-to-analog converters, speaker amplifier, switches, buttons, LEDs, as well as converters for easy connection to screw terminals, BNC jacks, servo motors, and more [1,10].

A. Functional Description

The 8051 is designed for embedded control and robotic applications as well as microprocessor experimentation. The 8051 has an on-chip loader/programmer: The loader / programmer is accessed via Serial COM Port #0 DB9 Connector. The 8051 Trainer features a flexible power supply routing system with VCC and GND pin available on 20 pin male and female connector for powering the ICs on

the breadboard as well as Digilent Pmod peripheral modules connected to the board. Digilent Pmod peripheral modules can be connected to the connectors on the 8051Trainer board via cables. Digilent has a variety of Pmod interconnect cables available. [1, 10]

B. Programming the 8051 Trainer

The 8051 Trainer programming can be accomplished using Serial#0. Programming via Serial#0 requires use of the HyperTerminal program which comes with the Microsoft Windows Operating System. [1]

C. RS232 compatible Serial connectors (DB9)

The DS89C450 microcontroller provides 2USART serial interfaces. The 8051 trainer board comes with MAX232 to convert TTL voltage level to RS232. So you can connect the 8051 trainer board directly to a PC. [1,10]

D. Jumper Settings for second serial port

Jumpers S1 and S2 are provided for connecting the second serial port. If no jumper is connected to S1 and S2, then the P1.2 and P1.3 are disconnected from MAX232 and are be used as simple I/O pins. [1,10]

E. Crystal Oscillator

The DS89C450 microcontroller supports numerous clock source options for the main processor operating clock. The 8051 Trainer has an 11.0592 MHz oscillator crystal. 11.0592 MHz oscillator crystal enables you to connect the 8051 trainer board to PC by COM port and the serial transfer error will be as low as zero. [1]

IV. GSM/GPRS RS232 MODEM [2, 11]



Fig.4 Representation of GSM Modem

A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends

and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves. AT commands are used to control modems. Both GSM modems and dial-up modems support a common set of standard AT commands. In addition to the standard AT commands, GSM modems support an extended set of AT commands. These extended AT commands are defined in the GSM standards. With the extended AT commands, one can do things like:

- Reading, writing and deleting SMS messages.
- Sending SMS messages.
- Monitoring the signal strength.
- Monitoring the charging status and charge level of the Battery.

GSM/GPRS Modem-RS232 from rhydoLABZ is built with Tri-band GSM/GPRS engine, works on frequencies EGSM 900 MHz, DCS 1800 MHz and PCS 1900 MHz. The Modem is coming with RS232 interface, which allows you connect to PC as well as microcontroller. The baud rate is configurable from 9600-115200 through AT command. The GSM/GPRS Modem have an internal TCP/IP stack to enable you to connect with internet via GPRS. It is suitable for SMS; Voice as well as DATA transfer application in M2M interface. The High quality aluminium enclosure enables you to use in rugged environmental conditions. The internal Switching Power supply allows you to connect wide range unregulated power supply. Using this modem, you can make audio calls, SMS, Read SMS and attend the incoming calls etc through simple AT command. This wireless data modem is the ready solution for remote wireless applications, machine to machine or user to machine and remote data communications. [2, 11]

V. DATA FLOW DIAGRAM



Fig.5 Flow chart

VI. APPLICATIONS

1. This project finds application as security systems in industries, any business organization or in home.
2. With the advantages of reliability, easy usage, Complement wireless, and low power consumption, the System also has practical value in other fields as other appliances that can also be monitored such as can detection of theft or smoke.

VII. ADVANTAGES

1. Electronic report of events
2. Low power consumption
3. Reliability
4. Easy usage
5. Low cost
6. Provides safety

VIII. DISADVANTAGES

1. Network congestion.
2. The system can only function within the reach of the chosen GSM Service Operator.
3. Requires maintenance

IX. CONCLUSION

This paper presents a low power consumption remote security system. The system based on GSM technology the leakage of LPG gas, leakage of chemical and fire tracks and sends alarm message remotely. The hardware of this system includes the GSM RS 232 modem, MDE 8051 development board, sensors. The system software developed in C language has the ability of collecting, receiving and transmitting wireless data, and can send a piece of alarm short message to the user's mobile phone when some dangerous condition is detected. In far off remote monitoring if the levels of temperature rises above certain level then sensors can detect gas, fire, and chemical in case of emergency and generate an SMS.

X. FUTURE SCOPE

With the advantages of reliability, easy usage, complement any wireless, and low power consumption, the system also has practical value in other fields as other appliances can also be monitored such that can detect theft or smoke The system is extensible and more levels can be further developed using automatic motion/glass breaking detectors so the solution can be integrated with these and other detection systems. In future the system will use a small box combining the PC and GSM modem.

REFERENCES

- [1] Harper, M., The use of thermal Desorption in Monitoring for the Chemical Weapons Demilitarization Program. *Journal of Environmental Monitoring* 2002, 4, 688-694.
- [2] Siegmund M. Redl, Matthias K. Weber, Malcolm W. Oliphant, "an introduction to GSM", Boston: artech House, 1995
- [3] Vijay K. Garg, Joseph E. Wilkes, "principles and applications of GSM", Prentice Hall, 1999.
- [4] GSM Technical Specification, "digital cellular telecommunications system, Global System for Mobile communications (GSM)", ETSI SMG, GSM 07.05, nov1997
- [5] J.W. Grate, M.H. Abraham, Solubility interactions and the design of chemically selective sorbent coatings for chemical sensors and arrays, *Sens. Actuators B: Chem.* 3 (1991) 85-111.
- [6] J.C. Chen et. al. Coherent Acoustic Array Processing and Localization on Wireless Sensor Networks. *Proc. of the IEEE*, 91(8), August 2003.
- [7] McLoughlin, M. P., Allmon, W. R., Anderson, C. W., Carlson, M. A., DeCicco, D. J., and Evancich, N. H., "Development of a Field-Portable Time-of-Flight Mass Spectrometer System," *Johns Hopkins APL Tech.*
- [8] National Institute for Occupational Safety and Health, *Guidance for Protecting Building Environments from Airborne Chemical, Biological, or Radiological Attacks*, DHHS (NIOSH) Pub. 2002-139 (May 2002).
- [9] Oppenheimer, A., Nuclear, Biological and Chemical detection: To detect and Protect. *Jane's Defence Weekly* 2004.
- [10] www.MicroDigitalED.com
- [11] www.rhydolabz.com
- [12] www.digilentinc.com

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