

Automatic Fire Sensing and Communicating Through GSM Modem

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Abstract

Fire accidents which are common in now-a-days particularly in vehicles such as buses, trains and industries are causing great threat to human life and property as well. Example of one such incident is the Karnataka and Mahaboobnagar Volvo bus accidents. About 70-80% of fire accidents cases remain uncontrollable mainly because of lack of communication. One way to avoid this problem is to make aware of surrounding people as well as the authorities immediately to take respective measures. In our latest version development of fire detector circuit we have chosen a GSM modem, fire sensor, smoke sensor, buzzer and LCD display and microcontroller At mega 32.

Keywords: At mega 32 microcontroller, Buzzer, Fire Sensor, GSM, LCD Display, Smoke Sensor.

Introduction

This is 21st century but still we lag to stop the communicating problem involved in fire accidents. This is major back drop in our development. The loss of mankind and property through fire accidents is the most devastating thing that can ever happen. It can be more dangerous if the vehicle or the object is moving as the wind adds extra force to the fire leading to more damage. To minimize the damage, we present a fire detection system which uses a GSM modem and microcontroller in particular. The sensors which are fire and smoke sensitive detects the fire and smoke caused due to fire passes the signals to Microcontroller and the Microcontroller controls the all the hardware components attached to it effectively.

A fire detection circuit using both fire and smoke sensors for detection as well as GSM modem for communication is presented in this paper.

System Components and Working Method

Fire accidents ultimately leads to large flame with high intensity light and dense smoke, so we use two main components to confirm fire accident has occurred. They are 1) smoke sensor and 2) fire sensor. Once the fire sensor (121000574) detects the fire, it sends signals to microcontroller. Once the microcontroller receives them it starts its operation in a very effective way. It controls GSM modem, buzzer, and LCD display, motor driving IC which are kept in ON state all the time and will respond. The pre coded message loaded in microcontroller register which is a

SBUF now sends them to GSM modem, now it sends the messages to the number specified about the accident. At the same time, buzzer and motor will be on automatically and motor sprinkles water to its surrounding area and it is also displayed on LCD. At mega 32 is interfaced to a GSM modem which is used to send messages. But only NMEA data coming out is read and displayed on LCD.



Fig: 2.1 Smoke Sensor (MQ135)

The same data is sent to the mobile at the other end. And EEPROM is used to store mobile number. The hardware interfaces to microcontroller are GSM modem, LCD display, and motor driving IC. The design uses RS 232 protocol for serial communication between modems and microcontroller.



Fig: 2.2 Fire Sensor (121000574)

The information detection module consists of fire sensors and smoke sensors if fire accident takes place then these two sensors immediately detects them and sends signals to microcontroller

A. Message Transmission Module GSM:

Global System for Mobile Communication (GSM) is a globally accepted standard for mobile communication. GSM is the name of a standardization group established in 1982 to create a common European mobile telephone standard that



Fig: 2.3 GSM Modem

Would formulate specifications for a pan-European mobile cellular radio system operating at 900 MHz frequency. Cellular is one of the fastest growing and most demanding telecommunications applications. GSM (Global System for Mobile communication) is a digital mobile telephony system that is widely used in Europe and other parts of the world. GSM uses a variation of time division multiple access (TDMA) and is the most widely used of the three digital wireless telephony technologies (TDMA, GSM, and CDMA). GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900 MHz or 1800 MHz frequency band. The structure of a GSM network: The network is structured into a number of discrete sections: The Base Station

Subsystem (the base stations and their controllers). The Network and Switching Subsystem (the part of the network most similar to a fixed network). This is sometimes also just called the core network.

The Atmel @AVR@AVR core combines a rich instruction set with 32 general purpose working registers. All the 32 registers are directly connected to the Arithmetic Logic Unit (ALU), allowing two independent registers to be accessed in one single instruction executed in one clock cycle. The resulting architecture is more code efficient while achieving throughputs up to ten times faster than conventional CISC microcontrollers. The ATmega32 provides the following features: 32Kbytes of In-System Programmable Flash Program memory with Read-While-Write capabilities, 1024bytes EEPROM, 2Kbyte SRAM, 32 general purpose I/O lines, 32 general purpose working registers, a JTAG interface for Boundary scan, On-chip Debugging support and programming, three flexible Timer/Counters with compare modes, Internal and External Interrupts, a serial programmable USART, a byte oriented Two-wire Serial Interface, an 8-channel, 10-bit ADC with optional differential input stage with programmable gain (TQFP package only), a programmable Watchdog Timer with Internal Oscillator, an SPI serial port, and six software selectable power saving modes.

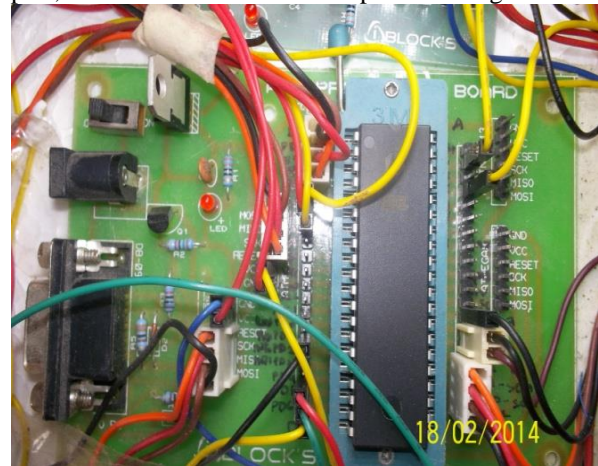


Fig: 2.4 AVR Programmer Board

The Idle mode stops the CPU while allowing the USART, Two-wire interface, A/D Converter, SRAM, Timer/Counters, SPI port, and interrupt system to continue functioning. The Power-down mode saves the register contents but freezes the Oscillator, disabling all other chip functions until the next External Interrupt or Hardware Reset. In Power-save mode, the Asynchronous Timer continues to run, allowing the user to maintain a timer base while the rest of the device is sleeping. The ADC Noise Reduction mode stops the CPU and all I/O modules

except Asynchronous Timer and ADC, to minimize switching noise during ADC conversions. In Standby mode, the crystal/resonator Oscillator is running while the rest of the device is sleeping. This allows very fast start-up combined with low-power consumption. In Extended Standby mode, both the main Oscillator and the Asynchronous Timer continue to run. The device is manufactured using Atmel's high density nonvolatile memory technology. The On chip ISP Flash allows the program memory to be reprogrammed in-system through an SPI serial interface, by a conventional nonvolatile memory programmer, or by an On-chip Boot program running on the AVR core. The boot program can use any interface to download the application program in the Application Flash memory. Software in the Boot Flash section will continue to run while the Application Flash section is updated, providing true Read-While-Write operation. By combining an 8-bit RISC CPU with In-System Self-Programmable Flash on a monolithic chip, the Atmel ATmega32 is a powerful microcontroller that provides a highly-flexible and cost-effective solution to many embedded control applications. The Atmel AVR ATmega32 is supported with a full suite of program and system development tools including: C compilers, macro assemblers, program debugger/simulators, in-circuit emulators, and evaluation kits.

Results

To initialize the working of fire sensor through GSM modem we have to enter the mobile number through keyboard.



Fig: 3.1 Entering Mobile Number

After the mobile number is entered a '#' symbol is entered at the end of the number so that the number gets stored in EEPROM



Fig: 3.2 Storing Of Mobile Number

once the number is stored the components such as GSM modem, lcd display, buzzer, motor all the hardware components gets in on state and after the detection of fire they are going to respond simultaneously. We have given some preloaded values to light sensor if it crosses the preloaded intensity i.e. digital values it passes signals to microcontroller.



Fig: 3.3 Preloaded Values



Fig: 3.4 LCD Display for Detection of Fire

Simultaneously the GSM modem will send the messages to the specified number regarding the incident of fire accident.

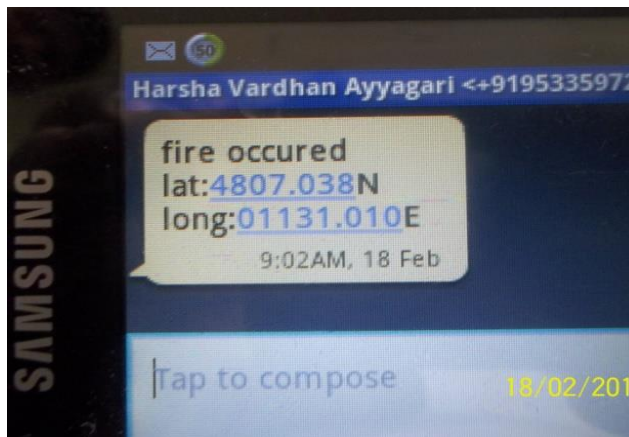


Fig: 3.5 Detailed Notification of the Accident to the Specified Number.

Conclusion

This is the most advanced fire detector circuit which communicates very fast and effectively through GSM modem to the required authorities such as ambulance, fire engine, police etc.

- ✓ It reduces human loss.
- ✓ It reduces property loss.
- ✓ It uses all the possible ways to minimize fire accident.

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