ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 5, May 2016

GSM System for Fire Detection and Notification System in Trains

Krithi Mohan K[*1], Muhammed Nisham K[*2], Naheem MR[*3], Sapthami BN[*4], Yathiraj GR[*5]

UG Scholar, Dept. of CSE, Coorg Institute of Technology, Ponnampet, India[*1,*2,*3,*4]

Asst. Professor, Dept. of CSE, Coorg Institute of Technology, Ponnampet, India[*5]

ABSTRACT: A preparation to diminish the death loss taking place due to fire accidents in trains is presented. Fire on a running train is more disastrous than on a stationary one, since fanning by winds helps spread the fire to other coaches. When these accidents are taking place in remote areas or during night times the loss or damage being caused is at higher rates. The damage is heavier due to inappropriate reach of service at right time due to improper communication. This time interruption is causing heavier damage. Thus, eliminate the time between when an accident occurs and when first responders are dispatched to the scene decreases the damage. This projects help in notifying the passengers and emergency services. The project consists of a microcontroller which is interfaced with the GPS module, GSM modem and fire sensors. Once the sensors attached in the compartment of train senses the smoke detection, it assumes a fire accident. The controller assumes it as an urgent situation and start the buzzer, LCD display and GSM modem in the engine transfering the latitude and longitude information to the specified mobile number and emergency services, by enticing the information from the GPS.

KEYWORDS: Fire sensors, GSM, GPS, Buzzer, Zigbee.

I. INTRODUCTION

Security in travel is primary concern for everyone. Now a day's fire accident is most often taking place in trains. When these accidents are taking place in remote areas or during night times the loss or injure being caused is at higher rates. The damage is heavier due to improper reach of service at accurate time due to inappropriate communication. This time setback is cause heavier damage. Thus, eliminating the time between when a disaster occurs and when initial responders are dispatched to the scene decrease the damage. One approach to reduce the setback is by identifying the fire accident and notifying the concerned authorities, loco pilot and traveler with in no time. Passengers will be notified by ringing the buzzer and loco pilot will be notified showing the message in the LCD display fitted in the engine along with alarm. In the similar time the railway authorities and crisis services are notified by sending SMS through GSM service.

II. SYSTEM ARCHITECTURE

When a fire accident occur in train, immediately the fire sensor will sense the variation in temperature and thusthe micro controller is provided with the power supply. When there is no fire accident the ZigBee fire sensors located in thecompartments will not give any signal so the micro controller will not work. Thus, once the fire is detected, the ZigBeefiresensors sends a signal and the GPS, GSM, Buzzer, LCD modem which are kept ON all thetime will respond to the signal. The GPS modem will be continuously tracking the land position and after the detection of fire the longitude andlatitude values of that location are stored in memory of the micro controller and the contents are moved to SBUFregister of microcontroller and then to the GSM through the transmitter pin. The GSM modemthen will send messagesto the emergencycontact numbers stored in EEPROM of the microcontroller about the accident specifying the latitude and longitude values. At the same time, when the microcontroller is supplied with power the BUZZER will start functioning. And also the details of the accident is displayed in the LCDdisplay to the loco pilot in the engine of train.

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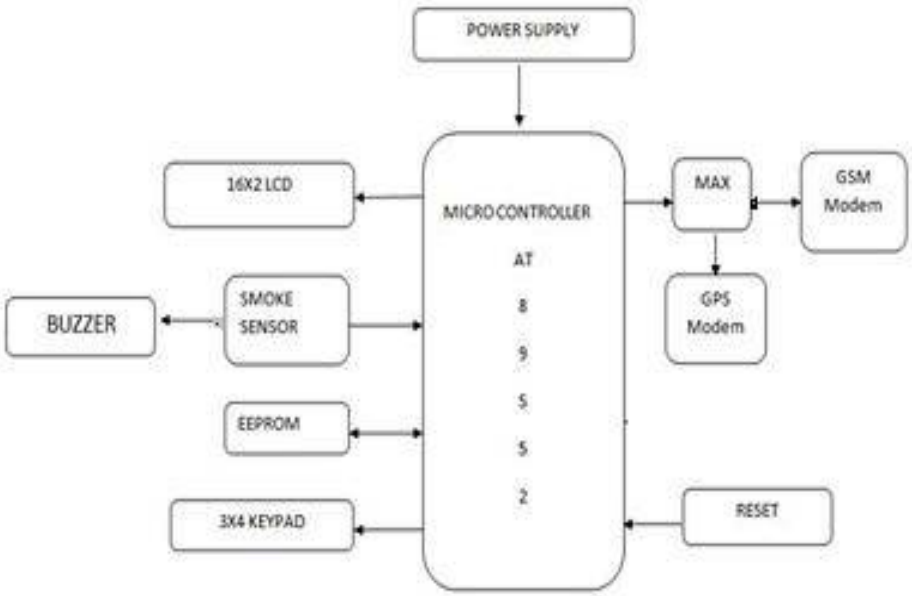
Block Diagram:
AT89C52 microcontroller is interfaced serially to a GSM Modem and GPS Receiver. A GSM modem is used to send the position of the vehicle from a remote place to concerned authorities. The GPS modem continuously gives the datai.e. Latitude and Longitude indicating the position of the vehicle. The GPS modem gives many parameters as output, but only NMEA data coming out is obtained and displayed on the LCD. The same data is sent to the mobile at the other end from where the position of the vehicle is demanded. An EEPROM is used to store the mobile number. The hardware interfaces to microcontroller are LCD display GSM modem and GPS receiver. The design uses RS 232 protocol for serial communication between modems and microcontroller. A serial driver IC is used for converting TTL voltage levels into RS 232 voltage levels.



III. HARDWARE DESIGN

A. The Information Detection Module

Information detection module consists of ZigBee fire sensors installed in every section of train. When fire accident occur any of the ZigBee fire sensors located in compartment of train senses and immediately it sends signals to the microcontroller in engine. Fire sensors also consist of modern sprinkler systems. A wireless sensor network, which combine computer and communication technology with the technology of sensor network, is measured to be one of the capable technology that will have an effect on the future of human civilization. This network is composed of several and everywhere micro sensor nodes which have the capability to communicate and estimate. These nodes can observe sense and gather in series of dissimilar atmosphere and a variety of monitoring objects cooperatively. ZigBee is a low-rate, low-cost and low-power kind of short sequence wireless network communication protocol. Compared with other wireless technologies, ZigBee has unique advantages of safe and reliable data transmission, an easy and elastic network configuration, low tools costs and long-term batteries. Thus, it has huge progress in potential and a capable market purpose in the field of industrial control. By applying a wireless sensor network based on ZigBee to a train fire detection system, information such as temperature and humidity at any position of the train is enclosed by the network could easily be collected, dealt with and analyzed at any time. In addition, the system can be absolute significantly, the cost of tools maintenance could be reduced and the whole system could be optimized.

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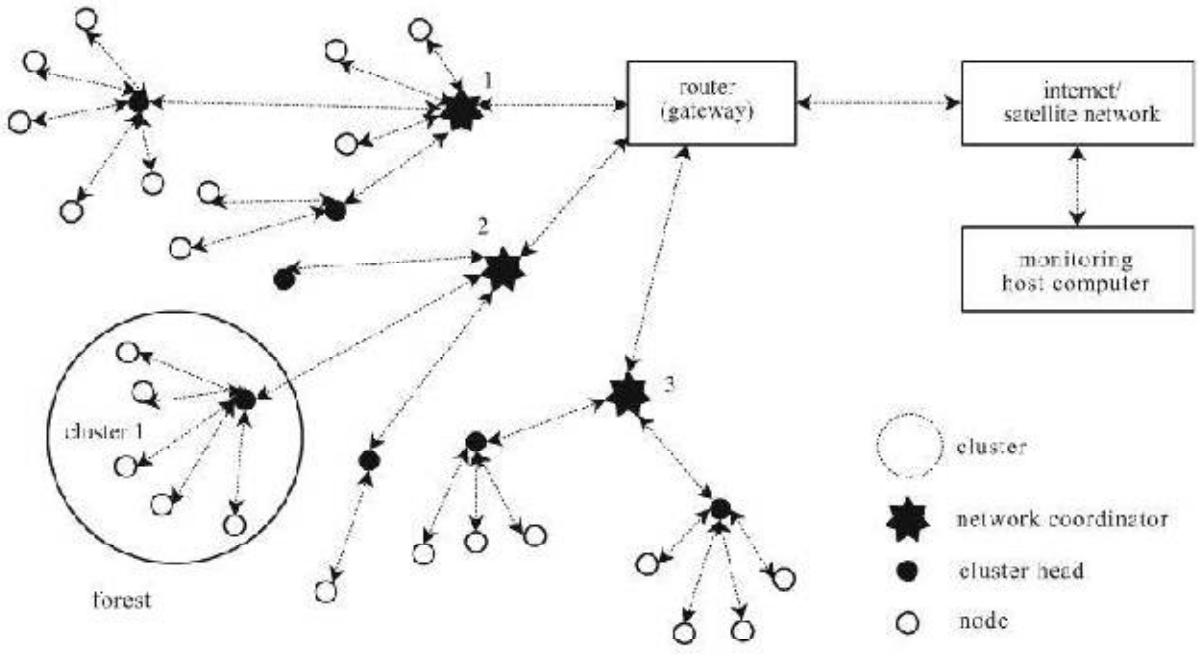

Fig. 1 Structure of a wireless sensor network for forest fire detection based on ZigBee technique

B. GPS Location Module

GS-87 is the GPS location module used. It is the third generation of GPS receiver chip designed by the United States SiRF star III company, which consists of a radio frequency integrated circuit, a digital signal processing circuit and embedded GPS software composition.

C. Message Transmission Module GSM

Global system for mobile communication (GSM) is a globally established standard for digital cellular communication. GSM is the given name of a standardization group established in 1982 to create a common European mobile telephone standard that would formulate specifications for a pan European mobile cellular radio system operating at 900 MHz frequency. Cellular is one of the greatest growing and most challenging telecommunications applications. GSM (Global System for Mobile communication) is a digital mobile telephony system that is broadly used in Europe and other parts of the world. GSM uses a variation of time division multiple access (TDMA) and is the most commonly used of the three digital wireless telephony technologies (TDMA, GSM, and CDMA). GSM digitizes and compress 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 Operations support system 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 occasionally called the core network. The *GPRS Core Network* (the optional part which allows packet based Internet connections). *The (OSS)* for safeguarding of the network.

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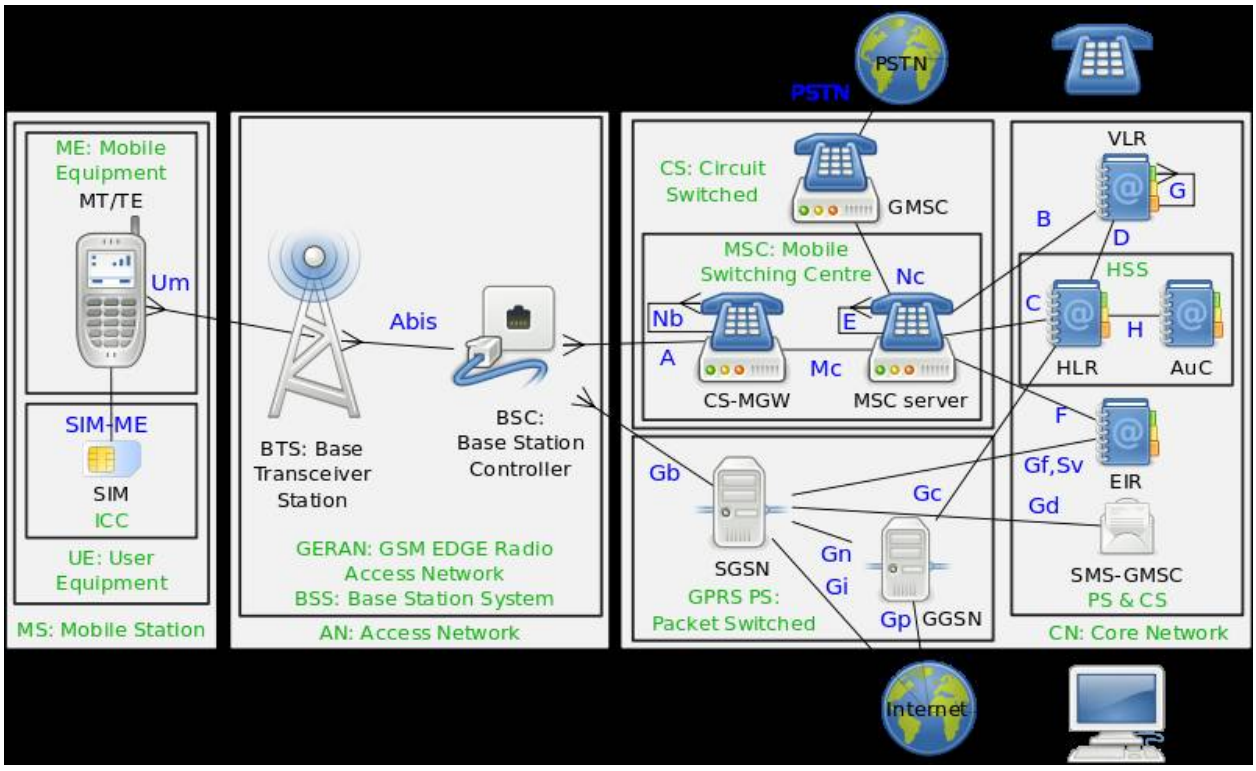
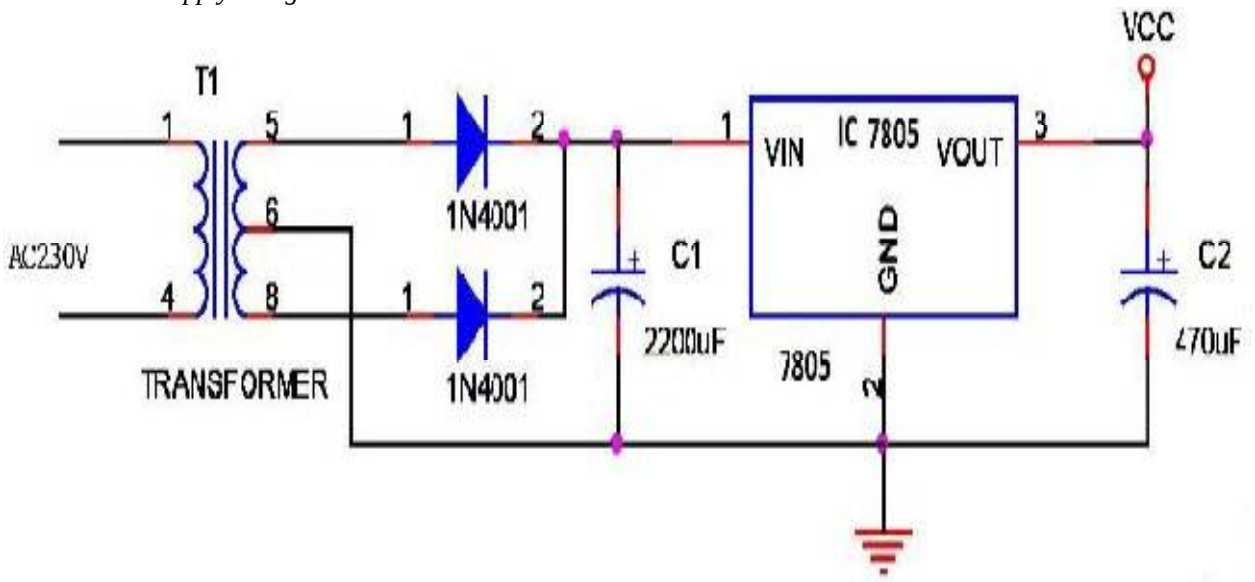


IV. SCHEMATIC DIAGRAM

A. Power Supply Design



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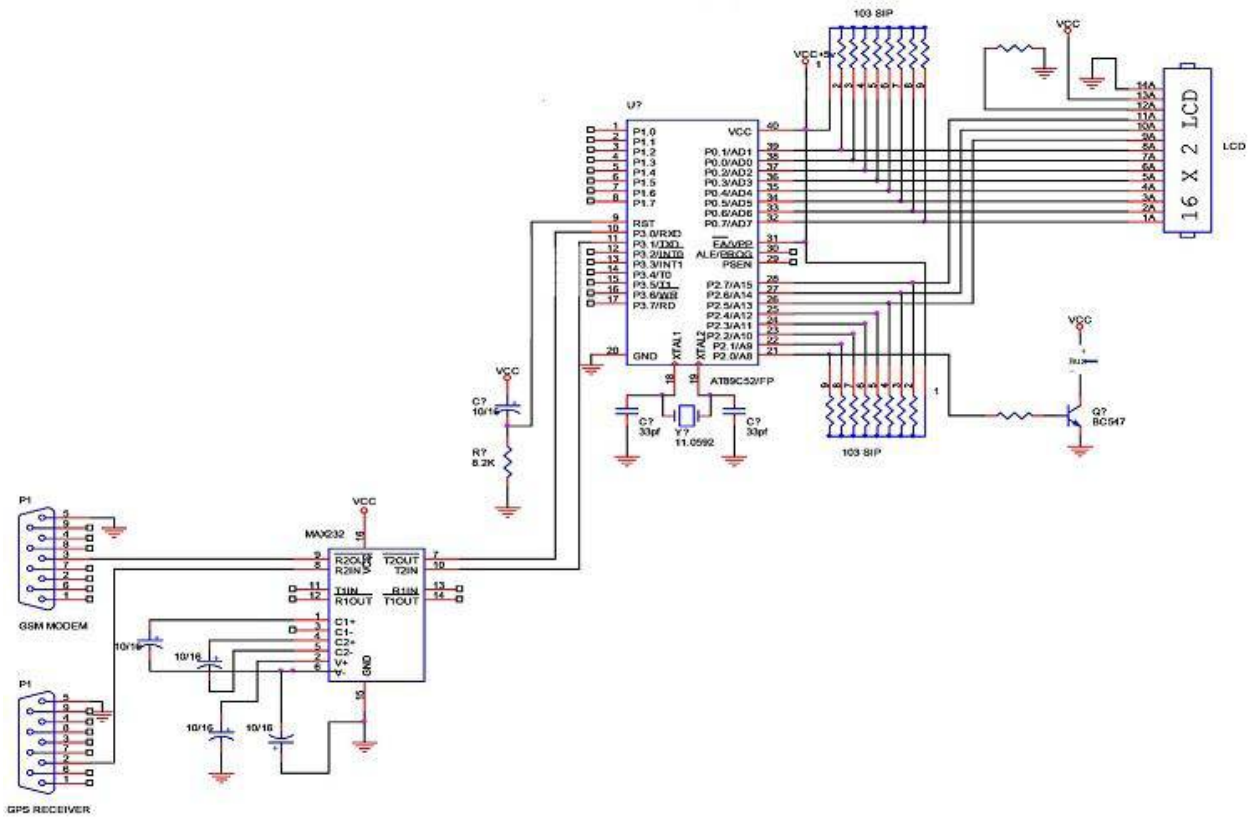
B. Complete Schematic



V. CONCLUSION

The technologies used here are, firstly ZigBee technology which is used to detect the fire accident in train and information about the variation in temperature is transferred to microcontroller which is placed in engine . Secondly, GPS technology is used to gather the information about the location where the accident took place.The GSM technology is used to inform about the disaster occured in moving train to the concerned railway helpline authorities and emergency services like police ambulance etc.

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BIOGRAPHY

KunchamViswa Teja1 was born in 1992 in Visakhapatnam District. He is currently pursing B.Tech Electronics and Communication degree from K L University. He is interested in Tele-Communication and Embedded Systems.
Correspondence Author: KunchamViswaTeja

Suresh Angadi2 is presently working as aAsst.Professor in K L University. He received his B.Tech degree in electronics and communication in G.V.P College of Engineering, vizag, 2007 and completed M.Tech in Maulana Azad National Institute of Technology (MACT) in 2009, Bhopal. He has published SEVEN international journals of repute.