To Design an intelligent systems for Hazard Gas, Human Detection and Temperature Monitoring

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ABSTRACT- *Now a days security is primary concern for everyone. There are many ways to provide security in coal mines. Because the main aim of this project is to continuously monitor the different parameters in coal mines, industries etc. This is a purely wireless project using GSM modem and totally eliminates a person who has to monitor the parameters in coal mines all the time. A GSM modem provides the communication interface. It transports device protocols transparently over the network through a serial interface.*

A GSM modem is a wireless modem that works with a GSM wireless network. This GSM Modem can accept any GSM network operator SIM card and act just like a mobile phone with its own unique phone number. Advantage of using this modem will be that you can use its RS232 port to communicate and develop embedded applications. Applications like SMS Control, data transfer, remote control and logging can be developed easily. The modem can either be connected to PC serial port directly or to any microcontroller.

INTRODUCTION

1.1 Overview

This paper is aimed to design an intelligent system for Hazardous gas and human detection and temperature monitoring and controlling in coal mines by using GSM technology.

Security is primary concern for everyone. Because the main aim of this project is to continuously monitors the different parameters in coal mines. This is a purely wireless project using GSM modem and totally eliminates a person who has to monitor the parameters in coal mines all the time.

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This paper is designed in such a way that, the analog quantities which are to be recorded continuously are taken and converted into corresponding digital values using an ADC. A gas senor is interfaced to the controller for detecting the hazardous gas in the coal mines and an IR transmitter and receiver also interfaced to the controller for detecting the objects (or persons) in specific area in coal mines. The microcontroller continuously monitors the sensors data. A GSM modem will be interfaced to the controller through serial communication. Whenever the temperature exceeds, a warning message will be sent to the predefined number through GSM modem automatically. Whenever the gas sensor activated or any object is detected by IR sensor then immediately message will be sent to the particular

number through GSM modem. A16X2 LCD will be interfaced to the controller to display the status of the sensors.

This paper uses regulated 5V, 500mA power supply. 7805 three terminal voltage regulator is used for voltage regulation. Full wave bridge rectifier is used to rectify the ac output of secondary of 230/12V step down transformer.

1.2 PROBLEM STATEMENTS

It is difficult to identify the hazardous gases like methane, propane, LPG, CO all the time by the people. In the same way it is difficult to monitor the temperatures in coal mining areas, pharmaceutical industries etc. It is difficult to monitor the people who are entering into prohibited areas. For this we have arranged a system for detection using GSM.

1.3 OBJECTIVES

The main objectives of this paper are:

1) This system detects the hazardous gases like methane, propane, LPG, CO in industries, offices, homes.

2) It detects the people who are entering and leaving in prohibited areas.

3) It will monitor the temperature values in coal mining areas, industries and sends a message to the authorized person.

2 LITERATURE REVIEW

GSM (Global System for Mobile communications) is an open, digital cellular technology used for transmitting mobile voice and data services.

GSM (Global System for Mobile communication) is a digital mobile telephone 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 telephone 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 1,800 MHz frequency band. It supports voice calls and data transfer speeds of up to 9.6 kbit/s, together with the transmission of SMS (Short Message Service).

2.1.1 GSM Frequencies

GSM networks operate in a number of different frequency ranges (separated into GSM frequency ranges for 2G and UMTS frequency bands for 3G). Most 2G GSM networks operate in the 900 MHz or 1800 MHz bands. Some countries in the Americas (including Canada and the United States) use the 850 MHz and 1900 MHz bands because the 900 and 1800 MHz frequency bands were already allocated. Most 3G GSM networks in Europe operate in the 2100 MHz frequency band. The rarer 400 and 450 MHz frequency bands are assigned in some countries where these frequencies were previously used for first-generation systems.

GSM-900 uses 890–915 MHz to send information from the mobile station to the base station (uplink) and 935–960 MHz for the other direction (downlink), providing 124 RF channels (channel numbers 1 to 124) spaced at 200 kHz. Duplex spacing of 45 MHz is used. In some countries the GSM-900 band has been extended to cover a larger frequency range. This 'extended GSM', E-GSM, uses 880–915 MHz (uplink) and 925–960 MHz (downlink), adding 50 channels (channel numbers 975 to 1023 and 0) to the original GSM-900 band.

Time division multiplexing is used to allow eight full-rate or sixteen half-rate speech channels per radio frequency channel. There are eight radio timeslots (giving eight burst periods) grouped into what is called a

TDMA frame. Half rate channels use alternate frames in the same timeslot. The channel data rate for all 8 channels is 270.833 Kbit/s, and the frame duration is 4.615 ms.

The transmission power in the handset is limited to a maximum of 2 watts in GSM850/900 and 1 watt in GSM1800/1900. GSM operates in the 900MHz and 1.8GHz bands in Europe and the 1.9GHz and 850MHz bands in the US. The 850MHz band is also used for GSM and 3G in Australia, Canada and many South American countries. By having harmonized spectrum across most of the globe, GSM's international roaming capability allows users to access the same services when travelling abroad as at home.. Terrestrial GSM networks now cover more than 80% of the world's population. GSM satellite roaming has also extended service access to areas where terrestrial coverage is not available.

Mobile Telephony Standards

Table 2.1 Mobile Telephony Standards

Standard	Generation	Frequency band		Throughput	
GSM	2G	Allows transfer of voice or low-volume digital data.	9.6 kbps	9.6 kbps	
GPRS	2.5G	Allows transfer of voice or moderate-volume digital data.	21.4-171.2 kbps	48 kbps	
EDGE	2.75G	Allows simultaneous transfer of voice and digital data.	43.2-345.6 kbps	171 kbps	
UMTS	3G	Allows simultaneous transfer of voice and high-speed digital data.	0.144-2 Mbps	384 kbps	

METHODOLOGY

3. OLD APPROACH

In olden days, for temperature monitoring , gas detection, human detection, we are using individual sensors and individual equipment to complete the task. People should present in every area in which these parameters are to be monitor.

3.1.1 DISADVANTAGES

1. Lot of people should be required for monitoring of these parameters.

2. It will be difficult to monitor in coal mining areas, boilers as people cannot go to that place.

3.2 NEW APROACH

This project is aimed to design an intelligent system for Hazardous gas and human detection and temperature monitoring and controlling in coal mines by using GSM technology. This is a purely wireless project using GSM modem and totally eliminates a person who has to monitor the parameters in coal mines all the time.

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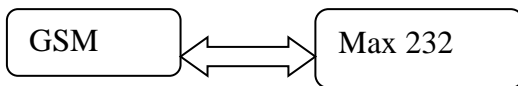
3.2.1 SYSTEM MODEL

Fig : System Model Diagram

The general view of the system can be described in the Figure 3.1

4. INTERFACEING OVERVIEW

After interfacing all the components in one circuit or at one place it looks like as below figure and in this sensors detects gases, temperature and human and it sends to microcontroller which is connected to GSM module. This sends the message to the Authorized person.

And with the help of MAX232 and RS232, Serial communication is made and the output can be viewed in the Computer through the software's. And also the output can be viewed with the help of LCD Screen.
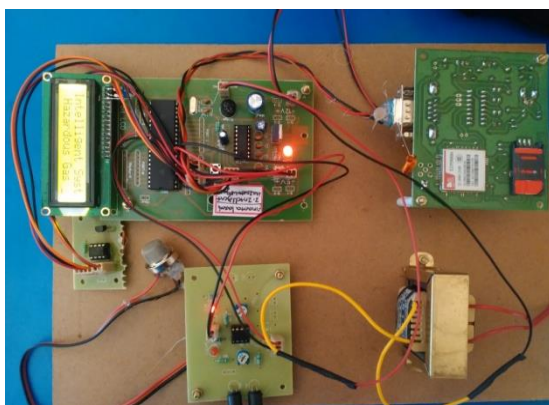

Fig 3. 2 Interfacing Overview

RESULTS&ANALYSIS

Initial:

Initially when the circuit is ON or RESET , it asks to send an SMS to the SIM in the GSM modem placed in the circuit in order to store that contact.

Registering mobile number:

After sending a message to the SIM placed in the circuit , it displays as "MOBILE NUMBER REGISTERED" and also displays the contact.

Displaying mobile number as registered

Fig :Initial stage of mobile number registering
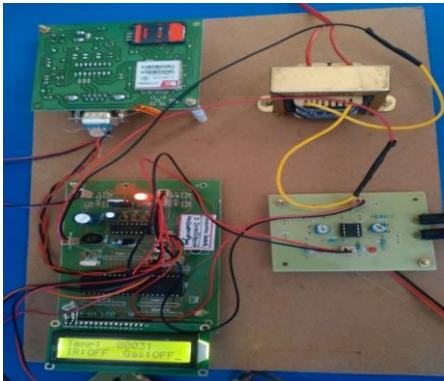
Output 1:Temperature Monitoring

Fig :Temperature detection

Output 2: Human detection

If any person enters into the harmful areas present in pharmaceutical industries, coal mines, the IR rays will break . Immediately it will sends a message to the authorized person.
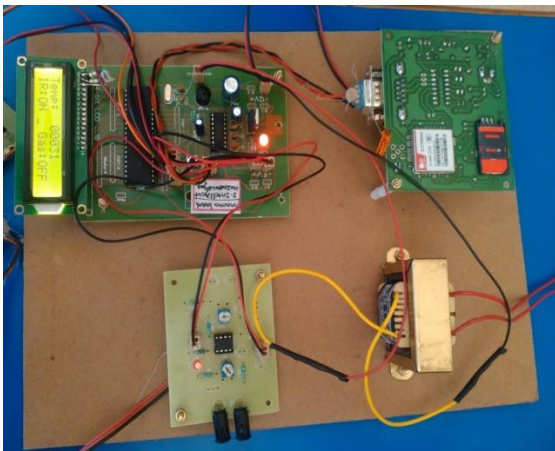

Fig : Human detection

Output 3: Gas Detection

If any hazardous gases like carbon monoxide, methane ,LPG is leaked, the gas sensor senses it and sends a message to the authorized person.
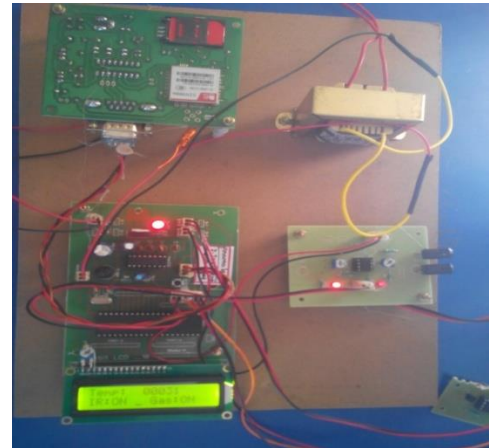

Fig : Gas detection

If there are any temperature changes in the environment, the temperature sensor senses it and it will sends a message to the authorized person.

ADVANTAGES AND APPLICATIONS

ADVANTAGES

- Low Cost
- Highly Reliability
- Ease of Maintenance
- High performance
- Efficiency is High
- consistent in Harsh Environment

APPLICATIONS

- Coal mining areas
- Pharmaceutical industries
- Chemical industries
- Petroleum companies
- Steel plants
- Steam boilers

CONCLUSION

The communication is properly done without any interference between different modules in the design. Design is done to meet all the specifications and requirements. With this project we can eliminate human

effort who has to monitor the changes in temperature, harmful effects of gases and human detection.

FUTURE SCOPE

In our present concept we are only using the GSM Technology for Gas, Temperature and Human detection . So we can extend the scope of this concept in other way for centralize data recording. For that purpose we can use the IR courting at the entry gate which is followed by the Camera which will be continuously capturing the images of the persons entering into the dangerous places. Now Gas sensors are limited to certain gases only, so we can extend to different type of gases in future.

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