

INTELLIGENT SAFETY SYSTEM FOR COAL MINERS

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Abstract

In recent days coal mining has been a very dangerous activity that can result in a number of adverse effects on the environment. For example during mining operations methane, a known greenhouse gas, may be released into the air. Underground mining hazards include suffocation, gas poisoning, roof collapse and gas explosions. Keeping all these aspects in mind there is an idea to design a system, i.e. smart helmet using wireless transceiver technology for monitoring the hazardous gases, abnormal temperature conditions and the humidity levels in the air. The improved safety features in our system dramatically increased life expectancy of the coal miners by alerting them about the hazards. If there is any hazardous situation in the mine the helmet gives the information to the mobile station through the wireless transceiver and the control station will alert the coal miner using the wireless transceiver by making the buzzer active which is positioned in the helmet so that a miner can have a chance to rescue his life from the hazards occurred in coal mines.

Keywords : ARM7, PIC Microcontroller, GSM, RFM75, Sensors

1. INTRODUCTION

Traditional coal mine safety uses cable network which is costly, time consuming and cant providing parameter details hence it is difficult to avoid hazards in mine . When any hazards takes place, cables get damaged, and couldn't provide any information . In this system, Wireless sensor network can solve the problems of communication bandwidth, mobile data transmission, working surface real-time monitoring, synchronization. Today when we use any system in any industry it is automated. Hence it is easy to use, required less man power and more accurate that is flexible, reliable. Due to this demand every field prefers automated control systems. Especially in the field of electronics automated systems are giving good performance. Accordingly, development of mine monitoring system to accurately detect temperature, pressure, flammable and poisonous gas, temperature, earthquake, moisture and water level. To improve mine safety, many systems have been designed, implemented in some countries today. One such design is for mine safety with wireless sensor network using ARM7. A system is something that maintains its existence and functions as a whole through the interaction of its parts. E.g. Body, Mankind, Access Control, etc A system is a part of the world that a person or group of persons during some time interval and for some purpose choose to regard as a whole, consisting of interrelated components, each component characterized by properties that are selected as being relevant to the purpose.

- Embedded System is a combination of hardware and software used to achieve a single specific task.
- Embedded systems are computer systems that monitor, respond to, or control an external

environment.

- Environment connected to systems through sensors, actuators and other I/O interfaces.

Table 1.1 Characteristic of Transmission Media RF Module

Characteristics	RF Module
Power Consumption	Medium
Controlled Units	1
Distance	50m
Transfer Rate	4800bps
Expansion	Low

2. Block diagram of Coal Mining Area Unit

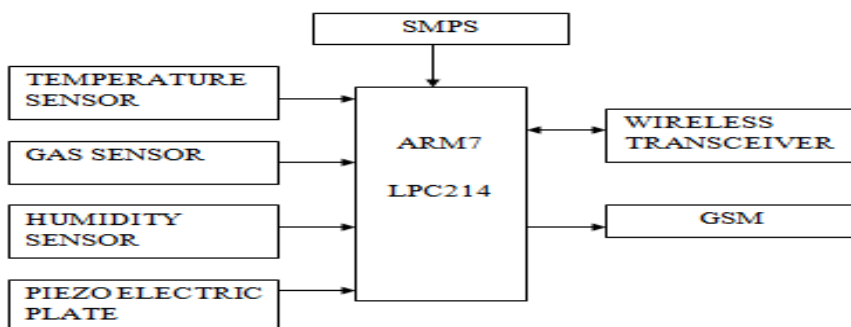


Figure 1.1 Block diagram of coal mining area unit

Under this unit the major sensors are Temperature sensor, Gas sensor, Humidity sensor and Piezoelectric plate will sense the appropriate senses and process the signals through ARM7 unit. The Wireless transceiver will send the signals to worker helmet. GSM will be send to the mobile unit.

Worker Helmet Unit

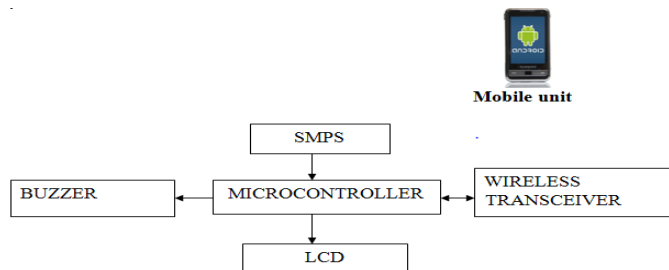


Figure 3.2 Block diagram of worker helmet unit

The Information will pass through the control station via wireless transceiver which will send the alert signal to the miners by giving a buzzer sound and displaying alert message in the LCD fixed in the helmet unit.

3. Simulation Results

A. Initial condition

At Initial condition Intelligent Safety System for Coal Miners is ready to working with multiple sensors.

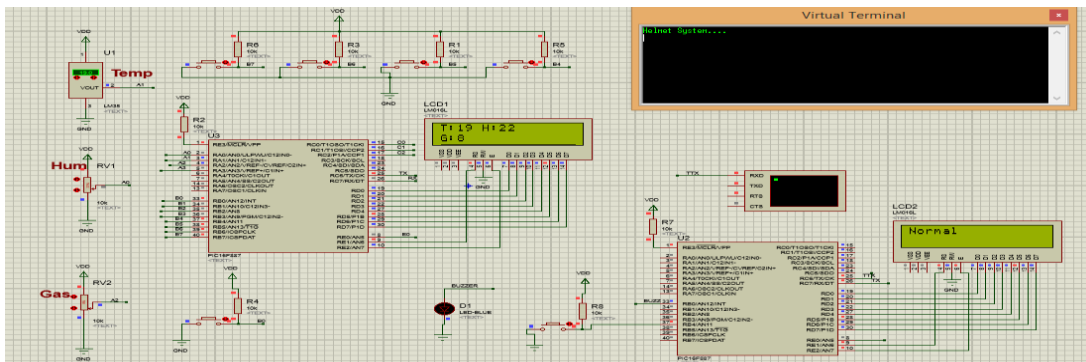


Figure 1.2 Initial condition

B. Mine worker in abnormal condition

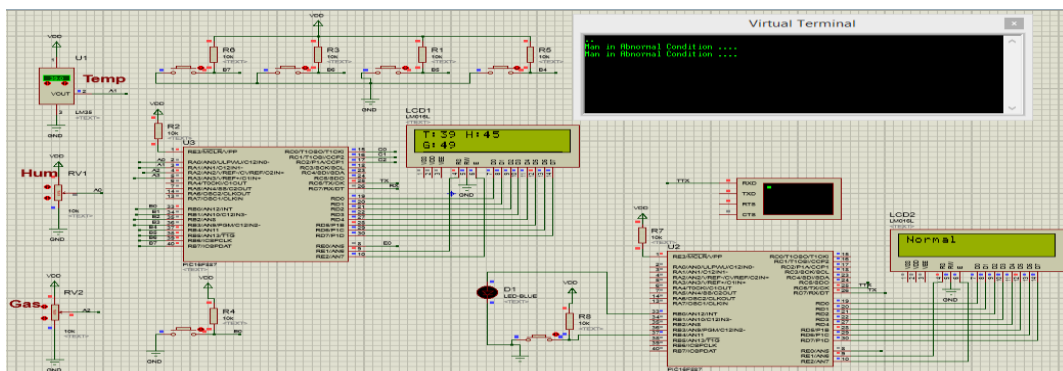
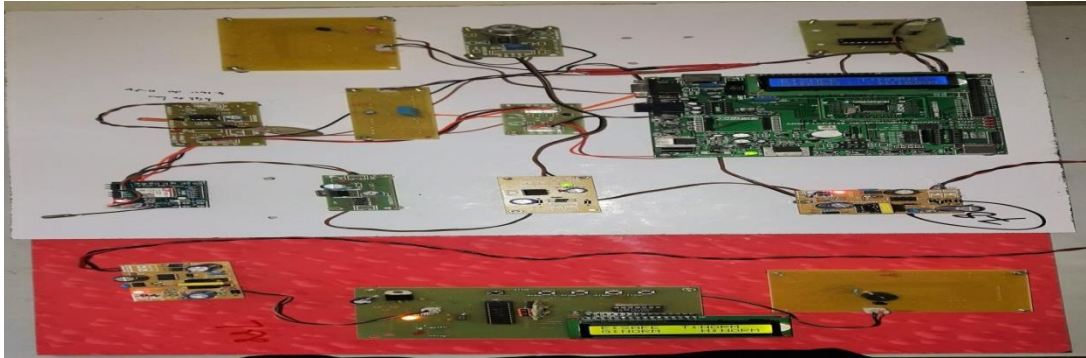


Figure 1.3 Mine worker in abnormal condition

If any personal problem occurs to the worker in the mine, if he/she presses the button in the helmet the alert signal will be sent via GSM to the mobile unit. Then rescue team will come to the mine for the rescue of the mine worker.

4. HARDWARE RESULT

At Initial condition Intelligent Safety System for Coal Miners is ready to working with multiple sensors.



CONCLUSION

The Present work, Intelligent Safety System For Coal Miners based on wireless sensor networks, and hardware and software design of wireless sensor network. this system can detect concentration of the toxic gases like, methane, carbon monoxide, Temperature, Humidity, Earthquake. Using Wireless sensor networks in coal mine improves the flexibility and avoid the accident in mines. In this application, as we are storing the values of the parameters in the PC, the stored values can be used to detect the hazards before they happen. As we are giving the information to the personnel regarding the measures to be taken in case of a hazard, it will be useful for them to save their life before any one comes and help them to come out of the mine.

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