

Real Time Monitoring of Integrated Coalmine Mash up Middleware System Using WSN

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Abstract— Now a day's safety of mine workers is a critical challenge. The health of diggers is way to some issues which should be the effect after of their work. Mining areas and surrounding places contain high temperature low humidity harmful gases and fire pulls the workers into danger of their life. This pulls a more pressure on the mining world. To protect miner workers and decrease the cost of mining along with safety of mine workers, an modern technique is developed. This system proposes a better solution with light weight, remote monitoring and alarming of underground mine workers. The hardware of the system contains sensor mote fitted in helmet of mine workers. It measures the parameters like temperature, humidity of area, fire accident and hazardous gases. The entire equipment organized by Arduino micro controller and these parameters to remote area with the help of Zigbee technology. In the receiver section all these status monitor on PC and send the safety indications to mine workers for alert when change the abnormal conditions. For the change of different parameters the different alerts send from main center. Then the mine worker alert and we can save his life. This system gives early admonitions which will be the useful to workers present inside the coal mine to spare their life before any loss happens.

Keywords: Arduino, Zigbee, gas sensor, fire sensor, DHT sensor, alarm and LCD display.

1. INTRODUCTION

Now a day's safety of workers is a major issue in any industry. The underground mining operation may be proving more risky in nature as far as the safety and health of the workers are concerned. The health of mine workers is way to some issues which should be effect after of their work. Mining areas and surrounding places contain high temperature low humidity hazardous gases and fire pull workers into danger of their life. This pulls workers into a lot of pressure. These dangers are because of various systems utilized for removing distinctive minerals. The deeper in mine, much more risk. These safety issues are of grave concern particularly if there should be an occurrence of coal industries. In this way, security of miners ought to dependably be of significant thought in any type of mining, regardless of whether it is coal or some other minerals. Present day mines regularly execute a few security systems, instruction and preparing for specialists, mine workers and

security measures, which prompt considerable changes and enhance ments. Coal has been one of major resource of energy in India. 70% of power generation made from it. Thus the coal plays as an important role within energy sector.

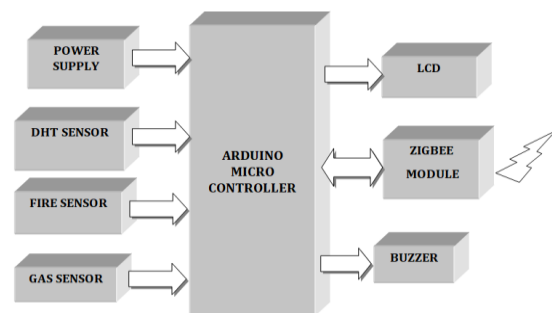
In mining section, air ventilate frameworks are fundamental to supply tasteful oxygen, keeping up non-perilous and non-lethal conditions and a practical working mine. In any case, the creation carries with it interchange symptoms, which push into potential threat to the earth and the average citizens related with it. In this present work is a genuine true endeavor in looking at the graveness and arranging an observing of identification by using the assistance of ZigBee.

2. SYSTEM DESIGN

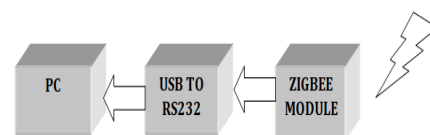
The modern middle ware coal mine security framework assume a primary job in coal mine industry. The ongoing sensor values measured remotely by using Zigbee and Ardriuno micro controller which is observe and give indication to the underground climate condition. The block diagram of the framework has been shown below.

i) Block Diagram:

Under Ground Miner Section:



Ground Control Centre:



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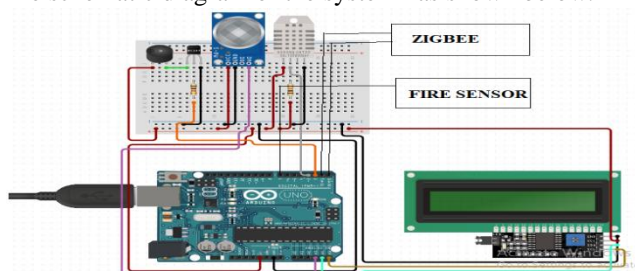
ii) Operation:

The hardware circuit that will be settled to helmet of the diggers. This may be preferably fitted with the prosperity defensive top of the masters and this involving a couple of sensors those measures progressing underground parameters like temperature, clamminess, and fire and gas obsession. Gas obsession suggests hazardous gases like methane and carbon-monoxide. It has been exhibited that our lightweight mixture middleware can decrease the costs productively to make coal mine safety checking and control computerization applications.

An ARDUINO microcontroller is to be utilized with the sensors to get the sensor information and to take the decision. At the point when temperature is more than the predefined level at microcontroller, microcontroller translates safety cautions through the headset speaker associated with controller. All the sensors status are shown in the LCD at workers helmet. In such cases, this will make an impression on the ground control terminal through Zigbee. In control station the data is gotten by Zigbee handset and the status of the sensors is checked in the PC. Depends up on the sensor status the individual at control unit can send diverse sound signs to the excavator. Then the mine worker alert and we can save his life.

iii) Circuit Diagram:

The schematic diagram of the system has shown below.



3. HARDWARE DESCRIPTION

This system needs some sensors for monitoring the mine conditions, micro controller for organizing all the hard ware and wireless sensor network for data transfer. This section explains the hardware required for this project.

i) Arduino Micro Controller:

Arduino is an open source, simple to utilize equipment and programming. It ia an IDE and utilized readymade programming called Arduino IDE which is utilized for compose up,debug and transfer the PC program into physical board.

Features:

- Micro controller: Atmega 328
- Operating voltage 5V
- Input voltage prescribed up to 7-12v
- Input voltage limits 6-20v
- Digital I/O pins: 14
- Analog input pins: 6
- SRAM: 2KB
- EEPROM: 1KB
- Clock speed: 16Mhz
- Serial port: 1
- It has USB association and Power jack.

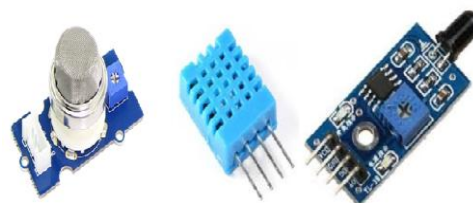
ii) ZigBee:

ZigBee is a remote advancement made by Zigbee Alliance as an open overall standard to address the unique needs of simplicity, low-control, remote sensor frameworks .The standard takes full good position of the IEEE 802.15.4 physical radio specific and works in unlicensed gatherings worldwide at the going with frequencies: 2.400– 2.484 GHz, 902-928 MHz and 868.0– 868.6 MHz .It can send data up to 30m and it has low power use (1mW for transmitting data). Zigbee works in 2.4 GHz repeat and offers three techniques for errand; Besides, it can recognize the source address of each group and thirdly, it will get invigorate on the transmission status whether it is viable or missed the mark.

iii) Sensors:

Sensor is an electronic device which converts physical quantity in nature converts into digital. In nature sensors are classified into 2 types. Those categorized to analog and digital. In this fire and gas sensors are digital sensors. The DHT sensor as analog sensor.

- **DHT11 sensor** – it is a low cost sensor for measuring both temperature and humidity of place. It require 3-5v power and measures good 20-80 % of humidity with 5 % accuracy. It also measures 0- 50°C temperature with ±2°C accuracy.
- **Fire sensor** – basically infrared receiver is used to detect the fire accidents. It is also require 5v power supply.
- **Gas sensor** - MQ-5 is for the most part utilized for gas spillage recognition in industry and home. It is likewise appropriate for H2, LPG, CH4, CO and Alcohol. It has high affectability and quick reaction. The affectability changed by potentiometer.



iv) Buzzer:

Buzzer is a device which generates beep sound. It requires 5v DC and also interfaced with a BC547 transistor for amplifying the low current into sufficient amplification. The device which is used in this project for alerting the mine worker.

v) LCD:

Liquid Crystal Display another way it is called as LCD is used for display the all alphabets, Greek letters, special characters and mathematical symbols. The mostly used character based LCD displays are developed by Hitachi’s with HD44780 controller. The available LCD’s in market are 1 line, 2line and 4 lines.



4. RESULTS



This paper builds up a security framework for underground diggers and open cast mines utilizing remote sensor arrange and microcontroller. The ongoing observing of parameters inside the mining are screen on PC. These status sent remotely, refreshed any second and put away in PC.

5. CONCLUSION

The paper builds a middle ware of protection with remote observations and gives audio alerts. This system observes the parameters like hazardous gases, humidity, and temperature and fire condition present in underground mining section. This system displays all these parameter in LCD at the underground area where sensor unit introduced. It will be helpful to every one of excavators present inside mine unit spare their life before any loss happens. This framework likewise records every one of the information in hyper terminal in the PC for further review. This is a light weight with low cost smart and lifelong system.

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