Intelligent Support System for Underground Workers

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ABSTRACT: A smart system with intelligent support to give alert to the underground workers. The underground workers could not get any information regarding the environment condition within the region they are working , we have proposed a system where the underground workers get the information regarding the environment condition. This includes a sensing network which is used to detect the environment condition and transmit the data to the workers and data monitoring unit. For information transferring we have used xbee module. Arduino is the principle processing unit .The sensing network are gas sensor, temperature sensor, smoke sensor, fire sensor. This system monitors the dangerous environment condition and simultaneously alert the workers and the monitoring unit.

KEYWORDS: underground workers, environment condition, sensing network, xbee module

I.INTRODUCTION

The underground workers have many difficulties in their working field. The average underground workers are exposed to the harsh underground environment which can incur an injury or loss of life. A portion of these injuries or loss of human life can be attributed to human error. However, there are circumstances that are caused due to the ambient conditions underground which can be blamed for these accidents. These conditions are difficult to monitor without placing someone's life at risk. The older methods of underground condition monitoring involved using a person to go down and report back. Our system monitors the environment condition using wireless sensing network and transmits the data using xbee module and alerts workers using voice without using any human help.

II. KEY FEATURES OF THE SYSTEM

The main key features of proposed intelligent security system monitors the environment hazardous condition such as is temperature ,gas, fire, smoke and detect the vibrations in the underground using wireless sensor network. We tranmsit the information using xbee . Xbee communication is an enhanced wireless system. The main processing unit is Arduino. We have placed limit switch to check whether the worker is wearing the helmet or not.Our system consists of three units namely field unit, workers unit, data monitoring unit.The main advantage of our project is to pass the information simultaneously to the data monitoring unit and workers unit and the alert is also made from the two units. Ultimately which increases the safety of the underground workers.

III.SYSTEM SETUP

The system requires Arduino, gas sensor, fire sensor, temperature sensor, MEMS, smoke sensor and Xbee module. These sensing network senses the dangerous environment condition and these information is processed in the Arduino and information is passed using Xbee module in the field unit. The information is received in the field unit using Xbee and processed using Arduino and the alert is made using voice. The information detected in the field unit is received in

data monitoring unit using Xbee and the defetcs are displayed in the LCD and an alert is also made from here using voice.Inaddition to these we have placed limit switch in the workers unit to check whether the worker is wearing the helmet or not. If the worker is not wearing an alert is made using voice.

A. BLOCK DIAGRAM

The block diagram consists of three units namely

1. Field Unit
2. Workers Unit
3. Data Monitoring Unit

1) FIELD UNIT

The field unit consists of wireless sensing network such as gas, temperature, smoke and vibration. If any fault is defected the information is processed using Arduino and it is transmitted using x bee.
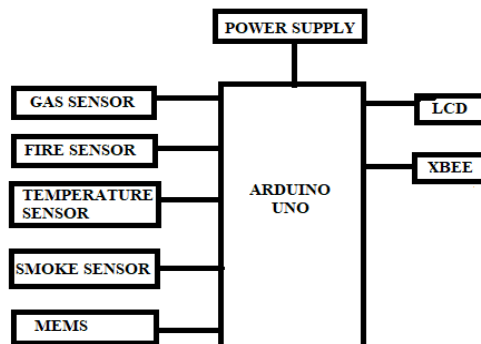

Fig 1 Field Unit Block Diagram

2) WORKERS UNIT

The workers unit is nothing but the alerting unit. The information passed from the field unit is received using x bee and processed in Arduino and the alert is made using voice.
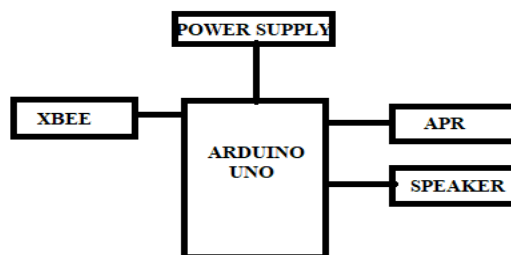

Fig 2 Workers Unit Block Diagram

3) DATA MONITORING UNIT

The information passed from the field unit is also transmitted to the data monitoring unit and the alert is also given to the workers using voice alert. In addition to these we have used limit switch which checks for helmet if not a voice alert is made.
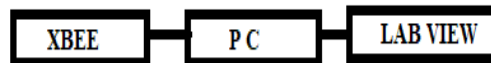

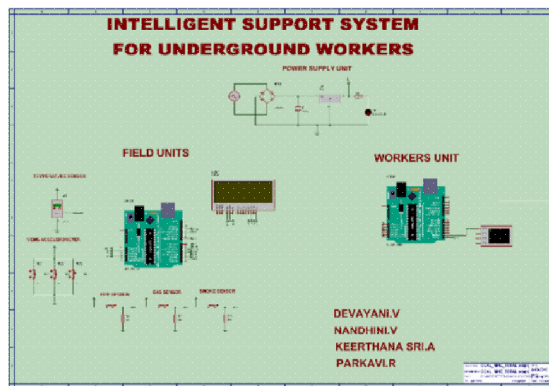Fig 3 Data Monitoring Unit Block Diagram

B. CIRCUIT DIAGRAM

Fig 4 Circuit Diagram

V.MODULES WITH WORKING PRINCIPLES

A.TEMPERATURE SENSOR

The frequently measured environmental quantity is temperature.The temperature affects physical, chemical, electronic, mechanical, and biological systems. Certain chemical effects, biological processes, and even electronic circuits executes best in limited temperature range. The LM35 is commonly used temperature sensor that can be used to measure temperature with an electrical output comparative to the temperature .(in °C).

B.GAS DETECTORS

Gas detectors measure concentration of certain gases in air via different technologies. To prevent toxic fire, gas detectors are often battery operated devices used for safety purposes. The units fabricated to detect gas, modern multifunctional or multi-gas devices are capable of detecting several gases at once. When the sensors response surpasses a certain pre-set level, an alarm will activate to warn the user.

C.MEMS

Micro Electro Mechanical Systems (MEMS) are small integrated devices or systems that combine electrical and mechanical components. They range in size from the sub micrometer level to the millimeter level and there can be any

number, from a few to millions, in a particular system. Applications include inkjet-printer cartridges, accelerometer, miniature robots, microengines, locks inertial sensors microtransmissions, micromirrors micro actuator

D.APR33A(AUDIOOLAY BACK RECORDER)

The high performance audio analog-to-digital converters (ADCs) and digital-to-analog converters (DACs). They have offering high performance and unparalleled integration with analog input, digital processing and analog output functionality. The functionality required to perform demanding audio/voice applications. The audio or voice systems with lower bill-of-material costs can be implemented with the APR33A series because of its integrated analog data converters and full suite of qualityenhancing features .

E.ARDUINO

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet).The FTDI USB-to-serial driver chip. The features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter. In shields will be compatible both with the board that use the AVR, which operate with 5V and with the Arduino Due that operate with 3.3V.

F.LCD

LCD can be fully controlled with only 6 digital lines (Any analog/digital pins can be used). The Data pin8 (DB7) of the LCD is busy flag and is read when R/W = 1 & RS = 0. Since it is busy with the internal operations. By before passing any data to LCD, its command register should be read and busy flag should be checked The LCD, data is first written to the data pins (to select the data register). The high to low pulse is given at EN pin when data is sent.

G. X BEE

The Xbee has Multiple channel selection enabling up to 255 different pairs to work in the same area Modes of operation: Configuration mode and Run mode. It has low-cost, low-power wireless sensor networks. They require minimal power and provide reliable delivery of data between devices. Xbee modules operate within the ISM 2.4 GHz frequency band and are pin-for-pin compatible with each other.

VI. RESULT AND CONCLUSION
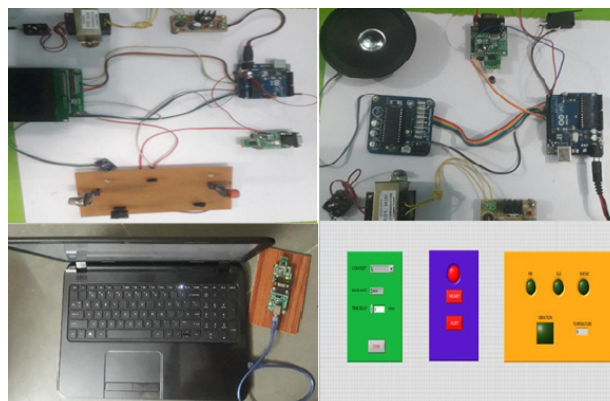
The intelligent support system for underground workers is implemented successfully . This system can be implemented in any underground working area such as subway, well digging and drainage system by adding or deleting

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any of the component.This system can measure ambient characteristics inside the mine environment and communicate them between two nodes using the XBee communication protocol. This methodology can be further improved by using the FPGA controller for transmitting data and further work can be done in increasing the intensity of light used in the helmet of underground workers.

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