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Coal Mine Safety Monitoring And Alerting System With Smart Helmet

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Abstract: Traditional monitoring systems in coal mines are difficult to install, hazardous, and difficult to power. Because of the complexity of the mining environment and the wide range of operations performed in coal mines, it is vital to monitor and maintain the parameters in the background to increase the efficiency and safety of mineworkers. As a result, traditional monitoring methods cannot be relied on to ensure coal workers' safety. This research represents a ZigBee-based wireless monitoring system using a smart helmet. The presented wireless monitoring system is capable of detecting and transmitting critical parameters in coal mines such as methane gas, high temperature, humidity, and fire. In an emergency, this monitoring system transmits distress signals. A buzzer will sound if emergency conditions are detected, and the monitored variables will be displayed on the user interface machine.

Keywords: Coal mine Safety, Monitoring system, IoT, ZigBee, Smart helmet.

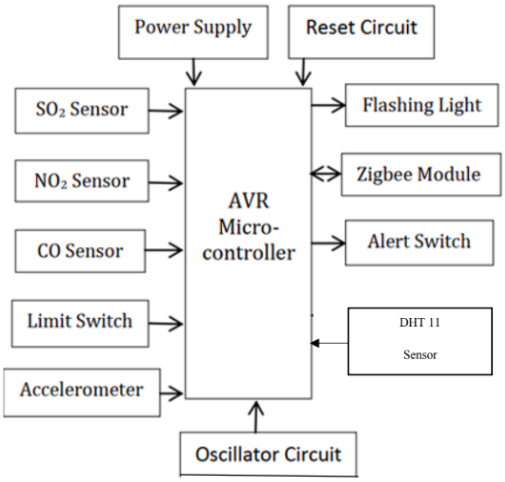
I.INTRODUCTION

In this project to develop a smart helmet for monitor the concentration level of harmful gases and hazardous event of coal mines and transmit the data to the base station using Zigbee. To monitor the concentration level of harmful gases present in coal mine like SO2, NO2, CO etc. the semiconductor gas sensor are used. We are also considering the health condition of person using fall detector accelerometer. The removal of miner helmet is also a important factor under consideration. The limit switch is used to detect the miner's wear the helmet or not. All data is transmitted from helmet to base station using Zigbee. The data at receiver side is transmitted on the web using GSM.

II.LITERATURE SURVEY

[1] Yongping Wu and Guo Feng implement coal mine monitoring using the Bluetooth wireless transmission system.
[2] Jing jiang Song, Yingli Zhu proposed automatic monitoring system for coal mine safety based on wireless sensor network.
[3] Kumar "Design and Implementation of Portable health monitoring system using PSOC mixed signal Array chip". International Journal of Recent Technology and Engineering (IJRTE), ISSN, 22773878, 2012 .

III. METHODOLOGY



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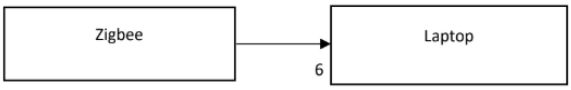


Fig.1. Block Diagram

The main controller in both the modules is an Arduino board. The transmitter module is installed inside the coal mine. The transmitter module contains the smoke sensor, temperature sensor and methane sensor. The transmitter module also has an LCD, all the sensor data is displayed on the LCD screen by the Arduino controller. The RF transmitter present on the transmitter module sends the sensor data to the receiver module.

IV. HARDWARE AND SOFTWARE DESCRIPTION

Hardware Requirements

Arduino Uno is the central component, and it sends the information on the internet via the Zigbee module. DC power supply is used for supplying voltage to the circuit. This is the circuit diagram for the smart helmet's monitoring and alerting system. This system will be built using Arduino, ZigBee modules, and sensors such as the DTH11 humidity sensor and the IR flame sensor, among others. The sensors we'll use will detect changes in the coal miner's environment, and variables like temperature, gas concentration, and fire detection will be continuously monitored. It will also have an extension that will connect to an LCD display, which will be placed at the entrance to the coal minefield. Also, the data which will be recorded by sensors will be transmitted via the Zigbee module to the control room so that proper actions can be taken effectively in minimum time.

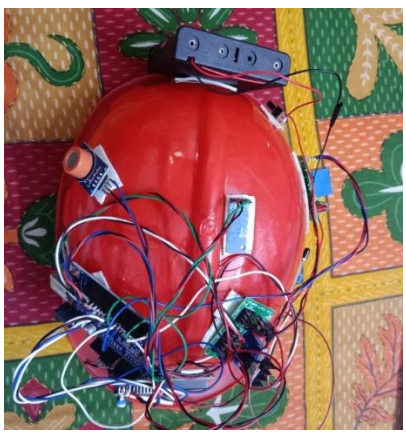
Software Requirements

A push-button, a buzzer, and a ZigBee transmitter will be included in another safety device, the smart helmet. If any worker becomes uneasy or requires medical attention at any time, that worker can use the push button to activate the buzzer and send an emergency message to the control room via ZigBee.

Zigbee is also used by vendors that provide connected lighting products for homes and businesses. With Zigbee-based smart home products, consumers can control LED figures, lightbulbs, remotes and switches in home and remotely to improve energy management. Utility companies can use Zigbee in their smart meters to monitor, control, inform, and automate the delivery and use of energy and water. Smart meters give the consumers the information – and automation needed to reduce energy use and save money.

V. RESULTS

IoT concepts and sensors are used to create a small, effective, and cost-efficient prototype. The temperature was successfully measured using LM35 sensors during the testing phase, and the output was satisfactory. The DTH11 sensor was also used to monitor humidity accurately. The MQ2 gas sensor detected gas concentrations in the area and successfully displayed a warning message on the screen. The IR flame sensor also detected fire and displayed an alert message informing the user of its presence. For wireless communication, the Zigbee Protocol was developed and tested in various locations and distances.



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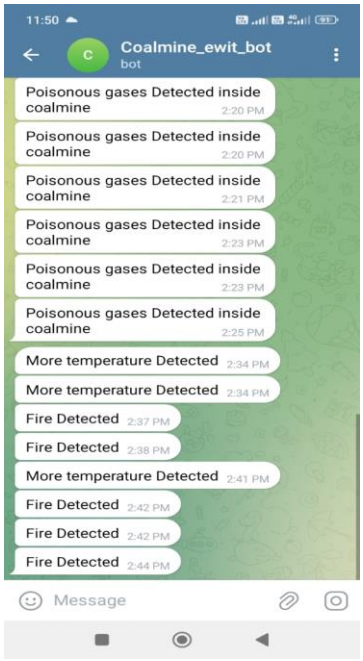

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