IOT Mining Tracking and Worker Safety Helmet

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Abstract: This project addresses a cost-effective, flexible solution of underground mine workers' safety. A module of MEMS and temperature-based sensors are used for underground environment monitoring and automating progression of measurement data through IOT communication technique is proposed with high accuracy, smooth control and reliability. Arduino microcontroller is used for collecting data and making decision, based on which the mine worker is informed through server. Sensor data transforms into digital signal and effectively communicate wirelessly with the ground control centre computer

Keywords: Temperature Sensor, Micro Controller, IoT.

I.   INTRODUCTION

Safety of workers should always be of major consideration in any form of mining. Underground mining operations proves to be a risky venture as far as the safety and health of workers are concerned. These risks are due to different techniques used for extracting different minerals. The deeper the mine, the greater is the risk. These safety issues are of grave concern especially in case of coal industries. Thus, safety of workers should always be of major consideration in any form of mining, whether it is coal or any other minerals. Underground coal mining involves a higher risk than open pit mining due to the problems of ventilation and potential for collapse. However, the utilization of heavy machinery and the methods performed during excavations result into safety risks in all types of mining. Modern mines often implement several safety procedures, education and training of workers, health and safety standards, which lead to substantial changes and improvements in opencast and underground mining. Coal has always been the primary resource of energy in India, which has significantly contributed to the rapid industrial development of the country.

II.   PROPOSED SYSTEM

Modern mines often implement several safety procedures, education and training for workers, health and safety standards, which lead to substantial changes and improvements and safety level both in opencast and underground mining. Mine ventilation system can help in eliminating high risk atmosphere. Primitive techniques to monitor the mining atmosphere can be traced back to the use of canaries and other animals to alert miners, when the atmosphere becomes toxic. Integrating ventilation monitoring system enables mine to intelligently make ventilation changes based on the extensive data, the monitoring system provides.
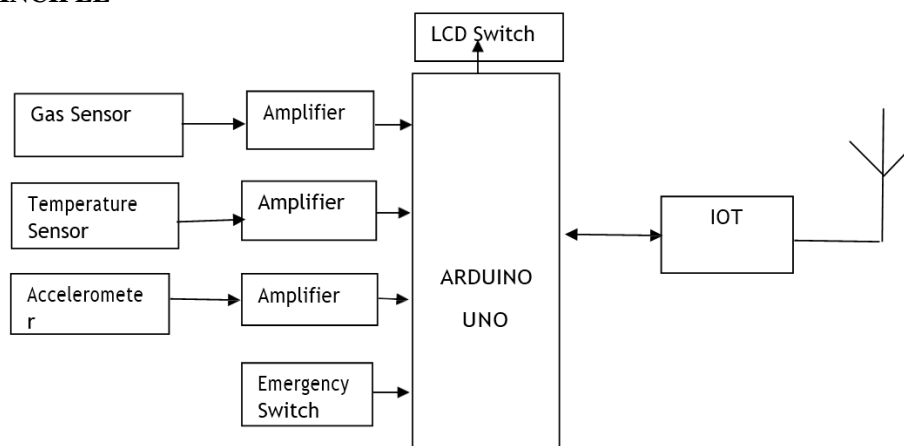
WORKING PRINCIPLE

Fig. 1 Proposed System

In this project, we have gas sensor and temperature sensor. When the temperature is high, the sensor send immediate notification to the main communication area. This work has to be by the Internet Of Things. Similarly the temperature has to notify the changes in the temperature and it will send alert messages to the user.

III.   MATERIALS AND METHODS

Materials used in this project are Arduino UNO, Gas sensor, Temperature sensor, Accelerometer, IOT, LCD display.

ARDUINO UNO MICROCONTROLLER

It has 14 digital input/output pins. The Arduino Uno R3 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

Fig.1 Arduino UNO

GAS SENSOR

Electrochemical gas sensors are gas detectors that measure the concentration of a target gas by oxidizing or reducing the target gas at an electrode and measuring the resulting current.
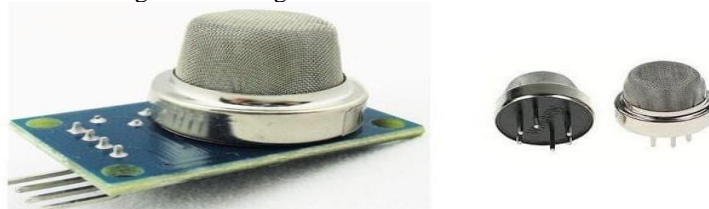

Fig. 3 Gas Sensor

TEMPERATURE SENSOR

A thermistor is a type of resistor whose resistance varies with temperature. The word is a portmanteau of *thermal* and *resistor*. Thermistors are widely used as inrush current limiters, temperature sensors, self-resetting overcurrent protectors, and self-regulating heating elements.

Fig.4 Thermistor Symbol

ACCELEROMETER

An **accelerometer** is a device that measures proper acceleration, the acceleration experienced relative to freefall. Single- and multi-axis models are available to detect magnitude and direction of the acceleration as a vector quantity, and can be used to sense orientation, acceleration, vibration shock, and falling.
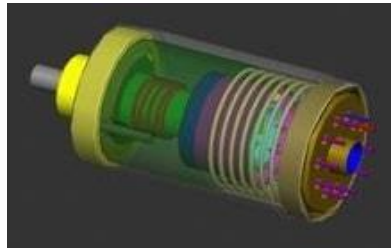
Fig. 5 Accelerometer

LCD DISPLAY

A **liquid crystal display** (**LCD**) is a thin, flat electronic visual display that uses the light modulating properties of liquid crystals (LCs). LCs do not emit light directly.

Fig. 6 LCD Display

IOT MODULE

An **IOT MODULE** is a small electronic device embedded in objects, machines, and things connected to wireless networks and sends and receives data..
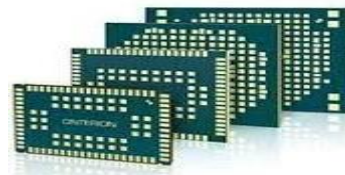

Fig. 7 IOT module

IV. RESULT AND DISCUSSION

The kit equipped with Arduino is placed inside the helmet of the worker who is inside the mine. When the temperature or gas reach out its levels, the sensors will send an alert message to the main users by using IOT and the readings are displayed through LCD Display. It will be easy to take precautions before the incident.
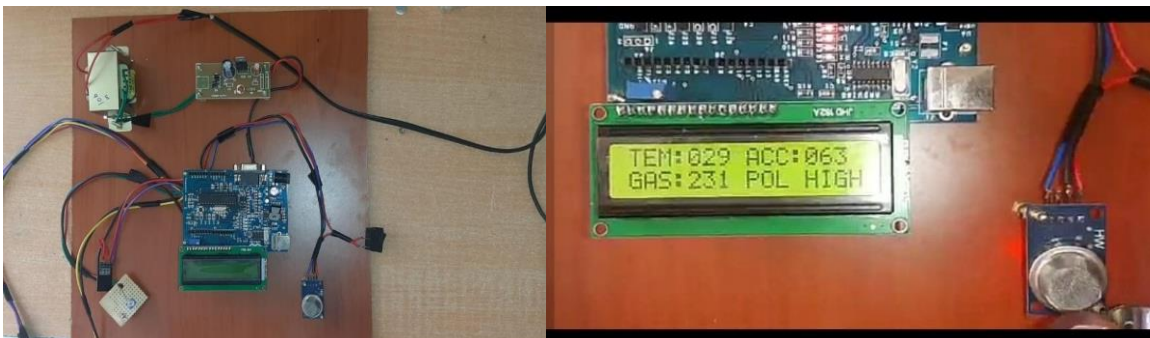

Fig. 8 Result

V. CONCLUSION

A real time monitoring system is developed to provide clearer and more point to point perspective of the underground mine system and also provide reliable communication using IOT between mine workers. In this way it will be helpful to all miners present inside the mine to save their life before any casualty occurs.

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