

Smart Helmet For Coal Miners

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Abstract— A sensor node is developed for sensing different environmental parameters of underground mine. The sensor node has feature of wireless communication using Bluetooth transceiver. Thus, sensor node can be deployed in different part of mine using efficient topologies. All sensed data is digitized by ARM7 which gives low power platform with fast execution. The system prototype developed has many advantages that makes it convenient to work in insensitive environment of underground mine, monitoring attention of deadly gases in its atmosphere along with temperature and humidity. Live communication used for emergency.

I. INTRODUCTION

Economy majority depends on country's natural resources which mainly include agriculture, forestry, fisheries and extraction of minerals through mining, in this paper we are concentrating mainly on underground coalmines and how the toxic gases can be monitored in order to control the mining operations keeping safety of workers. Underground mine environment is very complex and has more stringent requirement. It is seen that, the various environmental parameter of mine, such as methane, carbon monoxide, other toxic gases, temperature, oxygen, etc are not monitored. In coal mines, the major discharge is of methane. The methane released during and after mining operation is called coalmine methane (CMM).the concentration of methane if passed through a certain range with oxygen, it can be ignited easily with the presence of an ignition source which creates a violent methane explosion that may propagate in the presence of combustible coal dust. Hence, environment surrounding mine worker should be continuously monitoring. If the conditions become adverse for working, mine worker be alerted to go away the place.

II. BLOCK DIAGRAM

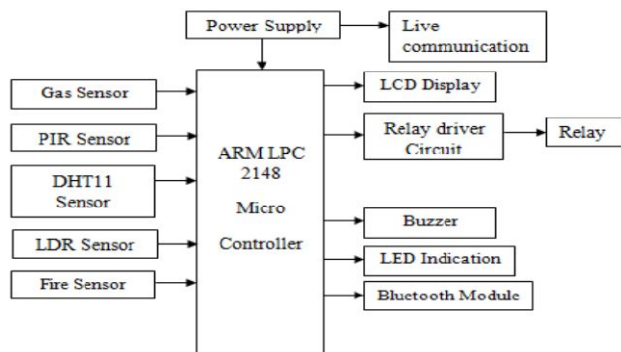


Fig.1 Smart Helmet for Coal Miners

A. DHT11 sensor



Fig. 2 DHT11 sensor

Humidity Sensor checks humidity in air. The amount of water presented in the air nothing but humidity. Its operating range is 0 to 60 degree. This sensor gives approximation. Humidity measurement accuracy $\pm 3.0\%$ RH. Temperature sensor checks the temperature variation in the coal mines and if a sudden change occurs in hazardous condition it gives the approximation about temperature. The normal temperature range of underground coal mine is 50 to 60 degree Celsius, and at the explosion area it is above 70 degree Celsius.

B. Gas Sensor

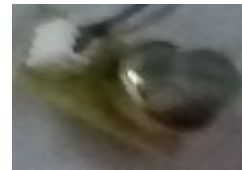


Fig. 3 Gas sensor

Gas sensor is essential to used, because it plays an important role in mining sector. By sensing various gases i.e. hydrogen sulphide, methane etc. and shows approximate percentage of that gases. The sensor's conductivity is higher along with the gas concentration rising. Gas sensor it senses the gases which is harmful for the person who are working in mining.

C. PIR sensor



Fig. 4 PIR sensor

A passive infrared sensor is an electronic sensor that measures infrared light radiating from objects in its field of view. They are most often used in PIR based motion

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detection PIR sensor is used if any accident happened then to detect persons in mine.

D. Fire sensor



Fig. 5 fire sensor

It plays an important role in mining sector by sensing fire in mine. It designs to detect and respond to the presence of fire. It interfaces with ARM7.

E. LDR sensor

When person inter in mine if there darkness then to ON/OFF the light

F. LCD Display

16 * 2 LCD interfacing with ARM microcontroller is very simple task. It is used to display status of sensors.

G. Bluetooth Module



Fig. 5 Bluetooth Module

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband.

H. Buzzer



Fig. 6 Buzzer

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers.

I. ARM 7

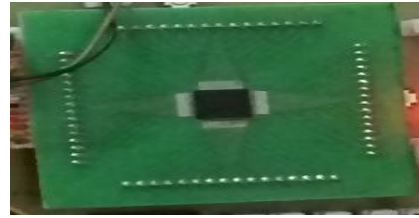


Fig. 7 ARM7 Controller

Sensor network is used to monitor the environment parameter of undergo mine area and send all data to ARM7 processor. ARM7 processor used to build a fully automated system with reliability, high accuracy and smooth control.

J. Live communication

By using inductor and capacitor generate free band frequency between 88MHz to 105MHz. When other system are break then , in the emergency workers contact with center office with the help of microphone which work within the above mentioned range

III. CONCLUSION

The main application these project safeties of the main application this project is safety of person who work in coal mine. We can give assurance about the safety of person who is working in coal mine. In future this person who work in coal mine can easily identify the various gases, temp. Or about sudden short coming natural accidents which happens generally in coal mine. So we overcome this using "Smart helmet for coal miners". This is not only for coal miners; in future we can use this overcoat where ever the underground works are done by workers.

IV. REFERENCE

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