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# A Smart and Secured Helmet for Coal Mining Workers

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**Abstract:** Industry should have safety for coal mine industry. Underground mining risk include suffocation, gas poisoning, object fall, and gas explosion, so air quality and dangerous event detection is very important in mining industry. Base station observe the underground mining by wireless network of real time situation. It provides real time monitoring of harmful gases like CO(carbon dioxide), METHANE, BUTANE, LPG and SMOKE and also DHT11 (humidity and temperature). The reason behind death of miner is due to improper treatment is provided them. By any reason if any person is fall down the emergency alert will beep. For this reason worker should wear helmet, many workers are not aware of it. The transmission of data in coal mine we will use zigbee technology. Mining system is based on capable wireless network. Smart helmet is developed for reducing difficulties in coal mining area in observation of real time monitoring of harmful gases. All these harmful gases are detected by gas sensor, humidity temperature sensor, and cross checked by some limits. Then the device will alert the buzzer will be beep and LCD will show the result. Microcontroller has transmitter and receiver that continue transmits the various value.

**Keywords:** Smart Helmet, Coal mines, DHT11, MQ5 and MQ2, Zigbee

## I. INTRODUCTION

Safety is a most important part of any type of industry. The first aim is safety and security in mining industry. Some basic safety is taken for dangerous condition in mining industry. Communication is most necessary key factor in today's life to observe different arguments like gas, collision using sensor such as humidity temperature and MQ5 and MQ2 to take aspects action state by to avoid dangerous condition of any type and gives alert using buzzer. To execute safety in underground mine comfortable communication system should be created in between workers. Wired communication network system is not that capable. For wired communication network installation cost of maintenance and high cost for uncomfortable situation of miners. Wireless network is cost capable and comes with early warning security. In coal mine equipment should be use for personal safety like helmet and shoes etc. The worker should wear a protective equipment is very important element. Mines are dark underground if any miner falls unknowing the supervisors will be not aware of health condition. The capable solution for communication is by using ZigBee wireless network to the underground mine. ZigBee technology provides mesh topology for long distance communication wireless network

## II. LITERATURE SURVEY

Coal mine provide essential energy for supporting high speed development for society. Multiple studies have been carried out by research to improve safety performance. The research topic mainly focus on risk management, monitoring and controlling technologies[1]: Hazard evaluation for computer control mine monitoring/control system[2]: A methodology for identifying safety in underground monitoring and control equipment. As a result of the developing methodology a set of design guideline has been developed to ensure that known system design difficulties can be identified from the outset for designers of new mine monitoring/control system[3]: Zigbee played necessary role in wireless application. In most of the industry it is observed that there is an increasing demand of zigbee based on wireless application[4]: We have analyzed the wireless patient health monitoring system of heart beat sensor was measured with the help of photodiode and bright LED[5]: In this paper we learn about a temperature sensor was successfully constructed using polymer – derived SiAlCN ceramics and an embedded system. Most importantly, the low cost small size of the sensor[6].

### A. Objective

The most important part of any type of industry is safety. In the mining industry safety and security is a first motive of all. Some basic precaution are taken by industry mining for unacceptable condition. Communication is the most important key factor today, to monitor different parameters such as collision, gas continuously using sensors such as gas sensor, MQ5 and MQ2, Humidity sensor, Temperature sensor. To take fundamental actions based to avoid any types of dangerous conditions and gives an alert using buzzer.

**B. Scope of Project**

In future, with the help of Zigbee module, we are able to avoid railways accidents, road accidents, submarine accidents. Motion sensor can be implemented in future.

**C. System Implementation**

The security intelligent system consists of a helmet which is situated with the sensor circuits on the helmet. The control section has a microcontroller which receives input from various sections like gas sensor, temperature sensor, and humidity sensor and in some case when dangerous event occur then helmet transfer alert in the coal mine to identify the location of miner. The temperature sensor, humidity sensor and gas sensors will sense the corresponding parameters. The helmet section consists of temperature sensor, humidity sensor gas sensors MQ-2 is the gas sensor which is able to detect the level of CO, LPG gases. The MQ-7 is the gas sensor which able to detect the level of methane. To avoid any types of hazardous conditions the buzzer alert the coal mine worker using buzzer. PCB (Printed Circuit Board) will be used to place all the sensors and microcontroller, LCD, Lipo Battery ,Zigbee, Buzzer. This project consist of control station which will observe and evaluate ,calculate the miners no. of heart beats per second , and it will detect the miners situation whether he is in good condition or not. The sensors have some percentage according to that it will detect the harmful gases and temperature and this data will get carry forward to the control station. Our project consist of two call buttons for transmitting data and receiving data and the information goes to the microcontroller. The station controller will send data to miners that the area is surrounded with harmful gases and the buzzer will beep.

**D. System Requirement**

1) **Hardware Requirement:** Microcontroller PIC18F2520:- It is a small computer, integrated circuit chip. In this Operating Frequency of PIC18F2520.



a) **Sensor**

i) **MQ5:** Gas Sensor is useful for gas detection .It is suitable for detecting LPG, ALCOHOL.



ii) **MQ2:** Gas Sensor (MQ2) module is useful for gas detection (in home and industry). It is suitable for detecting LPG, Hydrogen.



b) **DHT11 (Temperature and humidity sensor):** The temperature and humidity sensor is DHT11. It is simple to use, but requires careful timing to grab data.



c) **Heartbeat Sensor:** It is an electronic device that is used to measure the heart rate i.e. speed of the heartbeat.



d) **LCD:** An LCD is an electronic display which uses liquid crystal to produce a visible image. The basic component of LCD display is 16x2.



e) *Lipobattery*: Lithium polymer battery. It is rechargeable battery which is lipobattery.



f) *Zigbee*: It is high-level power digital radios, such as for home automation, designed for small scale projects.



2) *Software Requirement*: DIP TRACE:- Dip Trace is used to Design PCB. This software that offers everything to create simple or complex multi-layer boards. It is a user friendly software.

a) *Outcomes*: This microcontroller model is implemented on helmet, In this system the helmet having the 3 sensors like gas, heartbeat sensor, and DHT11 sensors to monitor the conditions in coal mine. If there is any hazardous situation in the mine the helmet will give the information to the control station through the ZigBee transmitter and the control station will alert the coal miner by using the ZigBee receiver by making the buzzer active so that a miner can have a chance to rescue his life from the hazards situation occurred in coal miners.

### III.CONCLUSION

This project can be implemented easily and successfully as the system demand and require element can be easily available to make this project. The various surrounding change in mine , it will available the safety to coal miner and the way to change their working as well as system controlling.

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