

# SMART HELMET FOR MINERS IN MINING INDUSTRY USING IOT

Sriviveka,Sangeetha poorani  
Electronics and communication  
Dr. n.g.p institute of technology  
Coimbatore-48  
vivebutterfly@gmail.com

I.rajkumar,M.soniya  
Electronics and communication  
Dr.n.g.p institute of technology  
Coimbatore-48

## Abstract

The main purpose for developing this helmet is to prevent accident that is happening in the mining industry. Mostly accidents happen due to the factors like poisonous gas or if a miner doesn't wear a helmet. So with the help of this helmet we can detect the level of poisonous gas. For checking whether the helmet is on the miner head or not we use IR sensor and using vibrational sensor we can detect the vibration of helmet when object falls on the helmet and we can send the results to the hospital through IoT if accidents occur.

**Keywords—**Raspberry prevention, IoT, Sensors

**Pi, Accident**

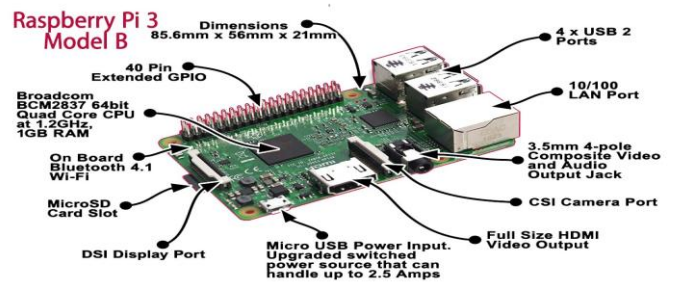
## I. INTRODUCTION

In every country where the mining industries are high, the accident can be prevented only when necessary device is provided. So for that purpose this project helps vast number of miners all the country. The existing system is been implemented with ZigBee and is limited for short distance. In this project we have implemented IoT and is connected with wireless sensor and it senses and sends the report to the server. So if any accidents occurs, then the information is automatically directed to the hospital monitoring system.

## II. SMART TECHNOLOGY

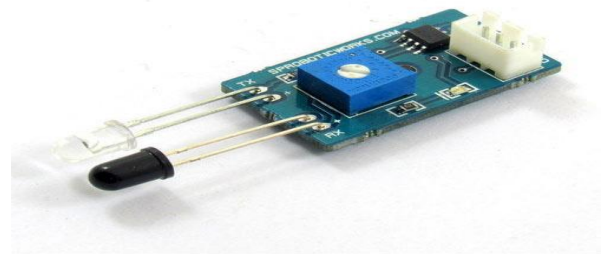
The IoT implements the feature of communicating among human and computer instead of human to human interaction. It is evolved as the convergence of interaction of devices. It improves the delay of treatment during the mining accident. The IoT system communicates with the hospital through the sensors attached in the smart helmet embedded system. This provides the easy accident prevention and sends immediate information to the hospital server management.

## RASPBERRY PI3



The IoT is mostly implemented with the help of Raspberry Pi. It is commonly called as a mini computer and it is latest microcontroller for latest technology implementation and we use Raspbian software for feeding code to make the smart helmet work

### A. Infrared Sensor



It is a radiation measure sensor. It is used to measure the heat around the surroundings. It also measures the motion of an object. So when a miner removes the

helmet, the status is sent and the buzzer will be turned on.

**B. Gas sensor**



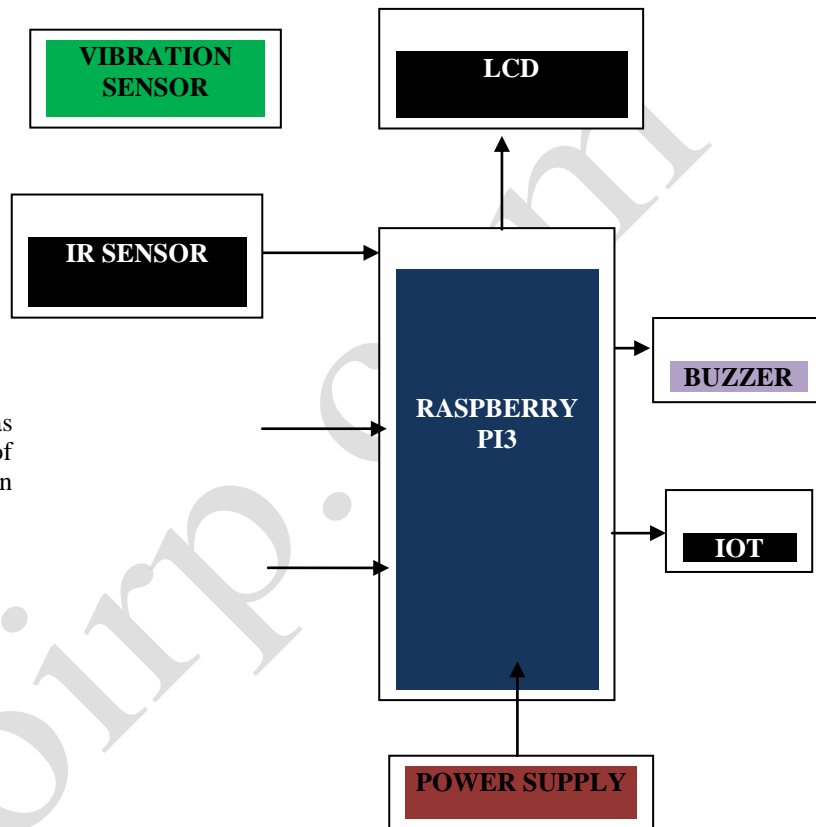
The gas sensor is used for the detection of hazardous gas level in the embedded system. It displays the amount of poisonous gas limit. Once it crosses the given limit then another buzzer attached with it is been switched on.

**C. Vibrational sensor**



When some object falls suddenly on the helmet, the vibrational level can be detected and displayed on the screen.

**System implementation**



A smart helmet has been developed that is able to detect hazardous events in the mines industry. In the development of helmet, we have considered the three main types of hazard such as air quality, helmet removal, and collision. The first is the concentration level of the hazardous gases such as CO, SO<sub>2</sub>, NO<sub>2</sub>, and particulate matter. The second hazardous event was classified as a miner removing the mining helmet off their head. IR sensor was then used to successfully determine when the helmet is on the miner's head.

The third hazardous event is defined as an event where miners are struck by an object against the head with a force. An accelerometer was used to measure the acceleration of the head and the HIC was calculated in software. Tests were successfully done to calibrate the accelerometer. The experimental prototype consists of three sensors namely gas, infrared and vibration sensor for their usage and the sensor data are monitored in pc via Internet of Things.

**Acknowledgment**

A smart mining helmet was developed that is able to detect three types of hazardous events such as danger level of



hazardous gases, miner helmet removing, and collision or impact (miners are struck by an object). The hazardous events were classified as a miner removing the mining helmet off their head. The usage of the IOT instead of zigbee is more accurate and it could be monitored in the the hospital servers and it could notify in the mobile and send the ambulance immediately to the accident spot.

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