WORKERS SAFETY MONITORING AND ALERTING SYSTEM

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ABSTRACT

Workers Safety Monitoring and Alerting System using helmet that is able to detect hazardous events in the mines industries and construction site. With reference to the development of helmet, we have considered three main types of hazards such as Air Quality, Helmet Removal and Collision. Suppose, if the workers has met with an accident then the alerting message will be sent to the frequently used contacts with reference to the location (using GSM), Alcohol detectors are commonly required by the law enforcement. The MQ-3 sensor is used in the project to detect the alcohol level. By using smart helmet, the accidents can be detected. The alcohol sensor recognizes the alcoholic substance in the workers/miners breath. If there is any alcohol senses or accident occurs, then the GPS in the helmet will send the location of the accident place to main server of the nearby hospitals or the main department of the workers.=

Keywords: Alcohol detector, microcontrollers, Vibration sensor, GSM module, Alerting System, LCD display.

I.   INTRODUCTION

In earlier days, the accident ratio was high due to the fact that people were working in coal mines without helmet and had lack of awareness of usage of helmet. As a result the death rate incrementally raised. The problem addressed was the improvement of a helmet in order to ensure more safety awareness between miners. When working with a noisy equipment, being aware one's surroundings can sometimes be challenging. Wearing the helmet can reduce the risk of severe injury by 79% and the risk of death by 43%. In consideration with mine industries, miners tend to remove some of their safety gear because it is too heavy, warm or uncomfortable to work with. The idea of developing this work comes from our social responsibility from society. The key to controlling such accidents is the prediction of outburst by implementing sensors and microcontrollers and to generate an alarm system before critical atmospheric level. A continuous monitoring is necessary which again requires some effective and accurate sensing system. To overcome this we introduce a smart helmet system made of discrete components which checks whether the miner consumes alcohol or causes any accident during work. It provides an early warning, which will be helpful to all miners present inside the mine to save their life before any casualty occurs. This system is highly beneficial for rescue and protection of miners. This helps map the current location of workers through the entire mining site. Moreover each worker helmet circuit is integrated with a panic/emergency button. This button when pressed shows an emergency sign over the IOT web interface about the worker emergency. However, miners generally do not remove their helmets. Presently mining safety helmets only have the purpose of protecting the miner's head against potential hazardous bumps.

II.   METHODOLOGY

The methodology are in the following steps given below:

- Wearing Helmet
- Alcohol Sensor(detects)
- Vibration sensor(detects)
- LED lights(Red or Green)
- Message request & respond
- Updates in Website
- Rescue team to appear
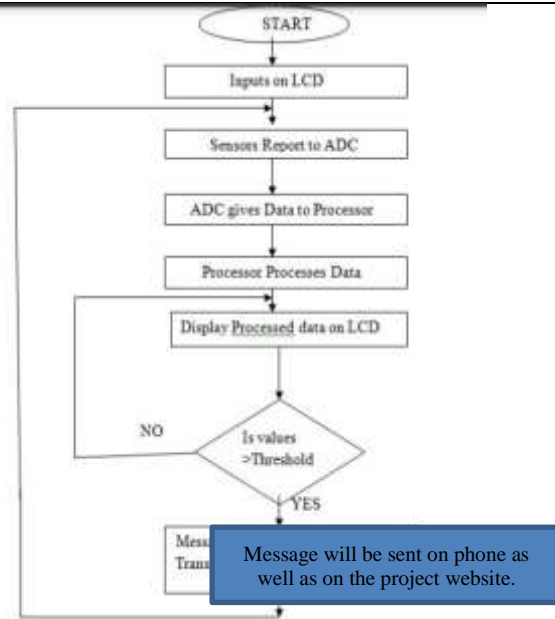
The System is implemented in two sections. Where the first section is our Hardware device (Helmet) used for all the sensors which are connected with RF transceiver, which detects temperature, humidity, gas, pressure to sense the worker's environment and the LED indicator to display the condition of workers. On the other hand, the second section is based on software(control room section) which have IOT and GUI system. LED and LCD are used to convey the status of the worker whether he is safe or in danger. While Wi-fi or Bluetooth does not support to underground signals, so we have overcome with these problems by using GSM module. GSM module is used to send the message and configured in Node Red with JavaScript code
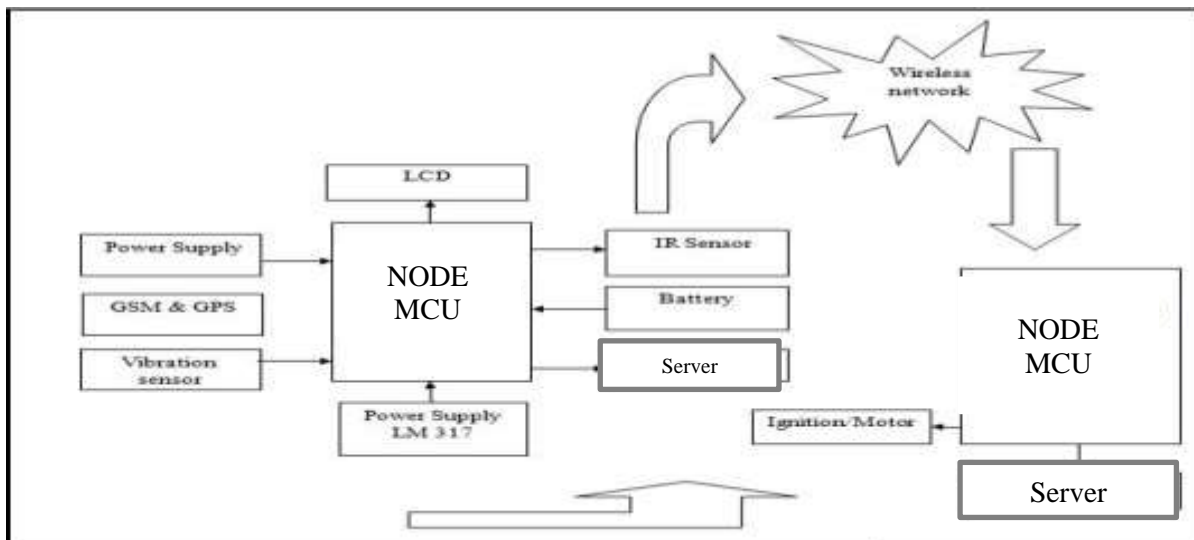
Buzzer is also provided, if miner is safe then he can manual switch off the buzzer to resist the rescue   team. GUI was created by Node Red and the GPIO of the Raspberry Pi are used to trigger the buzzer. The command register stores the data of LCD, the command register used for an instruction given on the LCD. The data is in the form of ASCII value of the characters displayed on LCD. According to that danger senses and Buzzer starts for 15-20sec, convey the message to the higher authorities and updates status in the web page.

III. MODELING AND ANALYSIS

The main parameter used for the implementation of the system are concentration of gas molecules measured which helps in the detection of alcohol. This module is made using Alcohol Gas Sensor MQ3. MQ3 is a low cost semiconductor sensor which can detect the presence of alcohol gases at concentrations from 0.05 mg/L to 10 mg/L. It's conductivity increases as the concentration of alcohol gas increases. MQ3 alcohol sensor module can be easily interfaced with Microcontrollers, Arduino Boards, etc. This alcohol sensor is suitable for detecting alcohol concentration on your breath. The second most important module is the vibration sensor which shows

output with the help of LED indicators, when the sensor detects any vibration beyond the threshold. Thing speak provides channels to retrieve the data by the IOT technology. Each channel includes 8 types of field for any data, 3 location fields and 1 status field. Once the data is allocated it is stored for the future analysis. These stored values are used to detect the hazards before they happen. By these we are providing the information of each personnel so that we can help them out to save their lives. The system requirement and all the components required for the project can be easily made available for the project's implementation. These project will offer security and alert to all workers working in the coal mines,various production industries and plants.
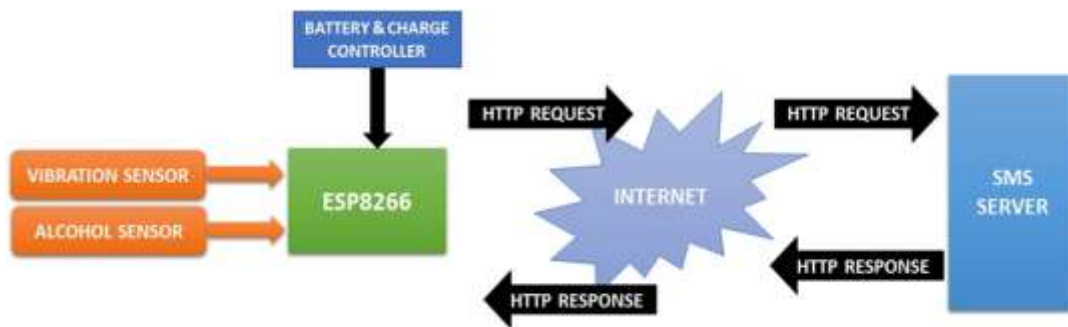
IV. RESULT AND DISCUSSION

All the components are assembled and tested successfully. The circuit is designed in such a manner that when miner wears the helmet shows active status on LCD display and server page. The safety helmet alarms the miners and higher authorities if there is alcohol consumption , accident happens by buzzing an alarm. If an hazardous situation occurs the GSM module sent SMS to prevent further injuries.

V.   EXPERIMENTAL RESULT
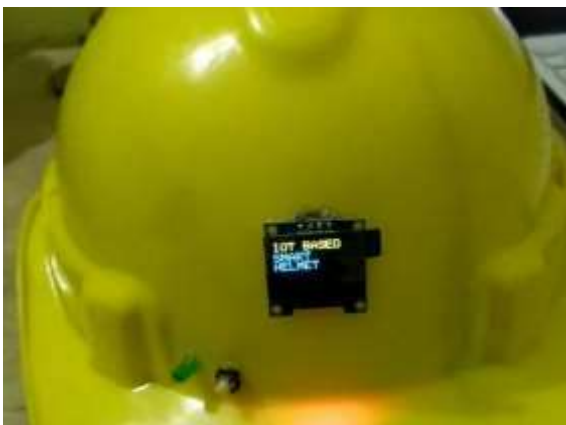
Fig.(c.1)

Fig.(c.2)

Fig (c). Experimental setup

Fig (d).Alcohol detection test

Fig (e).Accident detection test

As shown below Fig.(f) and Fig.(g) shows that , Initially every helmet it has an helmet ID for a fixed value. In the mining, the miners can take up and wear any of the helmets from the store room, every working day while miner picks up a helmet, his ID will be attached to the helmet. Now the helmet will be configured to work according to the range specified in his user ID.

Fig(f).Server site data

Fig(g).Export to excel

Login page

Home page

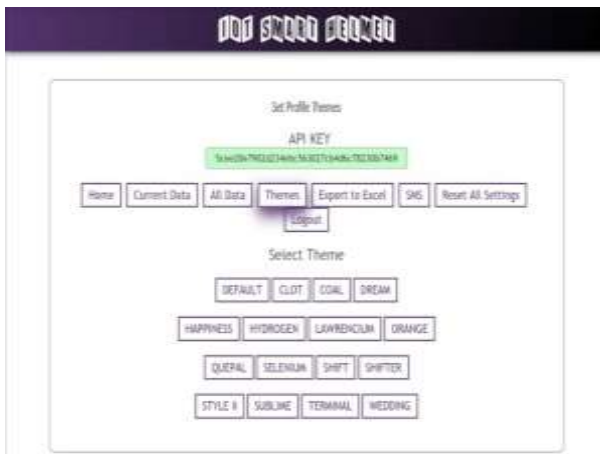Current status
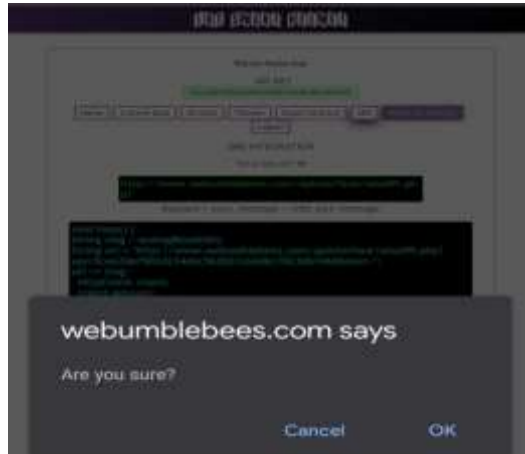

SMS

Themes   Logout module

VI. CONCLUSION

The design and the implementation of the smart helmet were discussed. The Safety Helmet will provide smart solutions based on using a microcontroller, GSM, GPS modules, and a group of sensors that locate the worker's position and send a conditional SMS if there is any risk of life to the higher authorities.

VII.   REFERENCES

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