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A Safety Mining Helmet for Coal Miners and Future Danger Alert Using ML

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ABSTRACT: In this paper we are designing an IoT (Internet of Things) monitor, a safety measures for mine workers which are most essential in underground mining areas. In this project, the system is build using different sensors network based on MEMS used to monitor the surroundings parameters of underground mine place and drives all sensed parameters/values to /values to arduino uno Microcontroller Unit (MCU). The MCU unit is used to build a completely automated evaluating system with high accuracy, smooth control and reliability. when a critical condition is detected alert is given by the system and the same statistics is communicated to webserver by initiating ESP8266 module based on Wi-Fi communication. The detected variations in the values are displayed on webserver page that makes easier for the underground control center to monitor and to take essential instantaneous action to prevent severe damage.

I.INTRODUCTION

The primary factor in running any industry successfully is to ensure the safety of person working that work area. Underground mining industry comes to the same category, where each and every parameter such as methane gas, high temperature, fire accidents and so on has to monitor regularly. Every mining industry follows some basic precautions to avoid any type of unwanted phenomena. In this paper we are considering above mentioned situations and also monitoring mine workers activities e.g. Fall Detector that states workers position. A major improvement is to implement internet of things in collecting and plotting parameter and sensor values to web servers. Designing of IoT systems in Mines for Safety and Efficient Monitoring is based on wireless sensor network can be sensible and correctly redirect dynamic condition of workers in the underground areas to data servers and can be monitored regularly using web applications and servlets in computer system.

The hybrid underpass radio propagation model comprising of the free space propagation and the modified waveguide propagation is proposed. However, using popular radio communication inside underground mines has some drawbacks. Though radio signals are transmitted, attenuation, diffraction, multi-path and scattering are frequently very serious. Therefore wireless communication is the important need today for the fast, flexible safety, accurate and production method in underground mines and we are using IEEE802.11 Wi-Fi wireless communication protocols to record the sensed parameters to data center or web servers. There are diverse added research ideas proposed by different people on wireless communication. In a network called chain-type wireless underground mine sensor network (CWUMSN) is recently proposed which consists of three kinds of sensor nodes: sensing nodes, cluster head nodes, and a base station installed on both sides of the passageway at consistent intervals to monitor the underground environment and locate the miners. An innovative decision-making method to coal and gas outburst prediction with multisensory information fusion is proposed. This IoT system is planned by bearing in mind all these factors i.e. it can measure temperature, sense pressure, fire, gas, humidity, as well as Persons Fall. Thus the intended system is giving a very good solution for most of the difficulties challenged in mine calamities.

II.RELATED WORK

INTERNET OF THINGS BASED AN INTELLIGENT HELMET FOR WIRELESS SENSOR NETWORK

Author: G.Ravi Kumar & B. Keerthi Reddy

Year: 2018

The main aim of the paper is to develop a smart helmet for mining industry workers. The problem addressed in this paper was the improvement of a mining helmet in order to ensure more safety awareness between miners. When working with noisy equipment, being aware of one's surroundings can sometimes be challenging. In the mining trade miners tend to get rid of their safety gear because the gear is too significant, heat or uncomfortable to work with. So this system is developed to intimate the authorities in critical conditions. To overcome the above problem, we are developing a smart helmet for mining industry workers. Firstly to identify the worker, each worker will be having

different tag. Once the tag is identified, person's data will be sent to the PC through ZIGBEE. In order to check whether the worker has been using the helmet or not, IR sensors are used to check the helmet presence. The surrounding hazardous gases will be detected by the gas sensor present in the helmet. When gas is detected voice notification will be given through speaker. By the use of MEMS sensor, the head injuries occurrence will be identified. All the data related to sensors will be posted into the PC through ZIGBEE transceiver.

III.EXISTING SYSTEM

The safety helmets do not have any technology added to it to let employees know when a fellow has encountered a hazardous event. Therefore, the purpose is to modify an existing safety helmet even safer by adding a wireless sensor node network. The task was extended to designing the system small enough to fit into the safety helmet and last long enough while running on battery power. A further challenge was to modify the helmet without changing its physical structure. The added weight had to be kept to a minimum.

Disadvantages:

- The safety helmets do not have any technology to let miners know when a fellow miner has encountered a hazardous event.
- In the mining industry miners tend to remove some of their safety gear because the gear is too heavy, warm or uncomfortable to work with.

IV.PROPOSED SYSTEM

The proposed system is divided into two sections. Firstly is a wearable device that will be attached/tagged to the body of the Mine Workers. The suitable design for this wearable is a safety helmet.

The device is build using sensor module consisting of some sensors that processes real-time underground parameters like natural gas release and concentration, humidity, fire and light, temperature, miner physical position. Excess natural gas concentration is meant for the harmful gases like Carbon-monoxide, Methane, Butane and Propane.

We use an arduino based microcontroller which is important in processing instructions given as a firmware. The MCU sense the change in physical parameters and process them to convert into digital form. The conversion can also be from analog data or an interrupt in data signal or a digital signal. If temperature exceeds a safety level pre-programmed at microcontroller, alert is sent to ground station controller make sense of, alarms the speaker interfaced with MCU. If the measured humidity value is more than the safety limits at microcontroller; it alerts with alarms. Likewise when gas concentration crosses threshold limit MCU decodes siren alarms. When a working person falls down for any reason fall sensor will alert by alarm to nearer areas and also to ground control section through Wi-Fi repeaters. Fire Sensor helps in stopping fire accidents and rapid spreading by detecting fire and feed alert to main station that helps in taking essential precautions.. ESP8266 is interfaced to the Module to send sensor data to the server in a regular intervals, and also sends the same to local ground monitoring station through Wi-Fi repeaters.

Advantages:

- Fast response time.
- It is portable.
- Low cost with precisely acceptable accuracy.
- This system is fully automated.
- It acts as a life saver.

Objective:

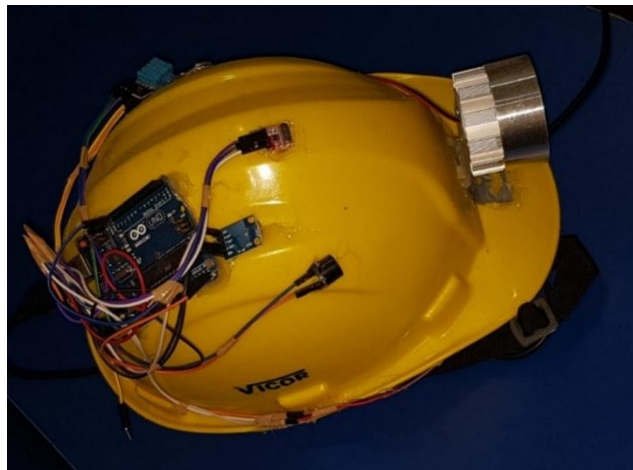
- To make more comfortable, we designed a smart helmet.
- Develop to make wireless connection.
- This project is built to aid people to do various task such as detect to gas, detect to fire.
- This project helps user's to even more wear helmet because of its features in addition to safety purposes.
- The objectives of this project are to design the circuit that can improve safety of motorcyclists, to develop a smart safety helmet for user

V.HARDWARE IMPLEMENTATION

It is a wearable device that will be attached/tagged to the body of the Mine Workers. The suitable design for this wearable is a safety helmet.



- The device is build using sensor module consisting of some sensors that processes real-time underground parameters like natural gas release and concentration, humidity, fire and light, temperature, miner physical position.



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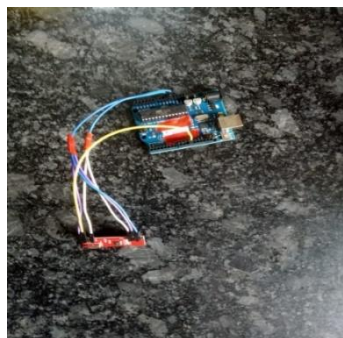


- The RF node supports **2.4-GHz** RF protocols which include 6LoWPAN. Each sensor node communicates to a sink node or a gateway. The gateway is a Linux-based system that collects data from the various sensor nodes and hosts the information on a web server.



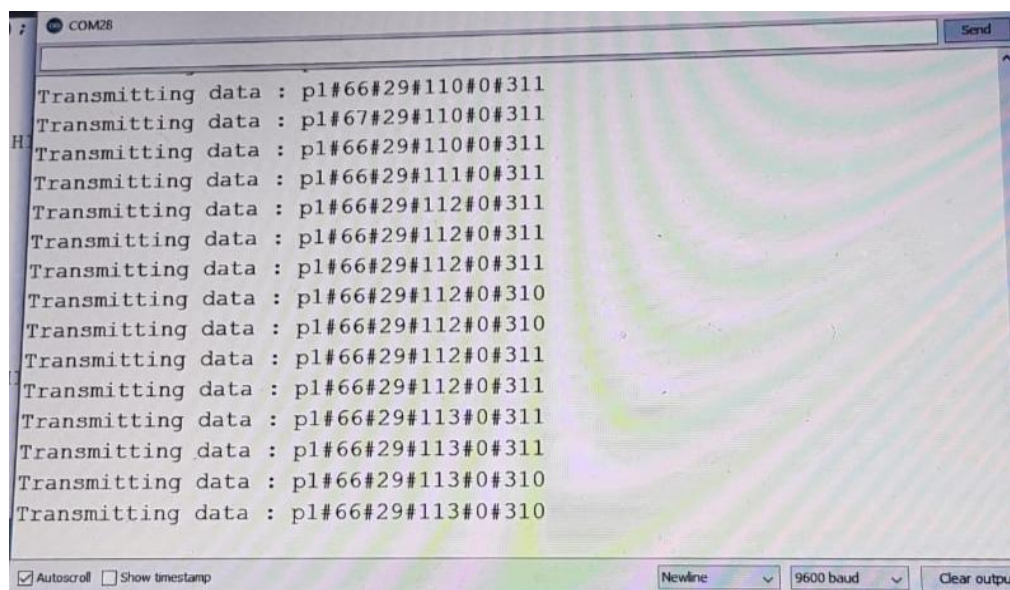
RF node

- RF module operates at Radio Frequency. This frequency range varies between 30 kHz & 300 GHz. In this RF system, the digital data is represented as variations in the amplitude of carrier wave.



RF receiver

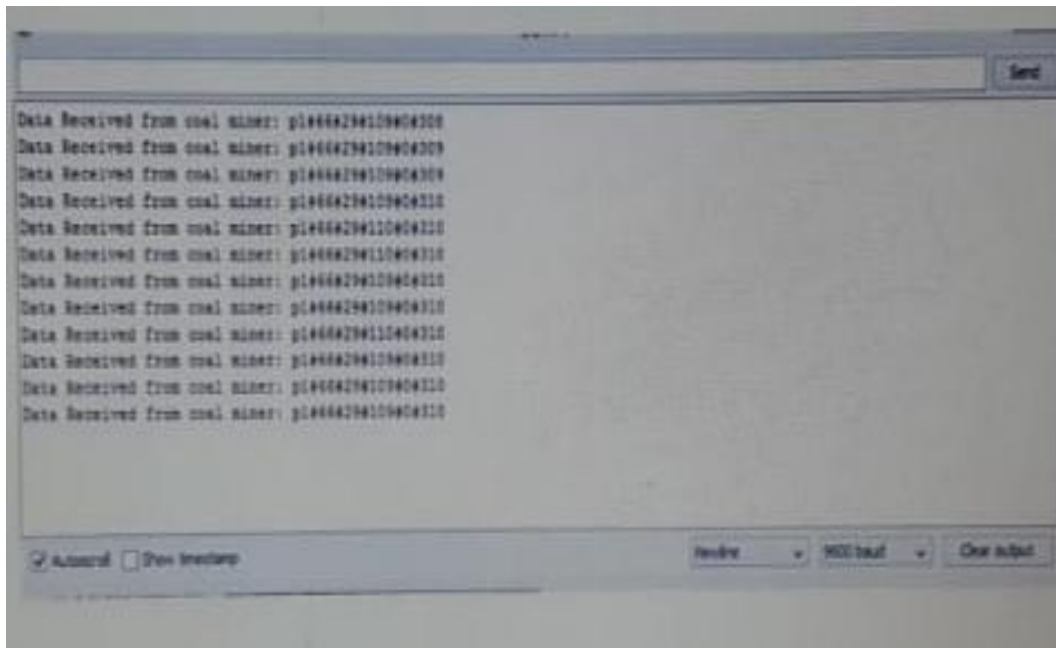
VI.OBSERVED OUTPUT



```
COM28
Transmitting data : p1#66#29#110#0#311
Transmitting data : p1#67#29#110#0#311
Transmitting data : p1#66#29#110#0#311
Transmitting data : p1#66#29#111#0#311
Transmitting data : p1#66#29#112#0#311
Transmitting data : p1#66#29#112#0#311
Transmitting data : p1#66#29#112#0#311
Transmitting data : p1#66#29#112#0#310
Transmitting data : p1#66#29#112#0#310
Transmitting data : p1#66#29#112#0#311
Transmitting data : p1#66#29#112#0#311
Transmitting data : p1#66#29#113#0#311
Transmitting data : p1#66#29#113#0#311
Transmitting data : p1#66#29#113#0#310
Transmitting data : p1#66#29#113#0#310
```

Autoscroll Show timestamp Newline 9600 baud Clear output

Data Transmitted



Data Received

VII.EXPECTED OUTCOME AND CONCLUSION

The helmet device is build using sensor module consisting of some sensors that processes real-time underground parameters like natural gas release and concentration, humidity, fire and light, temperature, miner physical position. We use an Arduino based microcontroller which is important in processing instructions given as a firmware. If temperature value exceeds a safety level pre-programmed at microcontroller, alert is sent to ground station controller. If the measured humidity value is more than the safety limits at microcontroller; it alerts with alarms.

The present underground Mines system can be productively substituted by this IoT safety system proposed in this paper. This IoT system enclosed the utmost Key and major feature of currently deployed mine workers safety. Since this system is made of low power Wi-Fi module and control lamp with PWM technique, proportion of power consumption is lowered, which is significant for any device that is powered by battery. Additional safety can be delivered to data servers and maintained accurate information of mines.

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