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IoT Mining Tracking and Workers Safety Helmet

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***Abstract* - The mining industry is crucial to the global economy. However, it is not one of the safest industries in which to work. The life of mining workers is constantly under risk. The goal of this work is to provide urgent assistance to the distressed miners. The miner's helmet can be improved more effectively by including a wireless sensor mote and other necessary sensors, which will aid in tracking the miner's health. This can result in the development of a network of wireless sensors. This wireless sensor network (WSN) can be used to track the well-being of all miners on the site. The routing protocol developed for this project is based on Distance Vector Routing (DVR) and determines the optimum path based on the shortest hop. The protocol is also robust in terms of failures. The nodes do not need to be synchronized. The protocol takes proactive measures to reduce delays. The helmet's mote tries to send a distress signal to its Room Manager via the pre-stored route whenever the load on the force sensor is greater than a threshold value. Officials from the Health Centre can send a medical team in response to a miner's distress alert via Room Manager. The miners in the adjacent rooms are also alerted so that they might volunteer to assist. The mote occasionally was unable to determine how to get to its room manager. A failed recovery procedure is carried out in these situations.**

Keywords: Smart helmet; industrial application; detection system; wireless sensor network (WSN), Distance Vector Routing (DVR).

I. INTRODUCTION

In every sort of work, worker safety should always be a top priority. When it comes to the wellbeing and safety of employees, underground mining operations are a risky business. These risks are caused by the various methods used to extract the various minerals. The risk increases with the depth of the mine. These safety concerns are quite important, particularly for the coal industry. Therefore, whether mining for coal or any other commodity, worker safety should always be a top priority. Due to ventilation issues and the possibility of a collapse, underground coal mining entails a higher risk than open pit mining. However, the utilization of heavy machinery and the methods performed during excavations result into safety risks in all types of mining. Modern mines However, safety risks exist in all types of mining due to the use of large equipment and excavation techniques. In opencast and underground mining, modern mines frequently adopt a number of safety processes, worker education and training, and health and safety requirements, which result in significant changes and improvements. In India, coal has traditionally been the main source of energy, which has greatly aided in the nation's quick industrial growth. As a result, coal is essential to the energy sector and accounts for around 70% of all power generation. However, the process also creates additional byproducts, which pose a possible risk to the environment and the nearby population. Instead of that, the current study is an honest effort to evaluate the seriousness of the situation and design a real-time monitoring system of detection utilizing Wi-Fi technology.

II. LITERATURE SURVEY

This lecture survey presents previous work related to our proposed system. Many great contributors had placed a significant sign in the field of IoT and Knowledge-based expert systems. We have highlighted some of them to identify the significant attributes of these systems.

Mohammad Ehsanul Alim et.al [1] has given an approach Arduino NANO and Arduino Mega-2560 is microcontrollers which control the entire components of the system. Two 2.4 GHZ nRF24L01 for communication between sender and receiver. MQ-3 alcohol sensor is used which can detect whether the bike rider is consumed alcohol or not. If the bike rider is alcoholic, then the MQ3 sensor detects it and turn off engine. A Sharp IR sensor detects the head of the rider within the specified range. The Bike rider's engine will start only when the rider will buckle the helmet. GPS & GSM Technology is used for tracking the location of the bike rider and sending text message to the family members of the Bike rider when an accident occurs.

Dhruvesh H. Patelhas et.al [2] proposed an approach which the System is plan and implemented such a way that the bike will not ignite until the rider wear helmet and pass an alcohol test, this will help to solve the problem of 'drink and drive'. It consists of GSM GPS technology which sends the

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message to the family member as well as hospital with the current location at the time of an accident.

Saima Siddique Tashfia et.al [3] has proposed scheme reflects on the embodiment of a smart helmet, having an alcohol detection sensor to diagnose if the rider wears a helmet or is drunk. The expert system processes the information about bike speed, engine temperature, distance with the nearby vehicle, and location tracking. In the case of an accident, the system immediately sends an SMS, including GPS location to the emergency contacts. The proposed Expert System which analyzes IoT cloud data and gives a possible solution to identified problems.

Sandhya. A. Kulkarni et.al [4] has proposed the smart helmet system is equipped with advanced alcohol sensing, potholes, speed breakers and fall detection modules. The bikes ignition will be avoided, if the rider has consumed alcohol the system not letting the rider to ride bike. The proposed system is detecting alcohol concentration from 0.05 mg/l to 10 mg/l by using MQ-3 alcohol sensor, able to identify potholes and humps within range of 2cm-400cm. Global System for Mobile Communication and Global Positioning System are used to send the information to the registered number, if the biker meets with accident.

Pranav Pathak et.al [5] has proposed a smart helmet system has two units, the helmet unit (HU) and a motorbike unit (MU). Both the parts linked radio frequency (RF). The helmet has the sensors to detect the pulse of the human, the alcohol content in breath of the rider, and the intensity of vibration. The pulse sensor is used to detect helmet worn or not. The GPS and GSM module are used to share location and to send message. Accelerometer used for detecting accident. The sensor on bike helps to ensure that the rider is in perfect riding position, if accident detected send message to emergency contact. A LIDAR sensor used to detect vehicles approaching behind. Force-sensitive resistors are used to detect perfect riding position.

Keesari Shravya [6] has proposed a system to identify whether the rider worn the helmet or not. If the rider worn the helmet, then ignition will start the engine otherwise it remains off. For this, Force Sensing Sensor is used. The second step is alcohol detection. Alcohol sensor is used to detect the presence of alcohol in rider's breath and if it detects ignition cannot start.

Navya Sri K [7] proposed a system with GPS and GSM for accident detection. It uses push button to detect an accident and if the accident occurs location will be sent to the contact list saved in EEPROM.

H.C. Impana [8] has given a method proposed using microcontroller RF transmitter and other sensors is cost effective but we find the system proposed using Raspberry pi module, Pi camera, Pressure Sensor, GPS system which uses image processing algorithms is most useful since the image processing is included so that we can easily detect the helmet from the rider.

Souhardya Das et.al [9] the smart helmet is providing safety to the rider. This is developed using the method of alcohol detection, accident detection, get real time location, and fall detection. The rider should wear safety equipment otherwise engine will not start. An RF Module is used as a communication link between helmet unit and bike unit. If the rider is drunk the ignition gets automatically locked, and sends information to a contact number with the current location.

III. PROBLEM STATEMENT

Being aware of the environmental situation becomes a difficult aspect of the existing system. Miners often take their helmets off their heads because they are too heavy and difficult to wear while working. Miners are vulnerable to dangerous conditions in the event that it is removed. No smart helmet currently exists that can study the surroundings and make choices that ensures worker's protection. In the event of a toxic gas leak, the miners do not have access to oxygen. The main problem that mining industries must overcome is creating a barrier-free communication environment.

IV. NEED OF PROJECT

Today, wearing a helmet is required everywhere in India, not just in Maharashtra. India has seen an annual increase in traffic accidents. Careless driving and excessive speeding are the main causes of the collision. The most delicate component of the human organ system is the head. The rider of a two-wheeled motorbike may sustain significant brain injuries, which are life-threatening. For safety reasons, wearing a helmet is crucial; it helps prevent serious head injuries. Therefore, it has been declared essential by law in many states and nations. We are creating this Project while taking into account all factors.

V. METHODOLOGY

The block diagram of the proposed work is shown in Figure which explains different components of the system.

The Raspberry Pi and WiFi module are the main parts of this project that make up its model. The Raspberry Pi makes it possible to read sensor data, including the ppm readings from a gas sensor. Additionally, the ThingSpeak IoT platform

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updates these real-time ppm values in the cloud at the same time.

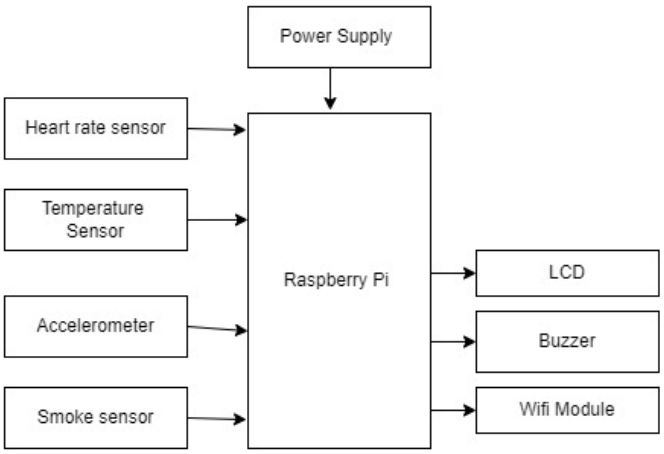

Figure 1: Block diagram of proposed system

Using the analytics features of ThingSpeak, the graphical depiction of the ppm values of various gases is plotted. When the values exceed the threshold value, the Wifi module sends a status or alert to IOT Thingspeak Server. To prevent any accident from happening when the labors are working at the sewage tanks and to protect them from health problems brought on by these toxic gases, the user can keep and monitor the data of the ppm values of the sensors.

VI. CONCLUSION

Using Raspberry Pi, we developed, built, and tested an IoT-based smart helmet for mining workers. Our primary goal is to create a system that meets the requirements efficiently.

The scope of this project is a motorbike rider or mining worker who is concerned about their safety while riding or working. Since motorcycle riders and miners are less worried about their safety currently, the introduction of this helmet could boost safety rates while lowering accident rates. A smart helmet for miners made with the Raspberry Pi and OpenCV that will eventually lead to mining worker safety features.

As noted above, the systems are capable of making a significant contribution in many different domains. However, these kinds of systems still require some sort of development in order to be a superior option.

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