A Smart Wearable device for securing the life of Coal Miners

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***Abstract*— We engineer are people who are always interested in providing the solution to meet the requirement of current scarcity keeping this thing in mind and visualizing the solution are the two main ethic of an engineer .This has been observed at an annual rate that many people die while working inside a coal mine. The paper suggests the design of a smart wearable jacket to protect the lives of coal miners. The prototype senses the various body parameters i.e. heart rate of miner, presence of h gases exact position. These all parameter will then be transferred over wife shield to the dynamic internet protocol. The way one can monitor all labors working inside the mines and moreover in case of any emergency all the miners can be extracted immediately from the site .The proposed wearable embedded system will not only send the live location but also how many workers are working in that site what is the condition of the environment These all thing ultimately helps in sensing the exact location of miners during any disaster so the extraction process can start immediately and maximum life can be saved.**

Index Terms: **Miners, humidity, Arduino, Temperatur.**

I.INTRODUCTION

Engineering is a field that belong to those person who are always passionate about providing the best alternative solution to our day to day scarcity. Incidents cause in coal mine is area due to several deaths in mining to give solutions for the people and to secure their life's before the panic situation we come under the alternative solution. The incident is due to unsafe activity for unavoidable circumstances and negligence to some people. It happens all over the world constantly.

Large number of employees (approximately 2.3 million) each annually 350,000 people die as a result of accidents at work once and for all about 2Millions due to occupational diseases. Life is a blessing, and in some occupations, so is the life of a high risk employee, as with mining, there is a great risk to the life of a worker in a mine as any sudden underground accident with a worker can result in injury and death when the worker goes to work in the mine. In this regard, we as computer engineers come up the design of wireless system that, while not guaranteeing the lives of workers, can disambiguate and guide them a lot in this way. Occupational health is defined as one that can affect the health of an employee in place. It is very important to be aware of public health approach. An application in which the impact of professional life health examination is being performed. Public Health approach using the concept of professional represents a partial understanding of health, which leads to Mine has possibility to collide at any point. The main place in which are issues that raise health and occupational safety the production phase of operations. Production activities cover the core activities such as quarrying, land conservation and transportation, as well such as activities such as electrical storage, installation and management of pressure chambers, communications and displays systems, maintenance and repair of various equipment as well equipment. In particular, the dangers of coal fall, pit fire, fire firefighting and explosion, transportation and equipment is a typical underground hole. Therefore, they are many ends with physical complications.

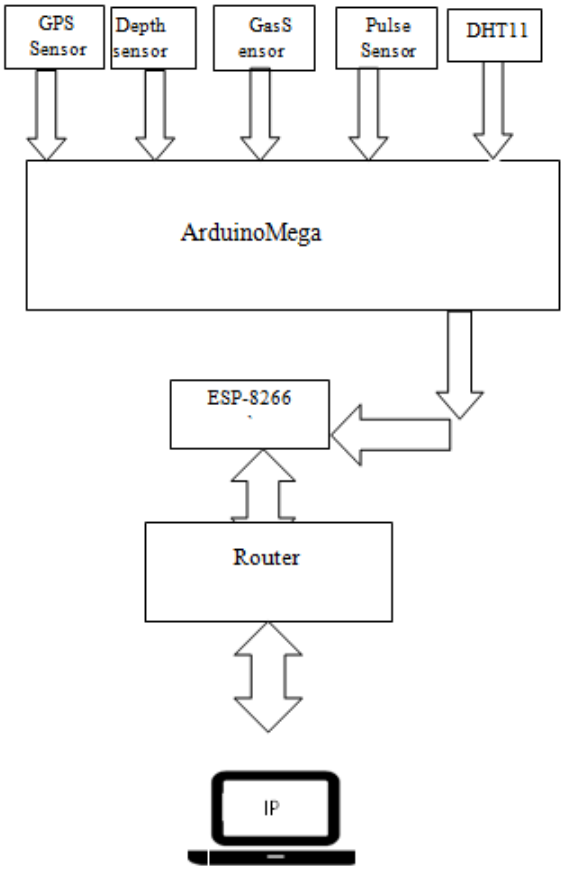
II.LITERATUREREVIEW

It is very important to study and understand the previously suggested systems which is being proposed in past for designing a smart system which can detect the different parameters which are related to the mining and specifically who are working in Coal mines. There are many researches that are available by which we can take a references of what

has been already done. One. In many literatures, the usage of audio communication is also given but this has tendency to create an unpredictable scenario for rescuers as these systems are designed to provide an easy way out for rescuers to set right priority to start digging at particular places where one find maximum chances to retain the lives of miners who are stuck in there [1] .However there are several systems, which are easy to wear, and carry i.e. a wrist band which use Aduino Platform. The main objectives of these papers are related to generating an alert alarm to rescue team using android based applications on other hand what rescue team will do if they do not know where the exact miner is lying in coal mine [2]. There are many solutions like designing a proper data acquisition and then transmitting it through wirelessly these task challenging. Being an engineer, the world expects us to provide a solution to these kinds of scenario and making the mining environment safer.

This paper introduces the design of a smart charcoal jacket diggers. This protective jacket is lined with methane once carbon monoxide gas sensor. These senses sense gas and the information is then transferred to the remote control room, using a remote module we can analyze and read the natural state of coal. If something went wrong before having the impact one can find the best solution in order to overcome the issue. IF in any case the amount of gases increase the control room can directly send.

The main issue come up in the establishment of these underground monitoring systems is that they can't sustain the communication in the mine when there is a collison in mine and so in order to tackle this situation we use low frequency The magnetic field of communication between a transmitter and says the recipient [3].. Hence we need to study and find the alternate way through which one can use these system further to monitor the devices in the underground .This field is yet to be explored and there are lots of things that one have to keep in mind while working on creating a device we need research and hardware which can with stand in any circumstances and provide us the information that we need to find.



III.METHODOLOGY

There are many different components that can be used in prototyping a smart wearable jacket and they are as below:

1 DHT11TemperatureandHumiditySensor
2 PulseSensor
3 MQ-2HazardousGasDetectingSensor
4 BMP180Pressure&DepthSensor
5 GPSModule&ESP8266Wi-FiShield
6 AdrianoUno

DHT 11 Temperatures and Humidity Sensor:-

This is a very expensive digital temperature and humidity sensor. It helps to calculate air pressure directly place. It's a very low price device which will give the data, and tells us about temperature when it rises 50 degree C(1).

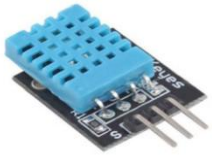


Fig.1 Pulse Sensor

It is a sensation that will help us to keep on the watch change for other people. It will give us the blink in led in the middle of sensor when the someone's heartbeat.

Fig.2

MQ-2 Hazardous Gas Detecting Sensor Iit is a metal oxide semiconductor sensor. Which help us when gas wills leakage form any area with range of 300-10000ppm?It will give signals to maintenance room and then we will get it.

Fig .3

BMP 180 Pressure & Depth Sensor:-

BMP 180 is an atmospheric pressure sensor. The working principle of BMP180 is it works on the weight of air. Because the air has a certain weight, and it has a specific.

Fig 4

GPS Module & ESP8266 Wi-Fi Shield:

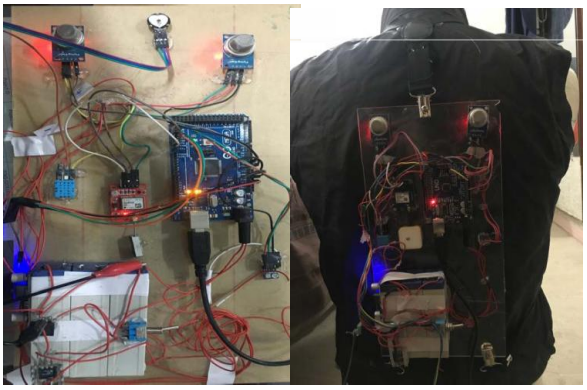
These ESP8266 Wi-Fi shield acts like it can scan nearby Wi-Fi. If there is any wife near then it will immediately access its IP address. Then when we connect it to the GPS module then it will tell us where it's located (5).

Fig 5

Arduino Uno :-

Arduino mega is a module which is multi input lines, so much memory and RAM. And its very fast module, which compare to uno and micro boards. Basically Uno and arduino mega has same clock speed but in case of memory uno has disadvantage. It has only 32Kb, but arduino has around 256kB speed. So that's why we are taking arduino Mega (6).

Fig 6



IV. RESULTS

Jacket and helmets are the most common dress code that every miner has to wear while working in coal mine.Smart jacket for coal miners is a tool that can be easily worn by minors clothes containing sensor that are implemented on board which are further connected to external hardware though wireless communication,Hardware integrates all the sensors at once arduino sensor and connects to arduino through cables .We used two gas sensors connected to Arduino board .These sensors will help detect harmful gases located below the mine.When there is a sudden increase in toxic gases the sensor will detect it and let the person know before something happensThe heartbeat is connected to it arduino to calculate miner's heartbeat if heart rate is miner decreases due to any conditions the information than further will be transferred to rescue team .The most valuable and promising phase of designing a smart jacket is that how you deal with the gaps location of a miner in mine and if due to any reason there is a break down in mine how we are able to find the location of miner is very important .further to power these all sensor we have used lithium battery pack to power the jacket .

The Result for above proposed device has been accomplished by using a standard coal jacket and then further installing the entire device in to it and then connecting it to the main server where all the data can be further processed and analysis. We do have used a display that show all the warning sign it is something like a car console that show warning if something went wrong in car and its surrounding environment. The entire sensor which senses person body will be directly in touch with skin through the jacket that will provide us the data related to oxygen

level, pulse rate, tiredness. These will be the first interference that the device will have will body after completion of this step the smart jacket will automatically start the further process.

In second step it will senses the amount of gases in surrounding like methane, oxygen carbon dioxide and on the basis of amount of gases that are present in environment the sensor will collect the information and then will share it to the base camp if something happens during this process if there is any increase or decrease in gases the information will be further transferred to base camp where they can take further steps to avoid any degasser.

To get these all result in a controlled manner the prototype result have been taken in way that surrounding can match the conditions of mines. We used a small room like a mine underground. One of the members of our team was inside the room wearing the jacket. During this experiment the person was asked to carry certain task in the room in order to get the required result. While the person who was in the room we on the above floor was able to see the result of data that the jacket was sensing we were able to get the required result which include the location of the person wearing the jacket , the surrounding condition. In order to see result for hazardous gases few fuel were burned in the room which increased the carbon dioxide, methane level in the room showing us the required result this shows us the how this prototype can help in saving life of coal miners. Same thing is done with the temperature of room we have used certain.

heating coil in order to increase the temperature of room so that the prototype can sense the temperature and if due to any reason there is an increase in temperature .We are able to see it on laptops .To check for how much the smart jacket can sustain it power and connected after getting the result we left the person who is wearing the jacket in room for 2-3 hours and the battery pack was able to sustain in for three and half hours on a small lithium battery . When we increase the battery capacity we are able to to keep the connection for extended hours. .All the data is then further collected and In an experiment of two hours we were able to get the required result of live location surrounding natural conditions and pulse of his body and temperature reading.

In further scope if we increase the number of person wearing the jacket in a particular surrounding we can easily get the much more data and with the help of this data one can make neural network of these devices in the mine and that will help in maximizing the safety measure for worker who are working in the coal mine and in case if something went wrong we would have last updated data which wastransfer by the jacket to the main server .This will also help in finding the last location of miner and if due to reason there is a scenario of panic the team outside the mine can easily see how many miners have come out and how many are left in the mine .

V. ACKNOWLEGMENT

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