

# Coal Mine Safety Monitoring and Alerting System using IOT Based

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## ABSTRACT

In our day to day life electric power is more important and the power generating many more types. And one of its mining So our project fully based on mine safety and alerting system with uses of IOT (Internet Of Things). Here we used a robot for analyzing the danger in undergoing mining. So we are going to use LDR sensor, GAS sensor, RF sensor, LM35 (temperature sensor) and micro camera for visualization for controller operating the robot. Now we see uses of sensor LDR (light dependent resistor) when LDR is dark place its resistances is high and, when the LDR is light places its resistances is low, GAS sensor is used for identify the carbon dioxide percentage in mining places, the mine engineers work in underground so the LM35 sensor used to measuring the temperature, RF is master controller and it will be rise the message on IOT. So we conclude that it will be useful for mine engineering safety.

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## I. INTRODUCTION

Standard coal mine noticing structures are routinely wired association systems that expect a huge part in choosing coal mine prosperity. If any kind of explosion occurs, the wired network will get damaged and it is very difficult to replace it.

It will take high time consumption to repair those networks. In order to overcome this, the coal mine safety measurement system using Internet of Things was designed and implemented. The device entails creating a Wireless Sensor Network (WSN) using an Arduino UNO controller to track the underground mine's condition.

This further develops creation wellbeing control and lessens coal mineshaft mishaps. Remote sensor networks are comprised of countless micro sensor hubs that have a little volume and minimal expense and can be conveyed anyplace, while laying link for underground checking is a complex, time consuming, and exorbitant operation.

The model is comprised of a gas sensor, a temperature sensor, also, a moistness sensor (AM2302), Heart thump sensor, Vibration sensor, Blood rate sensor, MEMS sensor, A force supply unit, LED show and a ringer.



## II. MATERIALS AND METHODS

Coal mining is the most common way of removing coal starting from the earliest stage. Steel and concrete businesses use coal as a fuel for extraction of iron from iron metal and for concrete creation. Underground mining industry goes to the class, where every single boundary, for example, methane gas, high temperature, fire mishaps, etc., must be checked consistently. Safe creation level of coal mineshaft is still low, debacles in coal mineshaft happen habitually, which lead to incredible loss of ownership and life.

The calamities occurring in coal mineshaft are because of the intricacy of mine current circumstance and the assortment of work completed in coal mineshaft, so it is extremely important to screen the workplace of coal mineshaft. To move past this issue our activities has proposed a remote sensor organization's application in coal mining wellbeing framework.

In this remote sensor organization's application framework there will, be ace regulators and slave regulators. Slave regulators will distinguish the risk and give alert through RF to dominate regulator and it will bring the caution up in all passages and furthermore raise message on IOT, which will assist with making a move at the earliest opportunity.

This checking and alarming framework is fuelled by Atmega328 microcontroller for ace regulator and 8051 miniature regulators for slave regulators. 8051 miniature regulator comprises of temperature sensor, methane and carbon dioxide sensor and RF transmitter which gathers temperature, stickiness and methane esteems underground of coal mineshaft.

## III. TEMPERATURE SENSOR THE LM35

The LM35 series integrated circuit temperature controls, the output voltage of which is linearly proportional to the temperature of Celsius. The LM35 therefore has a more flexible sensor compared to the Kelvin calibrated linear temperature sensors as there is no need for the user to subtract substantial constant voltage from their output to achieve convenient Centigrade scaling.

The LM35 does not require external calibration or trimming to provide standard precision of  $\pm 1/4^\circ\text{C}$  at room temperature and  $\pm 3/4^\circ\text{C}$  at  $-55$  to  $+150^\circ\text{C}$ . This fire sensor circuit mishandles the temperature distinguishing property of an ordinary sign diode IN 34 to recognize heat from fire.

At the present time it recognizes heat, an uproarious alarm reproducing that of Fire separation will be made. The circuit is unnecessarily unstable and can distinguish a climb in temperature of 10 degree or

more in its locale. Ordinary sign diodes like IN 34 and OA 71 shows this property and the inside restriction of these contraptions will lessen when temperature rises. The fire sensor circuit is exorbitantly sensitive and can recognize a rising in temperature of 10 degree or more in its locale. Standard sign diodes like IN 34 and OA 71 showcases this property and within restriction of these devices will lessen when temperature rises. In the pivot uneven mode, this effect will be progressively basic. Ordinarily the diode can make around 600 mille volts at 5 degree centigrade. For each degree rise in temperature; the diode makes 2 mV yield voltage.

That is at 5 degree it is 10 mV and when the temperature rises to 50 degree, the diode will give 100 mille volts. This voltage is used to trigger the remainder of the circuit. Transistor T1 is a temperature controlled switch and its base voltage depends upon the voltage from the diode and from VR and R1. Commonly T1 conducts (as a result of the voltage set by VR) and LED sparkles. This shows run of the mill temperature.



LM35 TEMPERATURE SENSOR Outputs 10mV per Degree that can also be read directly on multimeter or read in to microcontroller. For example at 30 degree celcius it will output 300mV at linear scale. The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in  $^\circ\text{Kelvin}$ , as the user is not required to subtract a large constant voltage from its output to obtain 25 convenient Centigrade scaling.

## IV. GAS SENSORS

Gas sensors are devices that can detect the presence and concentration of various hazardous gases and vapors, such as toxic or explosive gases, volatile organic compounds (VOCs), humidity, and odors. Fragile material of MQ-2 gas sensor is  $\text{SnO}_2$ , which with lower conductivity in clean air. Right when the goal burnable gas exist, the sensor's conductivity is progressively higher close by the gas center rising. You should use clear electro circuit, Convert change

of conductivity to look at caution sign of gas obsession. MQ2 gas sensor has high affectability to LPG, Propane and Hydrogen, also could be used to Methane and other burnable steam, it is with negligible exertion and suitable for different application.

Sensor is delicate to flammable gas and smoke. Smoke sensor is given 5 volt to control it. Smoke sensor show smoke by the voltage that it yields. More smoke more yield. A potentiometer is given to change the affectability.

In any case, when smoke exist sensor gives a basic resistive yield reliant on union of smoke. The circuit has a hotter. Power is given to hotter by VCC and GND from power supply. The circuit has a variable resistor. The check over the pin depends upon the smoke in air in the sensor. The deterrent will be cut down if the substance is more. Besides, voltage is extended between the sensor and weight resistor. 9  
GSM Module

This GSM modem has a SIM800A chip and RS232 interface while enables easy connection with the computer or laptop using the USB to Serial connector or to the microcontroller using the RS232 to TTL converter.



Once you connect the SIM800 28 modem using the USB to RS232 connector, you need to find the correct COM port from the Device Manger of the USB to Serial Adapter.

Then you can open Putty or any other terminal software and open an connection to that COM port at 9600 baud rate, which is the default baud rate of this modem. Once a serial connection is open through the computer or your microcontroller you can start sending the AT commands. When you send AT commands for example: "AT\r" you should receive back a reply from the SIM800 modem saying "OK" or other response depending on the command send.

## V. WIFI MODULE

Is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network.

The ESP8266 is capable of either hosting an application or offloading all WiFi networking

functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much WiFi-ability as a WiFi Shield offers (and that's just out of the box)! The ESP8266 module is an extremely cost effective board with a huge, and ever growing, community. 10 This module has a powerful enough on-board processing and storage capability that allows it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of on-chip integration allows for minimal external circuitry, including the front-end module, is designed to occupy minimal PCB area.



The ESP8266 supports APSD for VoIP applications and Bluetooth co-existence interfaces, it contains a self-calibrated RF allowing it to work under all operating conditions, and requires no external RF parts.

There is an almost limitless fountain of information available for the ESP8266, all of which has been provided by amazing community support. In the Documents section below you will find many resources to aid you in using the ESP8266, even instructions on how to transform this module into an IoT (Internet of Things) solution.

## VI. DC MOTOR

A DC motor is an electrical machine that converts electrical energy into mechanical energy The working of DC motor is based on the principle that when a current carrying conductor is placed in a magnetic field, it experiences a mechanical force. The direction of the mechanical force is given by Fleming's Left-hand Rule and its magnitude is given by  $F = BIL$  Newton. The working of the AC motor (Induction motor and Synchronous Motor) is different from the DC motor.



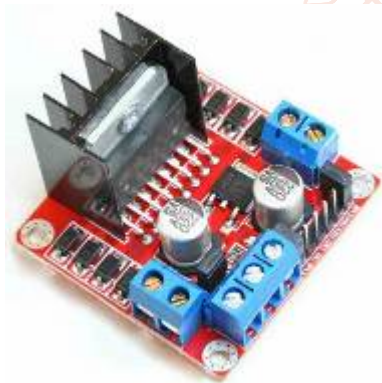
DC motor working There is no basic difference in the construction of a DC generator and a DC motor. In fact, the same DC machine can be used interchangeably as a generator or as a motor. Like generators, there are different types of DC motors which are also classified into shunt-wound, series-wound and compound-wound dc motors.

DC motors are seldom used in ordinary applications because all electric supply companies furnish alternating current. However, for special applications such as in steel mills, mines, and electric trains,

It is advantageous to convert alternating current into direct current in order to use dc motors. The reason is that the speed/torque characteristics of DC motors are much more superior to that of AC motors. Therefore, it is not surprising to note that for industrial drives, DC motors are as popular as three-phase induction motors.

## VII. DC MOTOR DRIVE

If you are planning on assembling your new robot friend, you will eventually want to learn about controlling DC motors.



One of the easiest and inexpensive way to control DC motors is to interface L298N Motor Driver with Arduino. It can control both speed and spinning direction of two DC motors And as a bonus, it can even control a bipolar stepper motor like NEMA 17. Controlling a DC Motor In order to have a complete control over DC motor, we have to control its speed and rotation direction. This can be achieved by combining these two techniques.

DC motor Drive 14 PWM – For controlling speed H-Bridge – For controlling rotation direction PWM – For controlling speed The speed of a DC motor can be controlled by varying its input voltage. A common technique for doing this is to use PWM (Pulse Width Modulation) PWM is a technique where average value of the input voltage is adjusted by sending a series of ON-OFF pulses.

## VIII. ULTRASONIC SENSOR

ultrasonic sensors measure distance by using ultrasonic waves. The sensor head emits an ultrasonic

wave and receives the wave reflected back from the target. Ultrasonic Sensors measure the distance to the target by measuring the time between the emission and reception. An optical sensor has a transmitter and receiver, whereas an ultrasonic sensor uses a single ultrasonic element for both emission and reception. In a reflective model ultrasonic sensor, a single oscillator emits and receives ultrasonic waves alternately. This enables miniaturization of the sensor head.



The distance can be calculated with the following formula:  $Distance\ L = 1/2 \times T \times C$  where L is the distance, T is the time between the emission and reception, and C is the sonic speed. (The value is multiplied by 1/2 because T is the time for go-and-return distance.) Since ultrasonic waves can reflect off a glass or liquid surface and return to the sensor head, even transparent targets can be detected. Detection is not affected by accumulation of dust or dirt. Presence detection is stable even for targets such as mesh trays or springs.

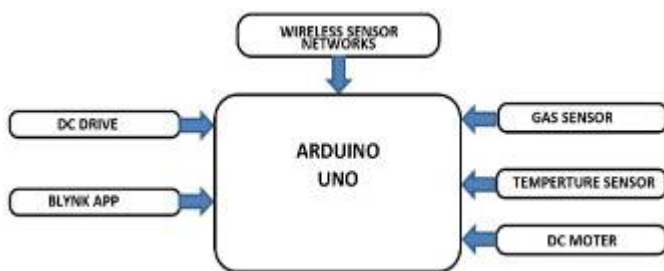
## IX. EXISTING:

In coal mine noticing structures are consistently wired association systems that accept a critical part in choosing coal mining tunnel prosperity. In the event that any sort of blast happens, the wired organization will get harmed and it is extremely challenging to supplant it. It will require some investment utilization to fix those networks [1-2]. To defeat this, the coal mineshaft security estimation framework utilizing Internet of Things was planned and carried out. The gadget involves making a Wireless Sensor Network (WSN) utilizing an Arduino UNO regulator to follow the underground mine's condition [3-5]. This further develops creation security control and decreases coal mineshaft mishaps. Remote sensor networks are comprised of countless miniature sensor hubs that have a little volume and minimal expense and can be sent anyplace, while laying link for underground observing is a mind boggling, tedious, and exorbitant operation.

## X. PROPOSED SYSTEM:

In coal mineshaft ventures is utilized to delivered electric force which is more significant and the force creating a lot more sorts. What's more, one of its mining, our task completely dependent on mine

security and alarming framework with employments of IOT (Internet of Things)? We utilized a robot for dissecting the risk in going through mining and observing the climate, issues. We will utilize LDR sensor, GAS sensor, RF sensor, LM35 (temperature sensor) and miniature camera for representation for regulator working the robot. Presently we see employments of sensor LDR (light ward resistor) when LDR is dim spot its protections is high and, when the LDR is light places its protections is low, GAS sensor is utilized for recognize the carbon dioxide rate in mining places, the mine designers work in underground so the LM35 sensor used to estimating the temperature, RF is ace regulator and it will be rise the back rub on IOT Fire, flood, mine breakdown, mine blast, risky environment and particulate matter are a portion of the perils related with underground mining. The mine current circumstance present underground is risky because of the outflows methane, nitrous oxide carbon monoxide and so on so we reason that it will be helpful for mine designing security.



## XI. CONCLUSION:

A real time monitoring system is developed to provide dearer and more point to point perspective of the underground mine. This system is displaying the parameters on the monitoring unit; it will be helpful to all miners present inside the mine to save their life before any casualty occurs. Alarm triggers when sensor values crosses the threshold level. This system also stores all the data in the computer for future inspection.

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