

# A Novel IOT Based Solution for Coal Mine Accident Prevention and Rescue System.

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## Abstract

The proposed idea is the implementation of a Surveillance Robot for observing, identifying, and detecting the heady parameters inside the coal mine. This robot acts as vital agent in the coal mines and executes all the rescue operations. Most of the coal mines require underground mining, this implemented method will be accounted for about 60% of the coal production in the world. This survey study inaugurates the need of environmental monitoring system. Due the harmful gases released from the coal mine industries and due to the leakages of toxics the major accidents are taking place. Augmentation in temperature variations inside the coal mines are also one of the harmful situation. For these extensive rescue operations, they need this type of robots that are used to rescue the lives of miners from unexpected threats. This robot can travel through underground section in the coal mine and by implementing this idea, the data like combustible gasses (CO, CH<sub>4</sub>, CNG gases) percentage and temperature in mine can be displayed with a wireless device by Collecting the information from the respective departments It alerts the employees and gives safety alert to them when the environmental conditions in the mine are in danger.

## Article History

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## Existing System:

The existing technology is little bit complex and which cannot be movable from one place to another the complications in existing system are:

- Breakages in fibers during data transmission.
- Unavailability of continuous data transmission.

- Absence of direct contact with Ground Section.

So, there is a need for the implementation of Wireless Network System for continuous data transmission and for quickly detecting the environmental conditions[1-3]

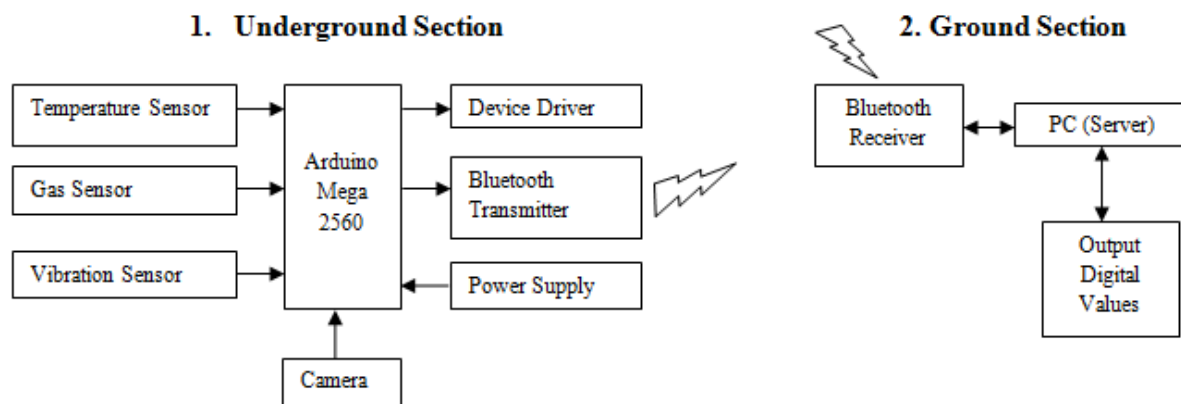
## Proposed System:

The Surveillance Robot uses a simple but efficient technology. For the accuracy of

existing system, proposed system has been designed.

The operations are carried out on Arduino Mega 2560 and a Bluetooth ranging module has been used for wireless communication

### Block Diagram



### Working Principle:

This system mainly operates in two sections for the final output to be displayed on the PC.

- **Underground Section:** This section consists of all the wireless sensors which detects the environmental and temperature variations. The output from this section is ultimately sent to the Ground Section through the Bluetooth transmitter.
- **Ground Section:** The Ground Section consists of Bluetooth receiver which receives the information from Bluetooth transmitter from Underground Section. The output values of the environment are finally displayed on the PC. This section also consists of Wireless A/V Camera

inside the coal mine. The proposed system comprises of two sections for continuous data transmission[2]. They are:

- Underground Section.
- Ground Section.

for clear visualization of the environmental conditions in the coal mine[3]

### Hardware Description:

- **Arduino Mega 2560:** It belongs to the family of microcontrollers based on ATmega 2560. It consists of 54 digital I/O pins. It's operating voltage is 7-12V volts. It also consists of 16 analog inputs. It can supply DC current of 40mA per pin. It is mainly suggested for more complex projects especially for Robotics and Embedded Systems based projects[4].

- **Bluetooth Module (HC-05):** It is a module designed for Wireless Communication. It is mainly used for communication between the devices such as smartphones. It consists of input supply voltage of 3.3-5V.
- **Motor Drivers:** These are the devices which makes the robot movable. Motors convert electrical energy into physical motion which in turn facilitates motion in robot. They can control the speed of the DC motors by simply controlling the input voltage.
- **Servo Motor:** Generally, Servo motors are used to control shaft motion very exactly. These motors consist of built-in circuitry to control their movement. They are small in size and can be connected directly to the Arduino to facilitate the movement of the shaft precisely.
- **Sensors:** Different types of sensors had been used in this project namely Temperature Sensor(LM35), Gas Sensor(MQ<sub>4</sub>), Vibration Sensor, Ultrasonic Sensor. These all are the wireless sensors utilized for environmental monitoring.
- **Wireless A/V Camera:** Wireless Camera is used for monitoring purpose. It consists of built-in microphone for audio monitoring. It is mainly used for theft prevention, home security and for the transmission of audio and video signals to the receiver. The transmission range is upto 200 ft.

### Software Design:

The software design flow is given as follows:

- **Open-source Arduino Software (IDE):** Arduino Software makes it simple to write the embedded code and for uploading it to the arduino board. This software runs on Windows, Mac OS X and Linux operating systems.

### Conclusion:

Coal mine workers are benefited using this system. By using sensors like LM35, MQ<sub>4</sub>, environmental monitoring is facilitated very effectively. Hence, this system increases the life safety of coal mine workers.

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