

# VIRTUAL REALITY BASED ROBOT FOR COAL MINES

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**Abstract**— In these times laborer in coal mines are passed away due to coal mine disasters: to control the fatality in the coal mine, we are scheming using VR environment. By this method, can simply interrupt or view what is occurring on the coal mine cave. The robot conveys the data about the current condition of the coal mine habitat in the dynamic form. When differentiated with other robots, our robot can give the data with more rightness inconsiderable necessity. VR robot is actually a robot which is automatic. The robot is made of different sensors like temperature sensor, humidity sensor, fire sensor, vibration sensor, IR sensor, gas sensor etc., The gas sensor and other sensors are operated and gives the coal mine environmental data for higher quality function of robots.

The data under the coal mine cave are collected and conveyed it to the PIC microcontroller. Then PIC controller will collect and transfer the data through the Wi-F- module. From the Wi-Fi module the data is passed to the control station.

**Keywords**—*component; formatting; style; styling; insert (key words)*

## I. INTRODUCTION

A coal mining is done in the deepest of the earth. There is only countable entrance way on ground. If the miners are concerned in cave and they cannot get out from it. Unpredictable accidents can occur in the coal mines such as gas explosion, leakage of methane gas, land-slides, lack of O<sub>2</sub> content, extreme temperature, smog, dirt, fire accidents, leakage of CO, CO<sub>2</sub> etc., These things may cause injury /difficulty to the workers and can also cause death. Methane gas is released during mining. Though the ventilation system is provided to take off the poisonous gases, there are some accidents occurring, since mining is done in the deepest of the earth and it has the tapered cave which can cause the damage to the workers. The robot is an ideal tool in the coal mine disaster. The robot must be designed as a flame proof device to avoid malfunction of components.

The coal mine cave consists of carbon-di-oxide, carbon-monoxide, methane, hydrogen sulphide, coal dirt etc., and the nature of the cave consists of extreme temperature, less oxygen level to humans to survive. Workers in the cave could be affected by high temperature, carbon-monoxide, carbon-di-oxide, methane, lack of oxygen for humans to breathe, and coal dirt. In this condition if any disaster has occurred the rescue team

cannot enter into the coal mine cave because condition is not known, this can affect and kill any of the rescue workers. To prevent this, in the environmental condition should be monitored prior to the entry and which gives the information of the cave along with the live streaming with the details of condition in the coal mine cave in automatic way.

The robot used in the coal mine should possess extra special characteristics which are unique from other robots. The first problem is leakage of methane gas, which in contact with oxygen cause explosion, so the robot must be modelled as a fire proof to avoid damage of the elements in the robot. The tapered cave is the second problem, conveying information is another problem in the coal mine cave.

## II. METHODOLOGY

The approach towards the making of proposed robot has been split into different steps called methodology. The steps start from designing, modeling and controlling of the robot. The VR robot is normally an automatic robot. The hardware at local site of robot is composed of different type of sensors like MQ-2 for gas sensor, LM-35 for temperature sensor, humidity sensor, IR sensor, Wi-Fi transceiver etc., and the details of the circumstances inside the coal mine cave are collected and conveyed it to the PIC microcontroller, then the PIC microcontroller pass on the information through the Wi-Fi module, from the Wi-Fi module the details/ information is passed to the site. Wi-Fi transmits this digital sensor data to remote monitoring site located at maximum distance from local site(30m), which is outside the coal mine cave, and by using routers distance can be extended to get the information about the cave. The wireless camera is incorporated on the robot. The wireless camera on the robot gives the real time data. There is no basic idea that what will be happening inside the coal mine cave during mining. So, when any disaster has occurred, the cartographical circumstances become more composite, at any time and there is a chance of subsidiary accidents/destructions happening in the coal mine. The Wi-Fi module at the remote monitoring site will transmit alert signal to the local site by blowing buzzer continuously. The rescue robot not only monitor the conditions in the coal mines but also performs the rescue operation. When robot enters into the coal mine cave it

collects all the environmental data through the different sensors and Wi-Fi module and display on the LCD display which is inside the coal mine cave and also convey the information to the rescue. If any parameter is exceeding than the set limit the alert signal is given and required precautionary measures are taken by the workers as well as the rescue team in the local site to minimize the accidents. During the disaster the robot enters into the coal mine cave and collects all the data through the sensors and camera and transmits the data regarding disaster to the local site and the site team can get a brief idea of the cave. So that they can save the workers. The VR robot also perform the rescue operation. The number of people inside the coal mine is monitored by the help of IR sensor, temperature sensor like LM-35, gas sensor like MQ-2. During a hazard this information will be useful to know whether there are any people remained inside the coal mine. Information regarding the safety measures like wearing O<sub>2</sub> helmets etc., will be already given to the workers so that they can safe their life. If any of the received parameters are beyond the set limit, then a buzzer will be ON, giving warning to the people. The parameters are displayed on the android app and as well as transmitted to the coal mine section through the Wi-Fi trans-receiver.

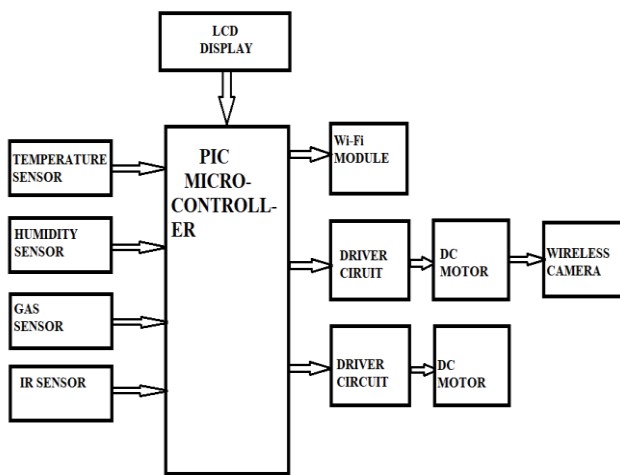


Fig 1: block diagram

Receiver:

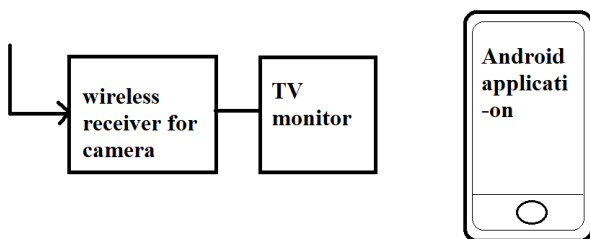


Fig 2: output

### III. AUTOMATIC SYSTEM

In the coal mine cave, the automatic control is required for the better performance of the robot. The information and the

live streaming video are conveyed by the sensors and the wireless camera via the Wi-Fi module. If any tragedy has happened the information about the coal mine environment is instantly passed to the retard via the Wi-Fi module.

The information about the rate of calamity and the location of calamity is conveyed to the rescue teams so that they can make the rescue operation easily and effectively.

### IV. EXISTING SYSTEM

In the present existing system, they achieved the locomotion efficiency of the rescue detection robot at certain circumstances of accidents in coal mine. VR robotics was used to construct the automatic control system in this paper. By using essential robotics to attain the instinctive expression of the location, and surrounding of the robot. In order to recognize the conditions and merging the effective modelling of robots. This robotics, to rebuild the ransom zone, the automatic control system based on virtual reality makes statistics consonant between the virtual reality surroundings and actuality environment. The modules and their functions of the automatic control system based on virtual reality are initiated, the fundamental theories and procedures are awarded as well. A virtual reality based automatic control system and the rescue robot to observe the environmental conditions to save the workers, is built under the laboratory conditions and the active modelling system meshed into the sub-system. The outcome shows that the technique can gather and exhibit the data surrounding the environment in the coal mine and robot gives the information of the environment inside the coal mine through the Wi-Fi module.

### V. HARDWARE COMPONENT USED:

1. PIC microcontroller
2. IR sensor
3. Gas sensor
4. Humidity sensor
5. Temperature sensor
6. Wi-Fi module
7. Wireless camera
8. 4 channel relay modules
9. DC motor

1. PIC microcontroller:

It is a controller that helps in collecting the sensors data and store it on its memory, then it transfers the data via the Wi-Fi module to the end users.

2. IR sensor:

It is the electronic device consisting of two LED lights, one is transparent and continuously emits the IR radiation and the other is photodiode. If any obstacle interrupts the IR radiation, it reflects back to the photo diode there by detecting the object.

3. Gas sensor:

These sensors will detect the range of gases present in the coal mine cave and transfers the information to the control station in the discrete form.

#### 4. Humidity sensor:

These sensors are the one which detect the range of water-vapor content present in the coal mine cave and transfers the values in discrete form to controllers.

#### 5. Temperature sensor:

These sensors are the one which dragonize the amount of heat in the coal mine cave and transfer the value to the microcontroller.

#### 6. Wi-Fi module:

This Wi-Fi module collects all the sensor data from the controller and transfers it to the rescue team via the wireless telegraphy.

#### 7. Wireless camera:

This camera transmits the live video streaming via the radio transmitter.

#### 8. 4-channel relay module:

A relay is the electrically operated switch, their main use is to control the circuits by low power signal.

#### 9. DC motor:

A DC motor is an electrical machine that converts electrical energy into mechanical energy.

### VI. APPLICATIONS

1. In VR technology, it is used to get the information in live manner about fire, temperature, humidity, gases by using different sensors present in the device.
2. It is used to get the status of cave condition.
3. A rescue robot helps to find the location of accidents, search for survivors to assist in first aid treatment's
4. It also informs the rescue team about environmental conditions and the possibility of survivors at the disaster.

### VII. CONCLUSION

We conclude that, this project provides security to the miners with the help of the robot. The robot will monitor the condition of the coal mining such as temperature, oxygen level, humidity and other hazardous gases using sensors and provide the clear vision of the cave using wireless camera. So that the information is given to the rescue team and they can take precautionary measures prior to the occurrence of the disaster. This project is constructed with the hope that it is very much convenient and useful to the workers in the underground coal mine cave.

### VIII. FUTURE SCOPE

Future this project can evolved to provide human safety for the workers in the mine cave. This can be executed in the real time application by using various sensors like oxygen sensor, vibration sensor, fire sensor can be added and thus helping to get a much improve image of the environment inside. When the workers trapped in the disaster it helps to supply the food and medicine. And also, to monitor the water level if present and checks the possibility of earthquake occurrence. By incorporating the mechanical part to the robot, the robot can remove the debris and it can go inside the coal mine during disaster and save the workers.

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