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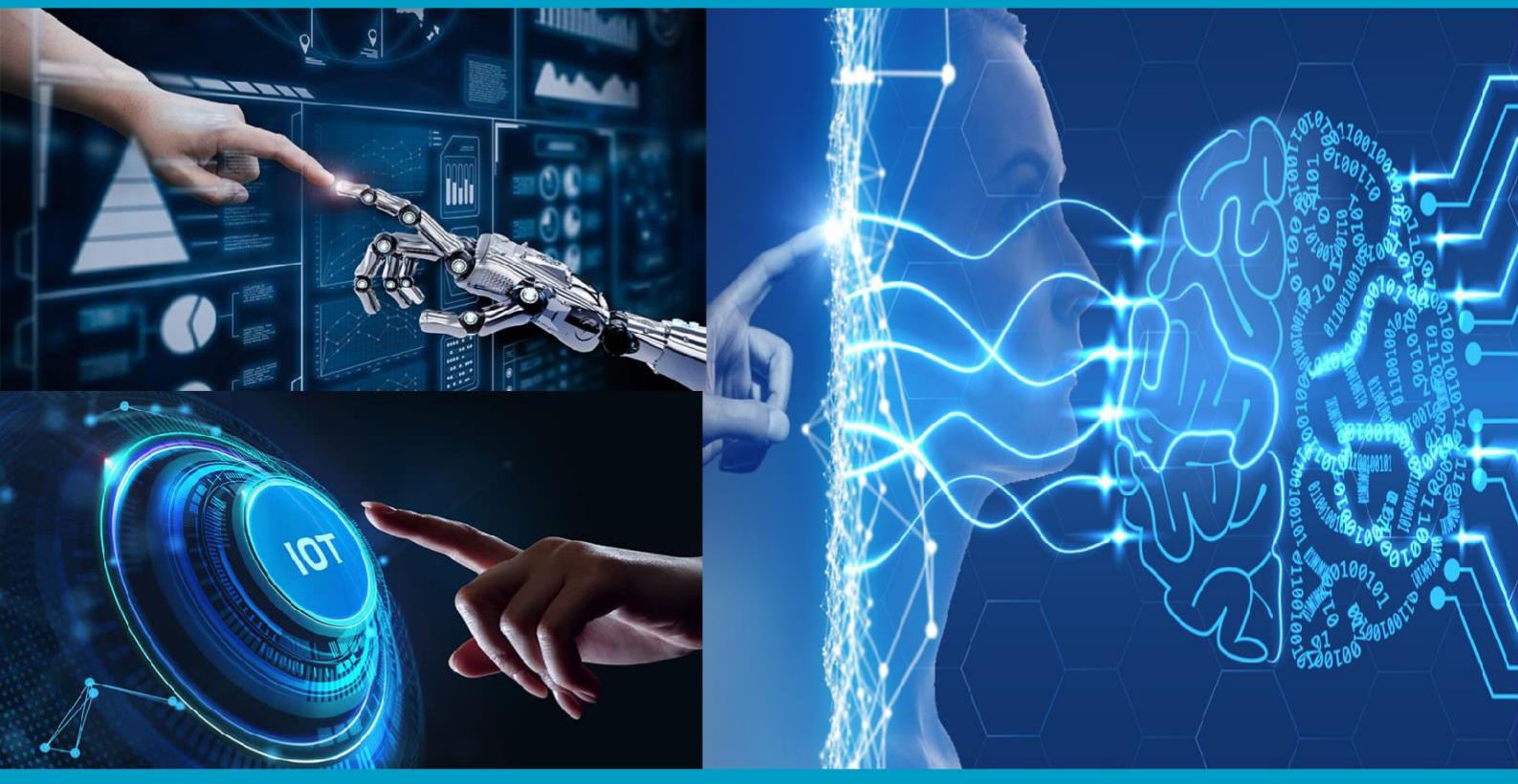

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MINING RESCUE ROBOT

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ABSTRACT : Underground mining, ground movement (roof/side collapse), flooding, drafts, etc. She faces many problems like; as well as gas and dust explosions limited to coal mines. Regardless of the cause and type of accident or the extent of the damage, reaching trapped miners is a dangerous task for the rescue team. The impact/non-breathing area, in addition to the lack of oxygen, has an increase in pollutants such as carbon dioxide and carbon monoxide and pollutants such as methane. All roads and streets are full of smoke or obstruct the view of rescuers when there is a flood to collect. Therefore, the ideal solution in such cases is to deploy a wireless robot equipped with a gas sensor and a camera to facilitate observation even in very low light conditions.

KEYWORDS: Mine rescue, Mining robotics, Rescue robotics, Underground robotics, Bluetooth

I. INTRODUCTION

Coal is the main source of electricity in our country. The robot will be sent to the mine to transmit data from cameras and sensors to the main system to control the robot using radio frequency to increase worker safety and improve fast job search without workers entering. In this study, a wireless monitoring and security system is proposed for underground mining robots based on wireless RF communication, which will use different sensors to get information about the environment of the mine on land and send data to the control room using Rf.

Robotic systems should be used to collect data from the mine site and tunnels using different sensors and to regularly send data from the main control system. It can accurately display the gas amount, humidity, and temperature in each soil.

It also helps identify and initiate work in hazardous areas. There are also robots to control the environment in my spare time. The robots will be specially designed to work in harsh conditions. In other words, regardless of the model and capacity of the robot, it will work in mines and tunnels. It takes the worst-case scenario like causing a gas explosion.

Therefore, many countries have adopted some regulations and standards for mobile robots to operate in hazardous areas. In this case, the robots will be designed and built according to these rules. Most robots in hazardous areas must be fireproof and waterproof. It will reduce the explosion. Robots will be sent to the mine to transmit information from cameras and sensors about the environment in the danger zone to a portable console in the hands of the team. The purpose of this study is to increase personal security and speed up the process before entering.

II. RELATED WORK

Hemanth Reddy A et.al. Underground mining is beset with numerous problems such as ground movement (fall of roof / sides), inundation, air blast, etc.; apart from the gas explosions and dust explosions that are restricted to coal mines. Underground mines are broadly classified into two type: coal mines and non-coal mines . Non-coal mines basically consist of metalliferous mines that are relatively deep seated compared to the coal mines The major problems encountered while working underground are confined space, high heat and humidity, unpleasant atmosphere and most importantly poor lighting conditions. These conditions are worsened immediately after an accident thereby making it difficult for rescue personnel to enter the accident zones and carry out the rescue operations on time[1].

LI Yun-wang et.al According to the different structure of the two robots, the concentrated and dispersed flameproof enclosures are respectively designed for the track-type robot and a rocker-type robot. This paper can provide reference for the explosion-proof design for coal mine robots. According to the structure and functions of robots, the robots can adopt the combination of several protection types, such as combination of flameproof enclosure and intrinsic safety, combination of pressurized enclosure and intrinsic safety, and combination of flameproof enclosure, pressurized enclosure and intrinsic safety. The flameproof enclosure type needs a flameproof enclosure that is designed to prevent an interior explosion from transferring enough energy to the external environment to trigger an explosion of that environment. Therefore, the robot of flameproof type requires a strength enough flameproof enclosure that is designed according to the explosion-proof requirements. Hence, this type robot's weight is heavy [2].

Hua Zhu et.al The scene is also impossible to reach with GPS, and other wireless positioning methods that rely on base stations are unavailable in the event of post-disaster power interruption. In future work, a multi-sensor fusion including IMU and infrared vision will be carried out to improve accuracy performance in degenerate directions. Scan registration is the core of laser-based SLAM approaches, solving the problems of feature extraction, data correlation and motion estimation. Our

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work is based on the NDT method to construct lidar odometry. Unlike ICP and its variants which look for associated features such as points, lines, and planes, NDT uses range scans to describe the environment model. The space is partitioned into cells and normal distributions are assigned to represent the probability model of the measured space [3].

Jeremy Green et.al The process formed part of a Melrose Training conference titled: Mine Emergency Preparedness and Rescue Innovation (MEPRI). The presentation then went on to describe current work in the development of mine rescue robotics. robotics This is a record of completed robots form the past. It presents an idea of the broad range of development in the field of Mine rescue robotics. This is a record of completed robots form the past. It presents an idea of the broad range of development in the field of Mine Rescue Robotics. It excludes the work directed at the Robo cup Rescue competitions, which have many overlapping technology requirements [4].

Robin R Murphy et.al Ground recue robots have been used in mine disasters worldwide, with five of those deployments involving the centre for robot-assisted search and rescue (CRASAR). The significant number of deployments suggest there is sufficient experience to comment on the usability of rescue robots. A robot with poor usability will fail or underperform in the field thus becoming a hinderance or distraction to recue operations rather than a benefit. Our experiences with nine robots at five incidents identifies barriers to both forms of usability [5].

III. METHODOLOGY

Arduino is an electronic board, which is a type of microcontroller that can control both physically and digitally. Arduino board is embedded with a chip and compiler that can be programmed by c-language. It helps in receiving the input from the user and control the movement of robot [6].

On the robot side, we use an Arduino microcontroller placed on the robot body or chassis, which is an important part of the robot car. Under the chassis, the wheels are connected to DC motors at 30 rpm each. All motors require 12V power from an external battery. The motor interfaces with the Arduino via a relay driver. Four relay drivers are used for two motors and they are used for power generation [7].

MINING RESCUE ROBOT PROCESS FLOW

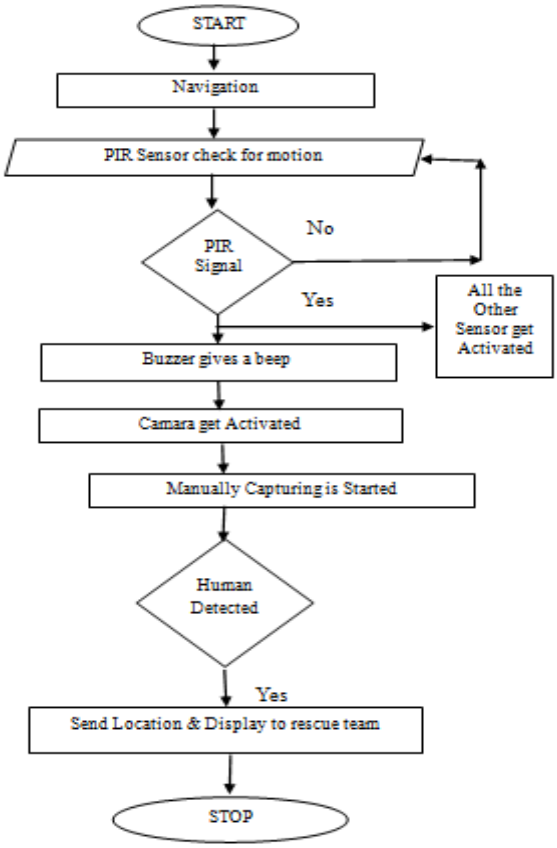

Fig 3.1 Flowchart of Project

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IV. EXPERIMENTAL RESULTS

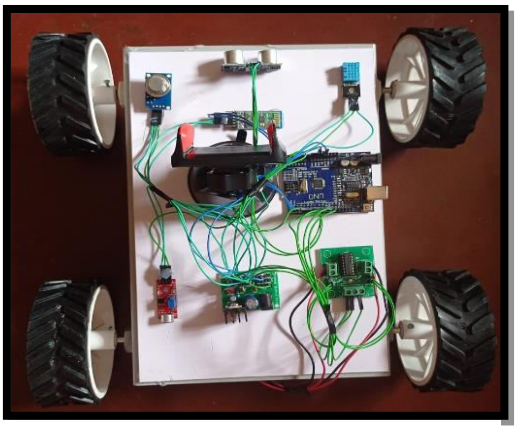

Fig 4.1 Top view of The Mining Rescue Robot

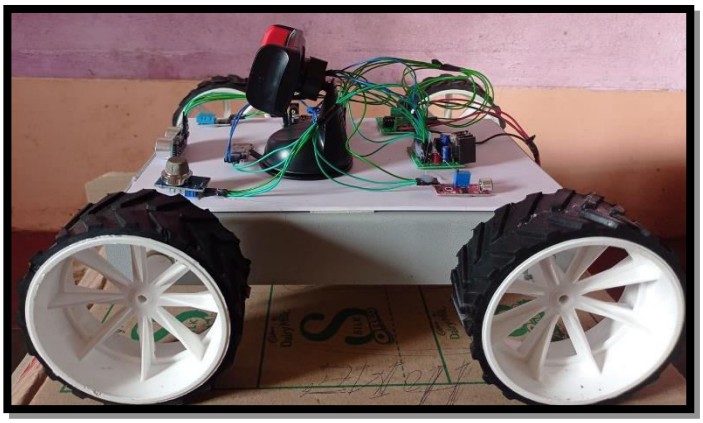

Fig 4.2 Side view of The Mining Rescue Robot

As shown in figure 4.2, the base of the robot is built with DC motors. The motors are connected to a rubber sprocket which can help move the robot through difficult terrains. The motors are controlled by PC via Bluetooth communication using the camera to view the path in front of the robot.

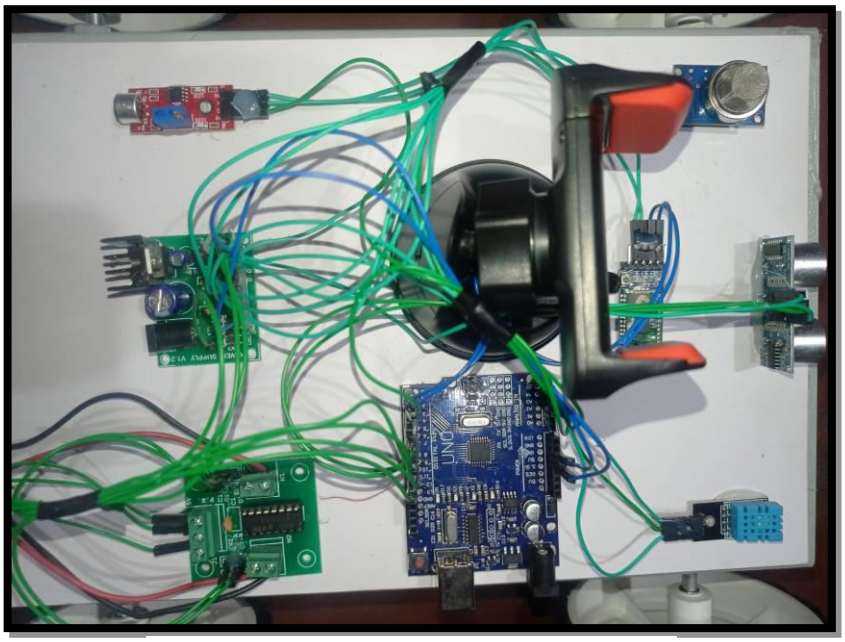

Fig 4.3 Sensor circuit of the project.

As shown in Fig 4.3, the sensor circuitry consists of gas sensors, humidity sensor, temperature Sensor, humitidy Sensor, IR Sensor, fire Sensor, Arduino, bluetooth. The data information from the sensors are coded to be displayed on the GUI on the PC at base. The data is received by the Arduino mega where the information is coded to be displayed on the PC and smart phones. The sensor circuitry collects the data to display it on the Smart phone, which is present on the body of the robot and transmits the data to the PC at base via bluetooth communication.

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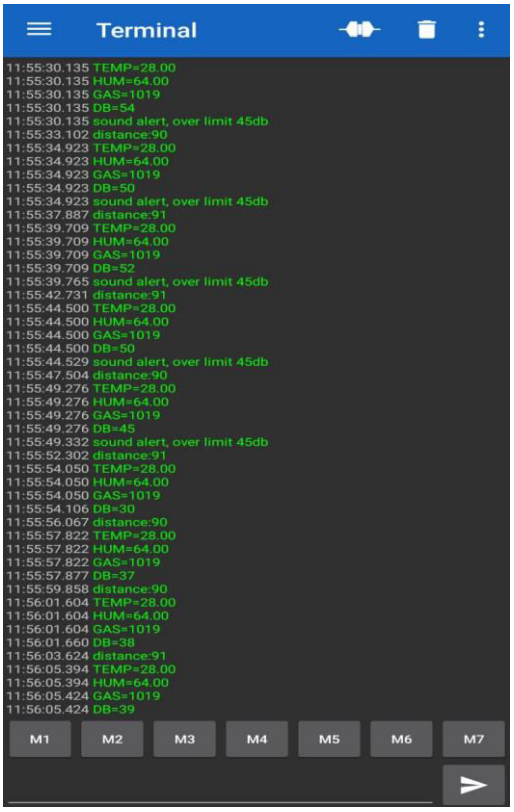

Fig 4.4 Commands & Output.

As shown in Fig 4.4, the coding had been done such that, by using the commands, '8', '2', '4', '6', the Moving system moves in the predefined directions Forward, Backward, Left and Right directions respectively. To stop the Moving system the command '5' is used. The sensor circuitry built in the Mining Rescue robot helps in finding the environmental composition of air. The Arduino mega collects all the data which is then coded to be display the data on the pc and smart phone. The segment of the code is shown in Fig 4.4 with comments.

V. CONCLUSION

The mining robot is successfully designed and accomplished in this project. The operation of coal mining robots in underground facilities is verified. The gas sensor helps to detect the hazardous gas present in that place while the ultrasonic sensor that helps to detect distance of the target. Then temperature and humidity sensor that gives the details of temperature. Android camera gives the details of the target condition. Dust sensor sends the information regarding the level of dust in that place. These results are successfully verified.

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