

Developing and Controlling the Mine Detection Robot System

Mrs. CH. Nishanthi¹, B. Nikhil², M. Jahnavi³, N. Sahana⁴, Y. Rohith Reddy⁵

¹Assistant Professor, Department of Electronics and Communication Engineering, Teegala Krishna Reddy Engineering College, Hyderabad, Telangana, India

^{2,3,4} student, Department of Electronics and Communication Engineering, Teegala Krishna Reddy Engineering College, Hyderabad, Telangana, India

Abstract - This paper framework the areas where landmines are buried used to be in the war zones where infrastructure such as roads and bridges has been destroyed, thus making it difficult to transport large mine-handling vehicles built on the basis of construction machine to such zones. Therefore, we are here to develop a landmine detection robot with the following concepts; 1. It has a capacity of running on rough terrains. 2. Mine detector and confirmation device can be mounted on a single robot. 3. The robot is mountable on a two-ton vehicle and the vehicle body can be disassembled into modules for transportation by airplane or for maintenance service. 4. It is weather resistant for assured operation under such adverse climatic conditions. 5. The vehicle body is structured resistant to explosion of an antipersonnel mine in a possible mishap to allow its operators safe return from a minefield.

Index Terms - Robotics, Arduino Uno, Metal Sensor, Fire Sensor, Temperature Sensor, GPS, Bluetooth, Motor Driver, Relays, Water Sprinkler, Fan.

I. INTRODUCTION

There are many countries affected by landmines which present a major threat to lives and cause economic problems. Landmines are harmful because of their unknown positions and often difficult to detect. The development of new demining technologies is difficult because of the tremendous diversity of terrains and environmental conditions in which mines are laid and also because of the wide variety of landmines. Currently, detecting and clearing mines demand specific expertise with special equipment. Use of robots for landmine detection provides a reduction in cost of mine detection and low risk of life as these can be operated wirelessly from a distance.

II. EXISTING SYSTEM

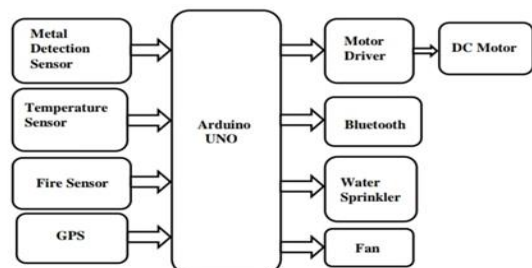
In the existing system, man has to find the mines. It is time consuming process. This robot is used to detect and control the mines in a very effective manner, and this consumes less time. Especially, in the field of electronics automated systems are giving good performance. In the present scenario of war situations, unmanned systems play very useful to do operations like detecting metals, detecting fire and controlling them.

III. PROPOSED SYSTEM

Our proposed system concentrates on developing and controlling a mine detecting robot as a part of the landmine detection system. And this robot is used in the places where man cannot enter to monitor the parameters continuously.

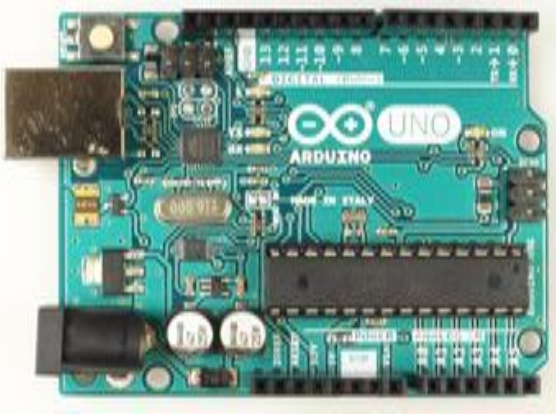
In this we will write a code to the Arduino board and start initializing the values. According to the values the robot will move. We also proposed controlling of the metal, fire, temperature is detected, and sprinkler and fan will turn on according to the sensor detection. Introducing the GPS module, we can find the exact location of the robot and can know the updates of the robot.

IV. BLOCK DIAGRAM



ARDUINO UNO

Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins, 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.



Features of Arduino UNO

It contains ATMEGA328P Micro Controller
It is a 8-bit microcontroller.
It contains 28 pins arranged in dual-in-line-package
It contains 14 digital pins and 6 analog pins.
It has 32kb of flash memory, 2kb of SRAM and 1kb of EEPROM.
Operating frequency is 5v.

METAL SENSOR



When a metal object enters this field, eddy currents are induced into the object. As the metal moves closer to the sensor, these eddy currents increase and result in an absorption of energy from the coil which dampens the oscillator amplitude until it finally stops.

FIRE SENSOR

A fire detector works by detecting smoke/heat. These devices respond to the presence of smoke or extremely high temperatures that are present with fire.



Specifications

Operating Voltage: 3.3V to 5V DC
Operating Current: 15ma
Output Digital - 0V to 5V, Adjustable trigger level from preset
Output Analog - 0V to 5V based on infrared radiation from fire flame falling on the sensor
LM393 based design

TEMPERATURE SENSOR



A temperature sensor is an electronic device that measures the temperature of its environment and converts the input data into electronic data to record, monitor, or signal temperature changes. It is used to measure temperature readings through electrical signals. LM35 is a temperature sensor that outputs an analog signal which is proportional to instantaneous temperature.

GPS

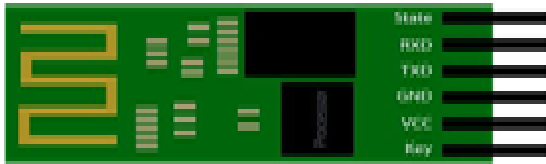
Global Positioning System (GPS) has been around since the 80's and is still one of the most important features you can add to any electronic system.



The idea of tracking something is cool enough but doing so without a telephone or an internet connection is much cooler. The whole GPS system depends on 24 (minimum) satellites orbiting the earth. Each satellite continually broadcast their current time and position. Generally, a GPS receiver requires a connection to at least four of these satellites to acquire data to compute for position. The receiver also computes for the clock difference between it and the satellite.

BLUETOOTH

Bluetooth works on the simple principle of sending and receiving data in the form of radio waves. Every Bluetooth enabled device has a card-like attachment known as Bluetooth adapter.



It is this bluetooth adaptor that sends and receives data. A Bluetooth adaptor has a particular range of connection. It has become a universal standard for exchanging data amongst a range of fixed and mobile devices. Bluetooth wireless technology has the ability to simultaneously handle both the data and voice transmissions.

SPRINKLER

Sprinkler irrigation is the method of applying water in a controlled manner in way similar to rainfall. The water is distributed through a network that may consist of pumps, valves, pipes, and sprinklers.



Sprinklers can be used for residential, industrial, and agricultural usage. It gets sprinkled on the crop. In sprinkler or overhead irrigation, water is piped to one more central locations within the field and distributed by overhead high pressure sprinklers or guns.

FAN

The cooling fan module is a complete electrical subsystem. It is able to set the right speed for the fan. Due to the increasing amount of power consumers it is necessary to protect the engine from overheating.



When the temperature is high, then fan is set to on to decrease the temperature.

MOTOR DRIVER



Motor drivers acts as an interface between the motors and the control circuits. Motor require high amount of current whereas the controller circuit works on low current signals.

DC MOTOR



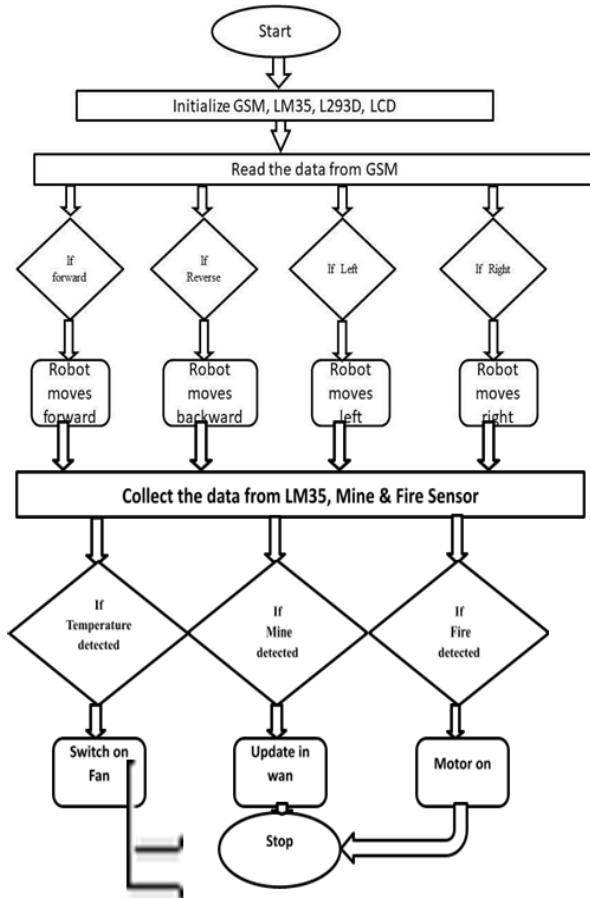
A DC motor converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields.

Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to

periodically change the direction of current in part of the motor.

DC motors operate on Faraday's principle of electromagnetism which states that a current-carrying conductor experiences a force when placed in a magnetic field.

V. FLOW CHART



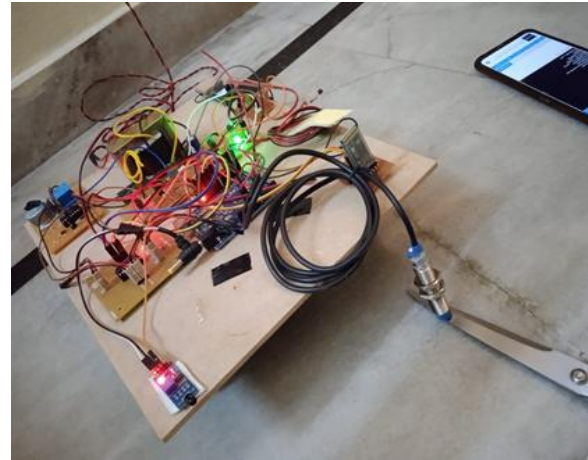
VI. IMPLEMENTATION

First we write a code in Arduino, then upload the code to the Arduino board. Arduino starts initializing. We need to connect all the analog components to the analog pins and digital components to the digital pins of the Arduino board. Connect your mobile with the Bluetooth module to operate the robot. Once they are paired, we can move the robot by giving commands to the Arduino. Then once the data is uploaded to Arduino hardware. Then based on the behavior of the sensor, the Arduino board starts the operational status of the sensors. It also sends the data through the

Bluetooth module to a server and monitors its position through the mobile phone or pc.

VII. RESULT

The output when metal is detected is shown the figure below :

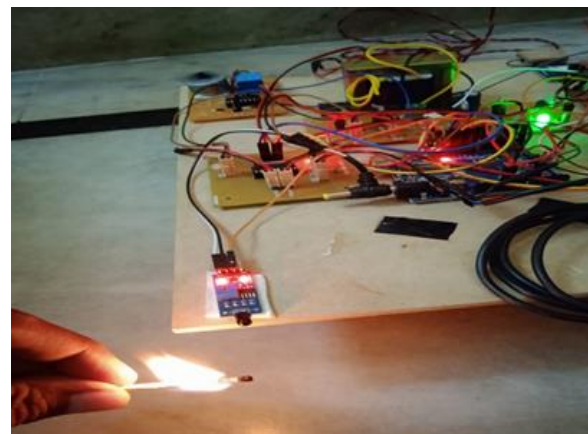


```

Longitude:.....N*
Temperature:28
Temperature Normal,FAN Off
Metal Detected
No Fire Detected
Got GPRMC,V.....,N*53
SGPVTG.....N*30
Latitude:N*53
SGPV
Longitude:.....N*

Temperature:28
Temperature Normal,FAN Off
Metal Detected
No Fire Detected
Got GPRMC,V.....,N*53
SGPVTG.....N*30
Latitude:N*53
SGPV
Longitude:.....N*
  
```

The output when fire is detected is shown in the figure below:

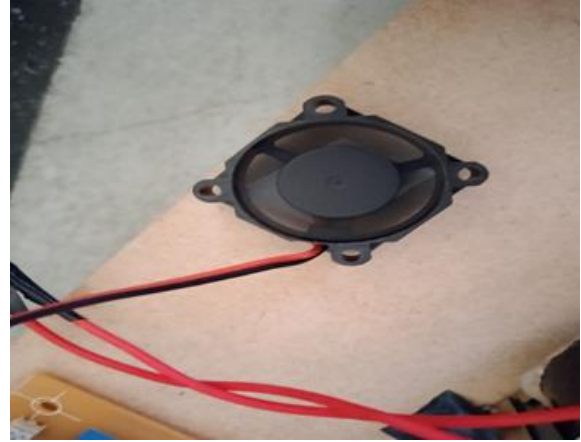


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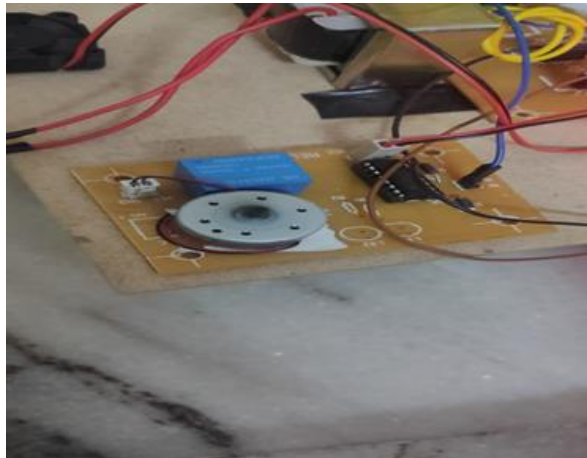
Longitude:,,,,,,N*

Temperature:27
Temperature Normal,FAN Off
No Metal Detected
Fire Detected
Got GPRMC,,V,,,,,,N*53
$GPVTG,,,,,,N*30
Latitude:N*53
$GPV
Longitude:,,,,,,N*

Temperature:27
Temperature Normal,FAN Off
No Metal Detected
Fire Detected
Got GPRMC,,V,,,,,,N*53
$GPVTG,,,,,,N*30
Latitude:N*53
$GPV
Longitude:,,,,,,N*
    
```



When the fire is detected, the sprinkler motor will be on. And it is shown the figure below:



At present, robots are increasingly applied in the security field. Continuous development of robot technology is expanding robot's application to various fields. Here the mine detecting prototype is designed as a robotic vehicle which can sense metals near to it on its track and this robot is controlled by a Bluetooth module application. In addition to this Temperature sensor and Fire sensor are used to find temperature and fire. In future we can also use the camera for better images of buried mines. Another future advancement in this prototype may include Shock absorbers and adjusters that can be installed to the wheels, so that the robot can run on any terrain.

The output when temperature is detected is shown in the figure below:

```

Temperature:48
High Temperature Detected,FAN On
No Metal Detected
No Fire Detected
Got GPRMC,,V,,,,,,N*53
$GPVTG,,,,,,N*30
Latitude:N*53
$GPV
Longitude:,,,,,,N*

Temperature:50
High Temperature Detected,FAN On
No Metal Detected
No Fire Detected
Got GPRMC,,V,,,,,,N*53
$GPVTG,,,,,,N*30
Latitude:N*53
$GPV
Longitude:,,,,,,N*
    
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VIII. CONCLUSION

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