Fabrication of Metal Detector Robotic Vehicle

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Abstract— **This paper presents a new type of robot that uses a metal detector sensor to detect metallic object passing over the metal detector. The robotic bot is controlled using android application for metal detection operation controlled with the help of Wi-Fi technology based on cloud computing. This project can be widely used because of its simplicity and ability to modify to meet changes of needs. Based on experimental studies, it was found that the mobile controlled robot can move in any direction as per the desired instruction and the beeper in the metal detector circuit beeps whenever it encounters any metallic object.**

Keywords—— **ESP8266, Metal Detector, Motor Driver, Android Application, Battery**

I. INTRODUCTION

In today's modern environment, almost everybody uses smartphones, which are a part of their day-today life. This project was about robotic movement control through smartphones. Many researchers [1] have developed such robotic movement control system using smartphones. Here, we aim to make a robot and to connect the metal detector circuit to it. Here, a dedicated application has been created to control robotic hardware, which controls the movement of the robot. This controller receives the commands from the Android phone, takes the data and controls the motors of the robot by the motor driver L293D. The robot can able to move forward, backward, left and right movements. The Smartphone is been interfaced to the device by using Wi-Fi Network. A metal detector circuit was connected to the robot to detect the metal. A beep sound was made when it detected the metal. This work is divided into two sections- hardware and software. Hardware section contains robot making, metal detector, and control unit. In the hardware section, we explain the working of ESP8266 and DC motors and how the robot utilizes them to detect the metallic obstacles. In the section of the metal detector, we describe general information about kind of metal detector and working principles. In the section of the control unit, we describe what kind of microcontroller we use. While in the software section, we explain the algorithm that we use in making the android application and metal detector.

II. LITERATURE SURVEY

In mine clearance robots, fast neutron generation technique, penetrating RADAR (GPR), metal detector and infrared imaging are used for anti-personal mines [1]. The robot with Bluetooth and camera as a controlling system, it is possible to send videos and pictures as same as IOT technology but it has the limitation in the controlling distance [2]. The eight direction metal detection robots provides accurate metal detection and can be easily movable in uneven surface but the electromagnetic wave intensity is very poor so it can able be detect closer objects [3]. The robots made by using AT89552 micro controller unit and the control is done with the help of gestures which is captured through camera of high quality but noise creation will happen also, high efficient filter circuit is used [4].

Mohd Aliff1 , MI Yusof3 , Nor Samsiah Sani2 ,‖Development of Fire Fighting Robot,‖, —Fire incident is a disaster that can potentially cause the loss of life, property damage and permanent disability to the affected victim. They can also suffer from prolonged psychological and trauma. Fire fighters are primarily tasked to handle fire incidents, but they are often exposed to higher risks when extinguishing fire, especially in hazardous environments such as in nuclear power plant, petroleum refineries and gas tanks. They are also faced with other difficulties, particularly if fire occurs in narrow and restricted places, as it is necessary to explore the ruins of buildings and obstacles to extinguish the fire and save the victim. With high barriers and risks in fire extinguishment operations, technological innovations can be utilized to assist firefighting. Therefore, this paper presents the development of a firefighting robot dubbed QRob that can extinguish fire without the need for fire fighters to be exposed to unnecessary danger. QRob is designed to be compact in size than other conventional fire-fighting robot in order to ease small location entry for deeper reach of extinguishing fire in narrow space

III. BLOCK DIAGRAM

A. ESP8266 CONTROLLER

Fig. 1 Block Diagram

Fig. 2 ESP8266 Micro Controller

ESP8266 controller is used as shown in Fig. 2 for assembling metal detection vehicle. The Node Micro Controller Unit (Node MCU) is used as a gateway. It has inbuilt Wi-Fi module which is used to send the sensor data to cloud for storage and analysis. The main motive behind selecting Node MCU is that the sensors used in our project uses only digital pins and one analog Input Pin are compulsory. Also, it consumes less power (3.3v) and is of low cost when compared to other microcontrollers /processors like Arduino and Raspberry pi. Node MCU is connected to metal detector sensor, servo motors, GPS module, L298N motor driver, etc.

- Voltage: 3.3V.
- Wi-Fi Direct (P2P), soft-AP
- Operating current Average: 80mA Flash memory attachable: 16MB max (512K normal).
- Integrated TCP/IP protocol stack.
- Processor: TensilicaL106 32-bit.
- Processor speed: 80~160MHz.
- RAM: 32K + 80K.
- GPIOs: 17 (multiplexed with other functions).

B. METAL DETECTOR

Fig. 3 Metal Detector

Metal detector is attached to the front bottom of the robot for detecting the landmines and the detected data is sent to the microcontroller for the process.

C. BUZZER

This is the metal detection alert in the form of sound, during the metal detected process the microcontroller stops the robot motion and sends a signal to the buzzer to start.
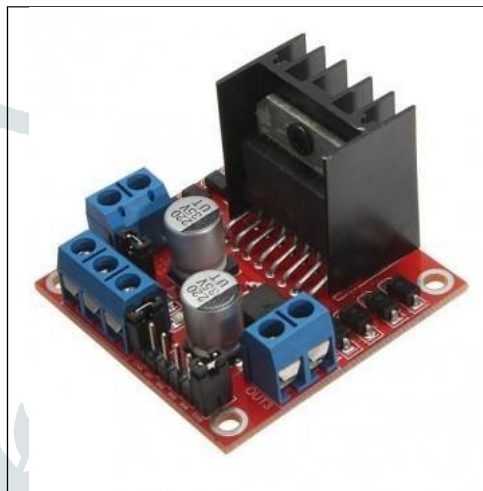
D. MOTOR DRIVER

Fig. 4 Motor Driver

Motor drivers are connected to drive robot motors having high power requirements as shown in Fig. 4. Based on the DTMF commands, the microcontroller sends a signal to the motor driver to drive the motors for the robot's movements.
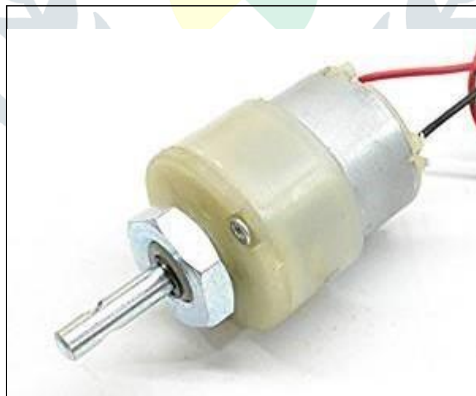
E. MOTORS

Fig. 5 DC Motor (12Volt)

DC geared motors of 12 volt as shown Fig. 5 is attached to the robot for providing mobility to the robot. It gets a signal from the motor driver which is connected to the microcontroller.

F. Battery

9V Original HW High-Quality Battery is a general-purpose battery. Alkaline batteries are a type of primary battery dependent upon the reaction between zinc and manganese dioxide (Zn/MnO2). A rechargeable alkaline battery allows the reuse of specially designed cells as shown in Fig. 6

Fig. 6 Battery

IV. WORKING

This project works with the proximity sensor as its metal detector. When the metal is detected it send the output to the mail. The signal getting from RF transmitter through RF receiver is also sent to the BeagleBone Black. The BeagleBone Black directly cannot drive the motors.so Beagle Bone Black sends the output to the L293 motor driver. This motor driver runs the motors. There are two DC motors. The motors will drive the robot. It consists of a pproximity sensor and a camera whenever the metal is detected the camera captures the surrounding area and sends it to the mail. The robot works with the RF technology and the project uses RF transmitter and receiver at 433MHz. whenever the robot finds any metal in its path it stops there and the proximity sensor sends the control unit and sends the surrounding images the mail. Further the project can be enhanced by live streaming so that the movements of the robot can control by remote. Working model of metal detector robotic vehicle is as shown in Fig. 7.
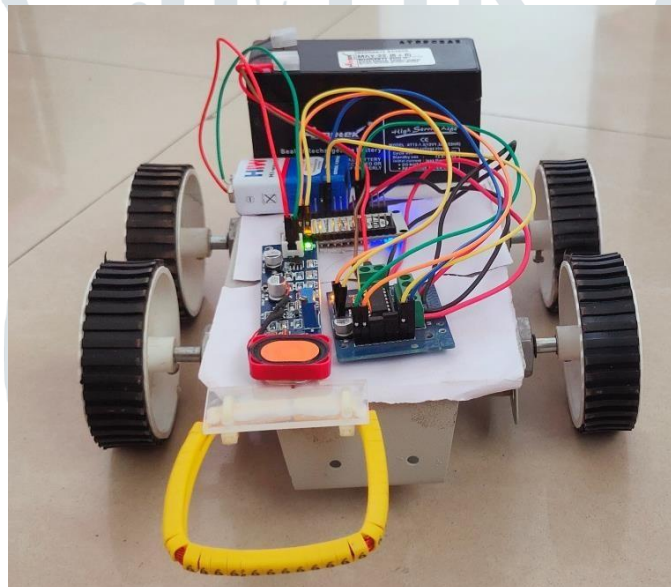

Fig. 7 Metal detector robotic vehicle

V. RESULTS

- The Robot will be able to moves in all four directions: ie. Right, Left, Front, Back
- The Robot will be able to detect mine ahead of it.
- This model robot provides less complex structure and reduces the cost to build a landmine detection robot.
- Since it provides the latitude and longitude positioning using the GPS module, it is easy to point out the exact position of the landmine in the form of co-ordinates.

VI. CONCLUSION

The main goal of this project is to design a robotic vehicle which can sense metals near to it on its track, and this robot is controlled by an android application. This project comprises of a metal detector circuit which is interfaced to the control unit that produces a buzzer sound to the user when a metal object is close to it. A microcontroller is used for the desire operation.

FUTURE MODIFICATION SCOPE

- Current detection unit is only able to detect metal in a range of 10 cm but replacing with large circumference electromagnet coil can increase the depth of detection.
- In case of plastic landmine detection, the detector can be replaced by ground penetrating radar or other detection mechanism.
- Wheels size should be increased to remove the landmine from the actual mine fields. Shock absorbers can be installed and adjust wheel unit, so that it can run on any uneven surfaces field.
- Obstacle detection sensor can be installed to avoid collision of robot with object which are coming in front of it.

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