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Detection of Landmine using Robotic Vehicle

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Abstract - *In modern world many countries are working on different technologies. Hence, safety of soldiers and army personnel who fight for national security of their respective country need to considered. During warfare many of the soldiers lose their lives in abandoned areas or at borders. Landmines are an explosive weapon which may be or may not be buried under the soil and activated by a mere pressure of 9 kg when someone steps on it. It also has an adverse effect on environment such as damage to soil structure, reducing soil productivity and increase vulnerability of soil to water and wind erosion. Mines also kill innocent civilians and soldiers after war ends. In order to save the lives of soldiers and diffuse the mines this paper is proposing a robotic vehicle with a metal detector which is capable of sensing mine ahead of it. It will also detect position of landmine and send latitude, longitude coordinates using GPS module.*

Key Words: **Node MCU (ESP8266), Router, GPS Module, Metal Detector, IP Camera, Motor Driver (L298N).**

1. INTRODUCTION

Landmine is an explosive device which kills not only human beings but animals as well. The landmines are often concealed 10-40mm below the soil and requires about minimum pressure of 9kg for detonation. Landmine pose a serious threat to soldiers and civilians worldwide and also provide major problem to agriculture land, water reservoirs and road development in border regions. In order to encounter above problems a robot prototype is prepared which is capable of detecting buried landmines as well as sending the location hence while enabling the operator to detect landmines precisely. A metal detector which uses the concept of Electromagnetic Induction (EMI) based sensors can detect metal mines. As the landmine is detected the robotic vehicle stops at that position and GPS module is activated. The GPS data is extracted to get the latitude and longitude information of a particular location. The collected data i.e. longitude and latitude is sent to the blynk app in the form of type metal detected. The robotic vehicle is controlled using blynk app and it enables the operator to move in all possible direction. The blynk app transfer the signal with the help of IOT. Also an IP camera is used for live streaming of actions of robot.

2. Literature Survey

Waqar Farooq [1] the paper entitled as "wireless controlled land mine detection"**.** A robot is proposed that has the ability to detect the buried mines and lets user control it wirelessly to avoid human causalities. The robot is equipped with special wheels controlled by H-Bridge module, allowing it to move in all possible directions. In this paper, focus is on the safety of humans and the robot; the robot is equipped with special range sensors that helps in avoiding the obstacles in the field by specifically detecting the position of obstacles. A wireless camera is added to the robot, which captures and broadcasts the present location of the robot. Raspberrypi commands the robot. This technique has the practical benefit of reducing the number of casualties, after the implementation of the technique, the robot can be controlled efficiently and it robustly determines the position of the obstacle.

Prof. R.M. Sahu [2] the paper entitled as "Wireless Detection of Landmines using GPS & GSM"**,** this system uses the Global Positioning System (GPS) tracking technology in combination with Global System for Mobile (GSM) technology. The system employing latest tracking techniques using satellite receiver in the form of GPS Modem, connected with a robotic vehicle can be used to detect the exact location of metal in the field. Then the GSM module transmits the received data to the authorized Mobile user. Main purpose of this project is to detect landmines by using a GPS enabled remotely controlled robot.

Prajakta Borole [3] the paper entitled as "Border Surveillance Using IP Camera "For the competent working of remote control, a wireless camera is used so that user could see the accurate location of the robot and can send the robot where humans cannot go securely. Therefore, camera module is installed in proposed system. The camera chosen has good assortment of wireless transmission and displays the location in high quality output. The camera used in this system is FPV camera. A FPV is a type of digital video camera commonly employed for surveillance and which, unlike analog closed circuit television (CCTV) cameras, can send and receive data via a computer network and the Internet.

3. Components and Description

The wireless control system consists of Node MCU (ESP8266), GPS module, Metal detector sensor, Motor Driver L298N, DC Motor, servo motor. The system is illustrated in fig below.

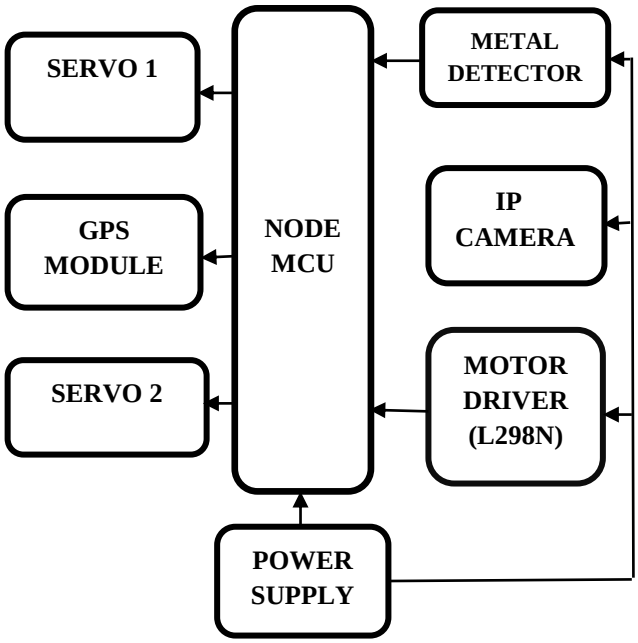


Fig. Block Diagram

3.1 Node MCU

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 pins 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).

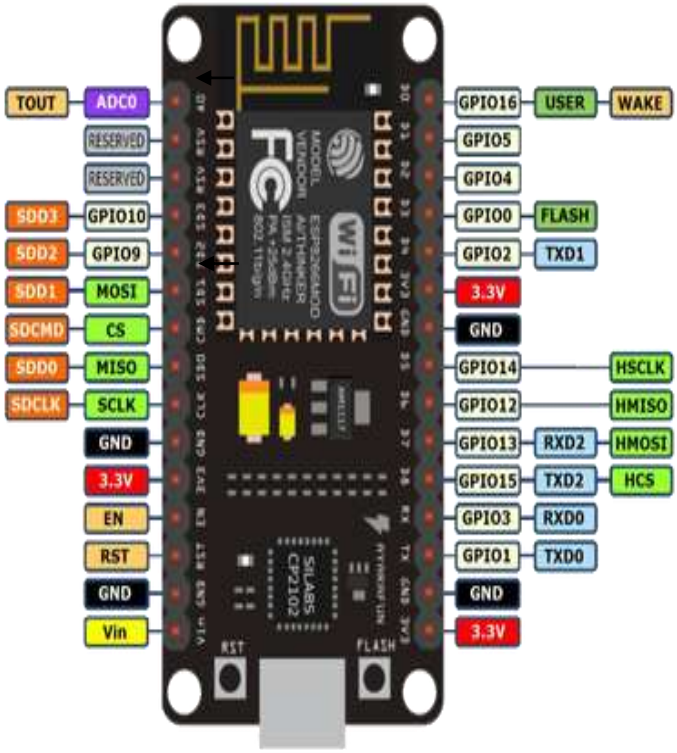
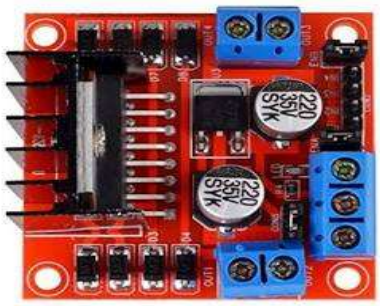


Fig. Pin Diagram of Node MCU

3.2 Motor driver (L298N)

It is essential to drive the motor accurately and it runs the required supply voltage and current to motors to drive it in clockwise and anticlockwise direction. L298N is used for this purpose and it works on H-bridge principle. The motor driver works on 12v.



3.3 GPS Module

Global Positioning System (GPS) satellites Transmission signals from space that GPS receivers use to provide three-dimensional location latitude, longitude and altitude. Once

the robot detect the location of landmine, it comes to stop position. The location of the landmine is given through GPS sensor. The GPS sensor contains an antenna to get the longitude and latitude value over a blynk app.

3.4 Power Supply Unit

On-board 12V rechargeable battery is used to drive dc motors. We require 3.3V and for various sensors and we need 5V to drive node MCU and IP camera etc. So to do this we will have to build power supply unit using voltage divider circuit and regulator ICs like LM7805.

3.5 DC Motor

Simple dc motors are being used as wheels of the original model. They are driven by 12V on board battery supply.

3.6 Camera Module

For the proficient working of remote control, there was a requirement to attach a wireless camera so that user could see the precise location of the robot and can send the robot where humans cannot go firmly .Therefore, camera module is installed in planned structure .The camera chosen has good collection of wireless transmission and displays the location in high quality. The camera used in this system is IP camera. An IP camera is a type of digital video camera commonly hired for surveillance, and which, unlike analog closed circuit television (CCTV) cameras, can send and receive data via a computer network and the Internet. In this new system, the network manager does not need to be in one place, as these cameras can be accessed over the internet. It also requires a personal computer or mobile to configure your camera and an internet-connected video device to act as a remote viewing station.

3.7 Servo motors

Here, servo motor is used which can rotate or push object at some specific angle or distance. Here we used servo motors for two purposes (1) To rotate IP camera in left and right direction to cover an entire area wide range of 0-180 degree for precise surveillance. (2) To rotate metal detector in left and right direction to detect landmine.

4. Working

The robotic vehicle consists of Node MCU (ESP8266) connected with four wheels for the movement of the vehicle over the land in clockwise and anti-clockwise direction. In front side of robotic vehicle metal detector is placed which can sense mine ahead of it. When a Landmine is detected the robotic vehicle halts at that position and activates the GPS module. The GPS data is extracted online to get the latitude and longitude information of a particular location and transfer it to the blynk app at the controlling end. The ESP8266 Wi-Fi Module is a self-contained SOC with combined TCP/IP protocol stack that can give access to your Wi-Fi network. The ESP8266 is proficient of either introducing an application or offloading all Wi-Fi networking functions from other application. Which gets the latitude and longitude location through online access and give it to the blynk app. The system consist of two main modules, which are control station which runs on a PC or mobile and remotely controlled robot. The control station consists of three integrated modules consisting of Metal detecting component, GPS data collecting component and Remote control component. These three components act as one system but the original system components act as instantaneously working autonomous systems.

5. Tools Identified

5.1 Hardware Tools

Figure shows the prototype model of landmine detection robotic vehicle and there components are listed below.

- Node MCU(ESP8266)
- L298N (motor driver)
- Servo motors
- GPS module
- IP camera
- LM7805 IC
- Metal detector sensor
- DC motors

5.2 Software Tools

- Proteus 8™ software
- Embedded program using arduino software
- Easy EDA

6. 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.

7. CONCLUSIONS

In the current examination of the existing prototype of automatic landmine detection and sweeper robot has been presented and it can be made economically. So investments on landmine detection can be made more economical in the countries which are susceptible by landmines. This prototype delivers less complex structure and reduced the price to form a landmine detection robot. It can detect the landmines present under uneven ground surface and produces alarm to the user and successfully provides coordinates of landmine which can be then diffused safely, without the hazard of explosion

8. Future Improvement

- 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.

REFERENCES

1. V. Abilash and J. Paul Chandra Kumar. 'Arduino Controlled Landmine Detection Robot'. In 'Third International Conference on Science Technology Engineering and Management (ICONSTEM)' 2017.

2. Waqar Farooq, Nehal Butt, Sameed Shukat . 'Wireless Controlled Mines Detection Robot'. In 'Department of Electrical Engineering, the University of Lahore, Pakistan' 2016.

3. Prof. R.M. Sahu, Mamata .S. Sawant, Komal .S. Salve, Mangesh .N. Nakade. 'Wireless Detection of Landmines using GPS & GSM'. In 'International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering (IJIREEICE)' 2016.

4. Gaurav Golatkar, Prathmesh Ambekar, Prashant Jadhav, Rohan Jadhav, Prajakta Borole. 'Border Surveillance Using IpCamera'. In 'IOSR Journal of Engineering (IOSRJEN)' 2018.

5. Bharath J. 'Automatic land mine detection and sweeper robot using microcontroller'. In 'International journal of Mechanical Engineering and Robotics Research'.