

Designing and Implementation of Multipurpose Land Mine Detector Robot (with Raspberry Pi)

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Abstract— Land mine detector robot (LMDR) is one of the modern world engineering masterpiece. As this technology is capable of providing services to the most important sector for any country i.e. the defense Sector. The advancement in LMDR technology is at its peak during the recent times. Here we propose a more efficient system which can help in surveillance as well as detection of the land mines located underground. The main objective of this is detection of land mines and explosives that are dogged underground by the opposition in the war to restrict the military troupes coming to the specific area of land. For this we have an onboard metal detector sensor which will detect the land mines because land mines are made up of metals. As well as we have a GPS module which provides us real time location of LMDR. Also we have onboard camera and raspberry pi module for real time streaming of video so that the LMDR could navigate to any area and this will help the person driving the system. As soon as the mine is detected by the sensor an alarm will glow on the website which is specially designed for LMDR control. Also the live streaming of video as well as the location tracking system along with the control buttons all are present on the same website. The availability of all this data which can be remotely assessed onto a single system and webpage makes the monitoring easier and effective.

Keywords: Land Mine Detector Robot (LMDR), Explosives, Raspberry pi

I. INTRODUCTION

During the wars of different countries in the past and during the world wars land mines were used as a major weapon against the opposition to restrict them to the specific area of land or to resist them to come to specific area. Land mines are nothing but explosive materials covered with a metal cover having a trigger point. This mines were bugged just underneath the ground not so far from the surface having its trigger point facing upwards so that whenever anyone steps his foot on to it or drive vehicle onto it, it will ignites itself and explodes. But the main problem nowadays is this landmines are still buried inside the ground and are still causing casualties to normal citizens. The chart below shows the number of casualties happened in the recent years.

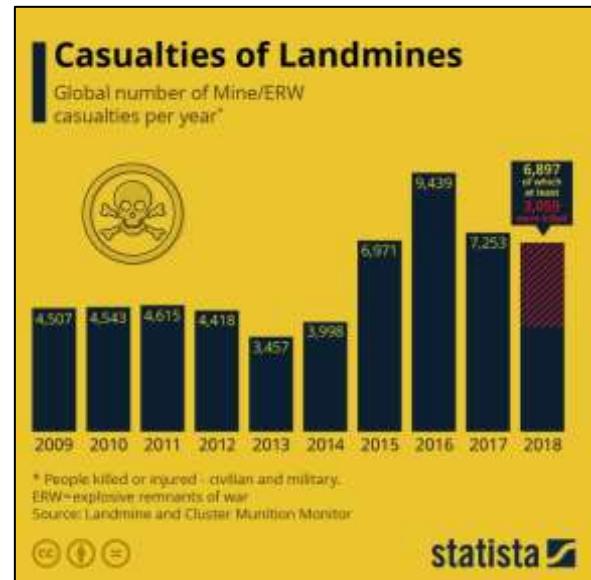


Fig. 1: Casualties of Landmines

And this numbers are really big. Also in the recent times countries across the world have recognized this problem and are trying to solve it. The tradition human based system to excavate the land mines is having lot of limitations of time and safety.

So we have designed an automated solution for this problem. Our system includes a rover that can be remotely operated. On the rover we setup an onboard camera for easy control and manipulation of the robot. It is also having a metal detector sensor on it so that it will detect the presence of land mines. The robot is also having GPS module so that whenever the mine is detected live position of the robot where the mine is detected can be given to the control unit. The main advantage of our system is that this whole system can be controlled over web so there is no physical limit of distance over which the robot can be controlled and this will also help to cover a larger area at a single time by just seating in the control unit.

II. OBJECTIVES

A. Landmine detection

The landmine detector robot is needed to design so that it will be able to detect the presence of landmine accurately.

B. Wireless control over web

For the safety the robot should be operated wirelessly over the internet so that it can be controlled from anywhere.

C. Low cost and high reliability

The robot can be constructed in low cost and will be having high reliability.

III. DESIGN CONCEPTUALIZATION

We will be using a remote control robot mechanism to carry out the mine detection. The robot will be having camera, GPS module, metal detector sensor. The robot will be operated from a distant location with the help of internet. As soon as the mine is detected by the metal detector the control unit will get an alarm and a red light indicator on the web site and the GPS module will send the location of the land mine. Robot is based on raspberry pi as a microcontroller.

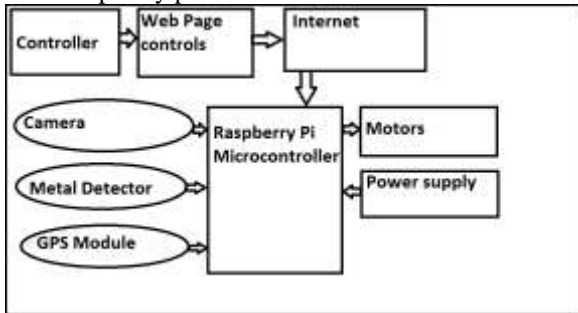


Fig. 2: Block Diagram

IV. LIST OF COMPONENTS

- 1) Raspberry Pi model 2 or 3
- 2) Servo motors (2x)
- 3) 6V battery for servo motors
- 4) 5V battery for raspberry pi
- 5) Wirings
- 6) Camera
- 7) GPS module
- 8) Metal detector sensor
- 9) Robot car structure

V. WORKING

The first part of the working of the land mine detector robot is the controlling of it. This robot is based on raspberry pi microcontroller so the controlling is made through the internet. A web page is specially designed for the controlling of the robot, this web page consists of buttons to control the robots forward, reverse, left-right movements. The web page also consists of a window for camera output in which a live streaming of the robots camera is going on. It also consists of a indicator LED to indicate the presence of land mine. As soon as the metal detector mounted on the robot detects the presence of land mine the red indicator LED on the web page will glow showing the controlling person that the land mine detected. When controlling person presses any of the control button the website will send the data to cloud. At the same time robot having raspberry pi is connected to internet through Wi-Fi module which is on board on raspberry pi kit. It will capture that signal and decodes it and sends it to the respective motor module and hence robot will be controlled. All the code that is needed to run the robot is uploaded on the SD card and inserted in the raspberry pi.

VI. CONCLUSION

It has been successfully proven from this proposed theory that land mines can be detected remotely with actual human intervention. This will open a new area in research in the field of military defense equipments. It will also insure pure safety

of the solders as the robot has already gone over that rote which the soldiers are going over so there is no risk of landmine now for soldiers. The greatest advantage of this system is safety as it will save soldiers lives which is extremely important to nations security.

VII. FUTURE SCOPE

There isa huge scope of development in this theory. Many things can be added in this system for better performance. Developments such as:

- Many sensors can be used in groups so that the accuracy of the system can be increased.
- A major development is that excavation of the land mine with the help of electromagnetic device.

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