

PV Based Sensor Controlled Defense Surveillance Robot for Landmine using Artificial Intelligence

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Abstract — In our project we are going to know about PV Based autonomous defence surveillance robot for antipersonnel mines using AI. An automated metal detecting rover-robot which can be automatically work to help the landmine detection. The purpose of this metal detector robot is used to identify the landmines in war affected places. The detection of land mines through this proposed method is free of risk and less human effort. The face detector is used to identify whether the person is known or unknown. GPS&GSM are used to share the location where the landmines are placed. While experimenting, this robot shows high metal detection ability which is competent enough to be used in the application in landmine covered regions.

Keywords—Metal detector, Robot, Landmine, Defense purpose, Microcontroller

I. INTRODUCTION

A land mine is an explosive device concealed under or on the ground and designed to destroy the or disable enemy targets, ranging from vehicles and tanks, as they pass over or near it. Such a device is blasted automatically by way of pressure when a target steps on it or drives over it, although other detonation mechanisms are used. A land mine may cause damage by direct blast effect, by fragments that are thrown by the blast, or by both. These killing tunnels were first collapsed to destroy the targets located above, but they were later filled with explosives and detonated in order to cause even greater devastation. Nowadays, land mines generally refer to devices specifically manufactured as anti-personnel or anti-vehicle weapons. Though many types of improvised explosive devices ("IEDs") can technically be classified as land mines, the term land mine is typically reserved for manufactured devices

designed to be used by recognized military services, whereas IED is used for makeshift devices assembled by paramilitary, insurgent or terrorist groups. There are a lot of landmines still hidden under the ground all over the world. It causes life loss, permanent and temporary disability to humans and other living creatures. It affects the economy and peace of the nations. Due to the conflicts between countries, landmines have become a serious global issue and clearance of it needs a huge amount of money to be spent on it. Many developing countries which are affected by landmines, to make this mission successful, spent a lot of gross national income and human effort on clearance of it. This research has established a landmine detection rover robot to assist in the field, which is faster, secured and precise than the traditional method. Metal detection is usually performed by metal detecting sensors. The distance between sensor head and the buried landmine is the important parameter which determines the performance of the landmine detection capacity of metal detector. By adjusting the gap and altitude between landmine and sensor head, the performance of the metal detector can be improved.

The function of robot assisted landmine detection can be performed in a convenient way, if the sensor heads maintain uniform gap with ground level. More priority is given to the human safety in this project. The robot can be operated from a safer distance or from the region where the landmines have already been cleared.

Since the landmine detection head is projected in front of the rover, the hazard of explosion is eliminated. By this approach, the rover as well as the person operating it by remote are safeguarded. Bluetooth controller is used for communication between rover and operator since it is of low cost and high-level security benefits.

Many defense activities can be accomplished by this rover robot. It can carry equipment and soldiers. Also, the basic rover robot model is shown in Fig. 1. can be converted into special task assigned robots like Metal detection robot, Army carrying robot or Battle robot. This paper is elaborated as follows. Section one describes the introduction about the system, section two depicts the literature review, section three discuss methodology, section four depicts the results and discussion and section five concludes the paper portraying the future scope briefly.

II. EXISTING METHOD

GPR has been considered as the most promising subsurface

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sensing technique for landmine clearance operations in combination with a metal detector. This is because of its ability to detect both metallic and nonmetallic landmines. Furthermore, the capability for imaging and post processing of data enables the identification of detected objects. A system combining GPR and a metal detector is commonly called a dual sensor.

The system uses the metal detector as the primary sensor for the detection and localization of metal-containing objects, after which it switches to GPR as the secondary sensor for target identification. GPR for landmine detection commonly employs relatively high frequencies in order to detect and/or image small objects near the surface and also to reduce the size of the antennas for easier handling and higher mobility.

With high frequencies, GPR becomes more sensitive to the heterogeneity of the media surrounding the object, which results in unwanted scattering in the data. The unwanted scattered waves are commonly referred to as clutter. Clutter degrades the quality of the GPR data and makes their analysis and interpretation difficult. In the case of landmine detection, a false analysis or interpretation of the data may lead to an accidental detonation.

III. PROPOSED METHOD

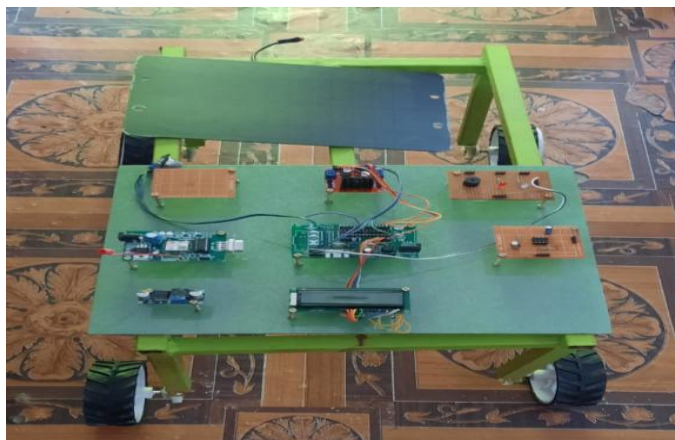
Landmine detection robot basically consists of the metal proximity detector which is used to sense the metal inclusions buried underground. The system is put down on a field to detect the landmine.

The system starts moving on the field. Simultaneously, metal proximity detector starts its operation. The robot has an ultrasonic sensor fixed into the robot front side it is used to avoid the obstacle. If ultrasonic sensor senses the presence of any obstacle nearby, it automatically change the direction to other side.

The mq2 gas sensor are used in this robot for detection of any gas present the gas can be detected. means the can be send SMS to control room with the help GSM module.

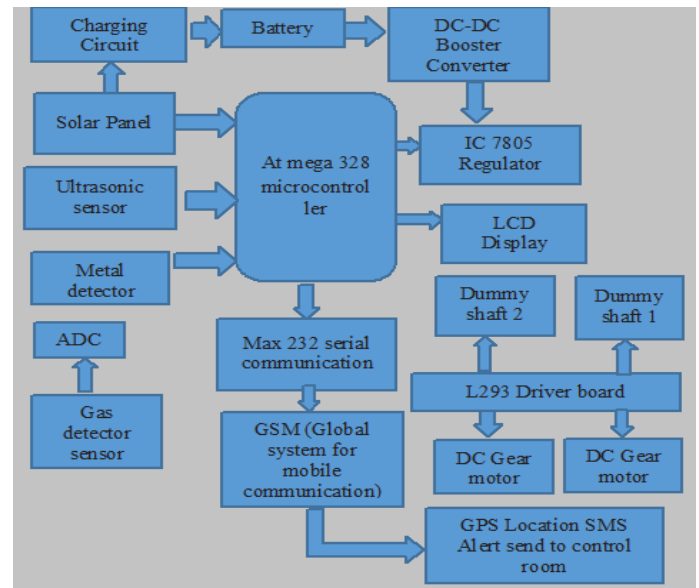
The camera used in this robot for detect the stranger faces ,if the stranger face is detected means send mail alert to control room by using IMAP protocol.

In this project we uses the solar power for input power source.



If the land mine can be detected means the GPS latitude and the longitude location can be send to control room with the help of GSM module. It locates the exact position and also informs about how far the proximate element is located.

The GSM through Attention Command sends the SMS to the user. Once the landmine is detected and the process is completed, the system stops at specific location. The landmine detected completely thereby saving many lives.



IV. BLOCK DIAGRAM

The block diagram is proposed for land mine detection robot with GPS and GSM technology. The robot consist the blocks of Atmega controller processing board, metal proximity sensor, ultrasonic sensor, GSM module, GPS location, driver controller, DC gear motors, battery, voltage regulator. This proposed robot was detecting the land mines and send GPS location to control room by using GSM technology. The camera used in this robot for detect the stranger faces ,if the stranger face is detected means send mail alert to control room by using IMAP protocol. In this system the solar panel power can be stored in the battery is used for power supply . the power from the battery is boosted by using dc-dc booster device then the 12v is regulating to 5v by using voltage regulator. Then linear 5v DC supply is given to Atmega328 processing board and all other blocks. The Atmega 328 controller board will controlling the robot. DC gear motors is used in this blocks for connecting robot wheels. The robot can be controlled instruction from the controller. The ultrasonic sensors will be used for obstacle detection and avoidance. The ultrasonic sensor will be placed in the front side of the robot, if the obstacle is detected means the robot can avoid the obstacle and move on continuously .The metal proximity sensor is used to detect the land mines and any poison gas is detected by using gas sensor ,if the land mines is detected in the particular location, the longitude and latitude values of the GPS location will be send to control room through GSM module. by sending the SMS alert to

control room immediately and save the life of military people.

V. FUTURE SCOPE

At present, the robot is replacing human in almost every field including defense field. The application of robotic technology is expanding in various fields due to its continuous development. A land mine detecting robot is designed in this research, which can sense metals in its arm range and on its path. HC-06 Bluetooth module application is used to control this robot. The ultrasonic sensor is used to detect the obstacles in its way in various directions. Based on the dimensions of the obstacles present, the mine detecting robot decides whether to take an alternate path or to move in the same path removing the obstacles.

In future, the sensors can be modified to work based on the radio controller or IoT controller instead of Bluetooth controller. And also a camera with night vision can be added for better image visualization of hidden mines. The hardware may include Shock absorbers, self-balance system and adjusters that can be mounted to the wheels so that the robot can run fast on any complex terrains. It can also be used in the future to save lives in disaster locations like building fire, building collapse etc if an image processing system is included. It can also be modified in future to dig land mines by itself if proper arm set is provided with necessary safety precautions.

VI. CONCLUSION

The landmine is the most dangerous weapon that is invented when the World War happened. It plays a very important role in the period of war and most of the soldiers have lost their life or body parts due to their inability to detect them. In order to prevent this, a robot can be used to find the landmine in the critical areas and also the robot can be controlled by the advanced technologies like Atmega 328 microcontroller, Metal detectors, GSM module and so on. The metal detector is used to find the landmine in the land and map them or mark in the field exactly. Then they can be easily defused with the help of robot and if the stranger person is detected means sending mail alert to control room. This is being discovered in order to save the lives of soldiers, people present nearby landmines and the economy of our country. It is a national project which acts as a life savior by avoiding the human interference with the landmines and allowing only robots to detect and dissolve the dangerous landmines and it helps to save lives. Finally, it is one of the greatest inventions as a tribute to our armed forces and their services to our Nation.

VII. REFERENCE

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A. ATMEGA328 CONTROLLER

1) Features

Two 8-bit Timer/Counters with Separate Prescaler, one Compare Mode One 16-bit Timer/Counter with Separate Prescaler, Compare Mode, and Capture Mode Real Time Counter with Separate Oscillator Three PWM Channels Eight Channels 10-bit Accuracy Six Channels 10-bit Accuracy Byte-oriented Two-wire Serial Interface Programmable Serial USART.

2) Ultrasonic Sensor

An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves. An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity.

3) Metal Proximity Sensor

Capacitive proximity sensors are non-contact devices that can detect the presence or absence of virtually any object regardless of material. They utilize the electrical property of capacitance and the change of capacitance based on a change in the electrical field around the active face of the sensor.

4) Lead Acid Battery

A lead acid battery consists of a negative electrode made of spongy or porous lead. The lead is porous to facilitate the formation and dissolution of lead. The positive electrode consists of lead oxide. Both electrodes are immersed in an electrolytic solution of sulfuric acid and water.

5) GSM Module

A GSM modem or GSM module is a hardware device that uses GSM mobile telephone technology to provide a data link to a remote network. From the view of the mobile phone network, they are essentially identical to an ordinary mobile phone, including the need for a SIM to identify themselves to the network.

6) L293 Driver Board

L293D IC is a typical Motor Driver IC which allows the DC motor to drive in any direction. This IC consists of 16 pins which are used to control a set of two DC motors instantaneously in any direction. It means, by using a L293D IC we can control two DC motors. As well, this IC can drive small and quiet big motors.

7) DC Gear motor

A Direct Current (DC) motor is a rotating electrical device that converts direct current, of electrical energy, into mechanical energy. An Inductor (coil) inside the DC motor produces a magnetic field that creates rotary motion as DC voltage is applied to its terminal.

8) DC-DC BOOST CONVERTER

XL6009 module is a non-isolated step-up boost voltage converter featuring adjustable output voltage, high efficiency.

It converts input voltage of 5-32V DC to an output voltage of 4-38V DC.

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