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DESIGN AND FABRICATION OF REMOTE OPERATED WEAPON SYSTEM

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ABSTRACT: The purpose of this paper is to design a robot which is capable of detecting buried landmines and marking their locations, while enabling the operator to control the robot wirelessly from a distance. The ideas and concepts from the theoretical stages are shaped into the physical hardware components by fabrication of a prototype and then software programs are integrated into the system so as to test and experiment the concepts that had been developed. The designed robot is capable of detecting a buried mine, marking the exact location of the buried mine, and controlling itself from stepping over it and detonating the mine. The detection of the buried mine is done by using metal detectors since most land mines contain metal components.

I. INTRODUCTION

The landmine crisis is globally alarming since there are presently 500 million unexploded, buried mines in about 50 countries. Governments are looking into this situation seriously since landmines are claiming the limbs and lives of civilians every day [1]. The purpose of this project is to design a robot which is capable of detecting buried land mines and marking their locations, while enabling the operator to control the robot wirelessly from a distance. A land mine detection robot is needed to be designed to employ in peace support operations and in the clearance of contaminated areas. Also the robot shall be able to detect 50-90% of landmines (Anti-personnel mines) and mark the locations of the mines within a tolerance of 5cm. For the safety of the operator, the designed robot must be able to operate remotely, moreover, must be equipped with wireless data transmitting capabilities [2,3].

Landmines are easy-to-make, cheap and effective weapons that can be deployed easily over large areas to prevent enemy movements. Mines are often laid in groups, called mine fields, and are designed to prevent the enemy from passing through a certain area, or sometimes to force an enemy through a particular area. While more than 350 varieties of mines exist, they can be broken into two categories, namely, anti-personnel mines and anti-tank mines. Anti-personnel mines are designed to kill or injure enemy combatants. They are usually buried 10mm to 40mm beneath the soil and it requires about 9 kg minimum pressures to detonate them. The face diameter of most the anti- personal mines ranges from 5.6cm to 13.3 cm

II. LITERATURE SERVEY

'Design and Implementation of a RF Controlled Robotic Environmental Survey Assistant System' by Md. Shamsul Alam, Insan Arafat Jamil, Khizir Mahmud and Najmul Islam published in 2014, focused on use of RF robots for environmental survey which involved datacollection and logging and sensors to sense the hazardous compounds in the vicinity.

'Low Cost Radio frequency Controlled Robot for Environmental Cleaning' by M.Muthiah,Rk. Sathiendran, K.Nirmal published in the year 2015, used RF controlled robot for the cleaning in hazardous areas like Chemical Labs, Radiation Factories, etc. and even in home applications.

'Robust Stabilization of Wheeled Mobile Robots Moving on Uncertain Uneven Surface' focuses on stability of wheeled mobile robots (WMRs) which is more than legged robots. Thecontrol design is carried out for the dynamic model of unicycle, the most common and simplestamong WMRs.

The need of such WMRs has been necessity of the age; they can be used in field operations such as for rescue and search applications. By this we can be sure that less human harm is done in rescue operations.

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'Robust Stabilization of Wheeled Mobile Robots Moving on Uncertain Uneven Surface' byXiaocai Zhu, Guohua Dong and Dewen Hu and Zixing Cai published in 2006, used dynamics of the system to stabilize the robot (WMRs).

PROBLEM STATEMENT:

The objective of this project is to design a small, robust and highly maneuverable walking robot. It will be designed for walking on the different platforms like rough terrains, smooth surfaces, overcoming obstacles in its path and climbing over obstacles of certain height, choosing different predetermined gaits and to have good stability, speed as well as payload capacity,which will be RF controlled robot to travel on uneven surface and detect landmines also transmit real time video.

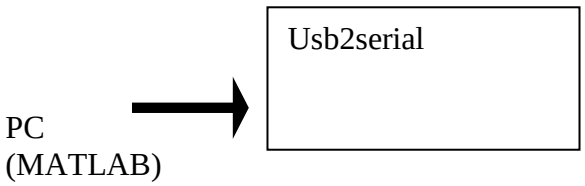
III. METHODOLOGY

SPECIFICATIONS OF THE SYSTEM

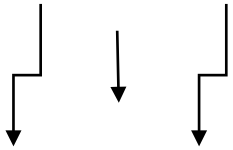
- RF module operating range is 30 meter with onboard antenna.
- RF module operation temperature range: -40 to +85°c.
- RF available frequency at: 2.4 to 2.483GHz.
- Operating voltage of ATmega16 is 4.5 to 5.5 V.
- Speed grade for ATmega16 is 0 to 16MHz.
- High performance, low power consumption AVR 8 bit microcontroller.

BLOCK DIAGRAM:

Transmitter



RF transmitter



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ROBOT SECTION:

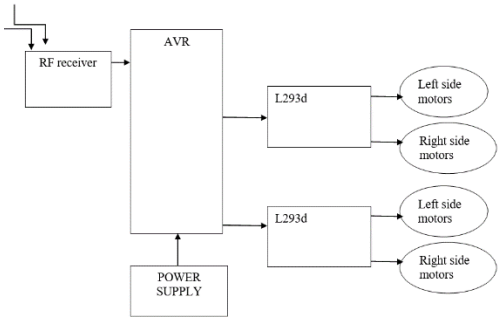
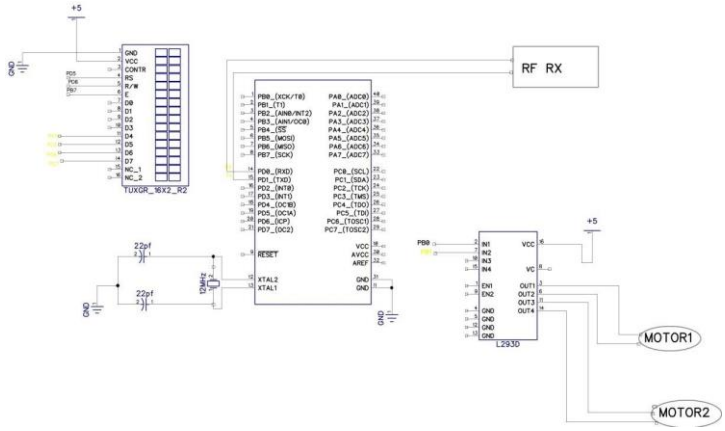


Figure 2: Block Diagram-Receiver

Circuit Diagram:



RF transreceiver:

This is an FSK Transceiver module, which is designed using the ChipconIC(CC2500). It is a true single-chip transceiver. It is based on 3 wire digital serial interface and an entire Phase-Locked Loop (PLL) for precise local oscillator generation .so the frequency could be setting. It can use in UART/ NRZ / Manchester encoding / decoding. It is a high performance and low cost module. It gives 30 meters range with onboard antenna. In a typicalsystem, this trans-receiver will be used together with a microcontroller. It provides extensive hardware support for packet handling, data buffering, burst transmissions, clear channelassessment, and link quality Indication and wake on radio. It can be used in 24002483.5 MHzISM/SRD band systems. It could easily to design product requiring wireless connectivity. It can be used on wireless security system or specific remote-control function and others wirelessan system. Operating Range is 30 meters without requiring any external antenna**.**

Power supply:

- The basic step in the designing of any system is to design the power supply required forthat \\system. The steps involved in the designing of the power supply are as follows,
- Determine the total current that the system sinks from the supply.
- Determine the voltage rating required for the different components.
- The bridge rectifier and capacitor i/p filter produce an unregulated DC voltage which isapplied at the I/P of 7805.
- The minimum dropout voltage is 2v for IC 7805, the voltage applied at the inputterminal should be at least 7 volts .
- C1 (1000 µf / 65v)is the filter capacitor .

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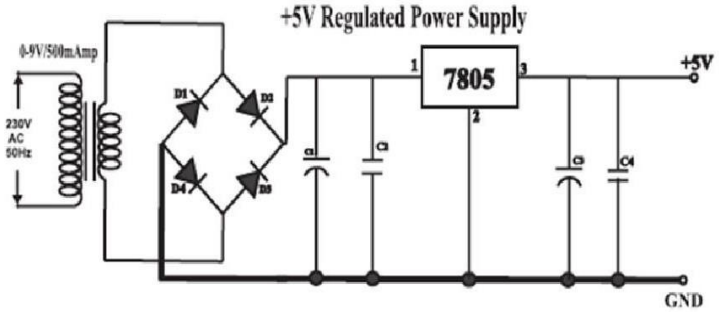
➢ C2,C4 (0.1uF ceramic),C3 (220uF/25V electrolyte capacitor) is to be connected acrossthe regulator to improve the transient response of the regulator.

➢ Assuming the drop out voltage to be 2 volts, the minimum DV voltage across thecapacitor C1 should be equal to 7volts (at least).

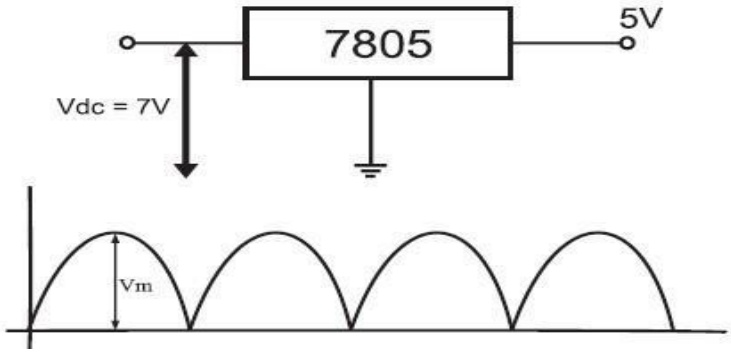


Transformer Design:

We require +5V o/p. The drop-out voltage of regulator is 2V (As per datasheet).

Vdc = 5+2 = 7V

So at the regulator input minimum 7V should be applied.



According to formula,

1) Vdc= 2Vm / pi.

Assuming there is no Ripple CapaciorHence From

2) Vm = Vdc . pi / 2

= 7 x 3.14 / 2

= 10.99V

3) Vm = 10.99V

During one cycle, two diode are conducting, henceDrop of voltage of one diode = 0.7V
Drop of voltage of two diode = 1.4V

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4) Vim = Vm + 1.4V

Vim = 10.99 + 1.4

5) Vim= 12.39V

6) Vrms = Vim / Sqrt (2)

=12.39 / Sqrt (2)

7) Vrms = 8.76VVim = 12.39V

8) Vrms = 8.76V

So we select transformer of 9V Similarly

9) Im = Idc x pi / 2.

Im = 400m x 3.14 / 2

10) Im = 628mA

11) Irms = Im / Sqrt (2)

= 628m / Sqrt (2)

= 444.06 mA

Irms = 444.06mA

IV. CONCLUSION

The landmine crisis is globally alarming since there are presently 500 million unexploded, buried mines in about 50 countries. Governments are looking into this situation seriously since landmines are claiming the limbs and lives of civilians every day [1]. The purpose of this project is to design a robot which is capable of detecting buried land mines and marking their locations, while enabling the operator to control the robot wirelessly from a distance. A land mine detection robot is needed to be designed to employ in peace support operations and in the clearance of contaminated areas. Also the robot.

V. REFERENCES

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