STEALTH- A Surveillance Robot

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Abstract: The main objective of our project is to tackle in war situations and terrorist crises to save precious lives of our soldiers as well as civilians. Terrorists activities had gone to higher levels and security personnel are getting threat alerts almost everyday. This Robot is designed to scan the entire area for bombs, landmines used by terrorists so that they can be eradicated by the concerned authorities. The robot is wirelessly controlled through RF communication and a global positioning system to see the exact location of our robot by getting the coordinates through the GPS module. In our proposed system a wireless camera has been installed on it with which terrorist activities can be monitored from a far off place. Moreover this camera works independently so the robot can still be controlled even if our GPS system fails due to some hardware failure.

Keywords: Metal detection, night vision camera, GPS module, RF communication

I. INTRODUCTION

Surveillance based robots are the autonomous systems that are operated remotely and which are mainly deployed for security purposes.

Countries around the world had invested a huge fortune in the production of these types of robots. Recently Indian army has successfully demonstrated Daksh which is used for the scanning and defusing of unattended suspicious objects. Similarly robots like PACKBOT and MARCBOT are used by Russia and U.S. army.

But the major disadvantage of these robots is that they can't go through small pit holes or in bunkers. Our system is a small sized, low weight robot which can go through small places where human can't reach.

These robots are controlled remotely by a controller through radio frequency communication and installed with various sensors to give important feedback to the controlling station.

These robots are in master- slave configuration in which controller will act as a master and robot as a slave.

The other disadvantage of conventional robots is that they are costly. But the idea of detecting a metal through LED has brought down the overall cost of our project in few thousands and which can be carried through without any complexities.

II. PROPOSED SYSTEM

The proposed robot is divided in three parts that are working independently to decrease the overhead on the controller.

First is the interfacing of PIC microcontroller with global positioning system and motor driver board. Second is the metal detection circuit and third is the wireless night vision camera. Block diagram for the robot is shown below.
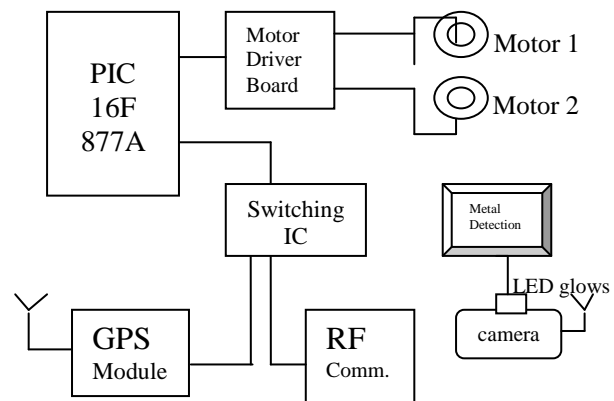

Fig : Block Diagram of Stealth

A. PIC 16F877A Microcontroller

It a 8 bit microcontroller with 20 MHz frequency. It is optimum for control applications which will drive the motor driver and the switching IC.

B. L298N Motor Driver Board

Motor driver board is used to give the constant torque to the geared D.C. motor and can give the maximum output of up to 46 V.

C. SIM28ML GPS Module

This is a low power device which will give the coordinates of the location at which the robot is. It is basically works on the triangulation property and receives the signal from three satellites.

D. Metal Detection

We have designed a circuit using BC547 NPN transistors in CE configuration. We have used 22 turns inductor coil which will induce magnetic field.

E. CC2500 Radio Frequency Module

It is designed by texas instruments. This is used for wireless communication which works on 2.4 GHz radio frequency.

III. WORKING OF THE SYSTEM

As said earlier the system is divided into three independent parts. For the first part, we have programmed the PIC controller in such a way that after every 20 seconds an interrupt will be generated and GPS will calculate the coordinates and send it to the controller. In between we can control our robot through simple instructions to move right, left, forward and to stop. A terminal interface has been installed on the controller console for controlling.

While moving the metal detection circuit which is installed right in front of the robot will check for any metal that is placed on the ground.

To make our project cost efficient we have designed our system in such a way that if any metal is detected we need not have to transmit a signal to the controller for that, instead we have put a LED which is placed just in front of the camera. So the controller can see on the video screen if the LED glows. Meta detection mechanism simply works on the eddy current generation due to some metal in the magnetic field.

Two CC2500's are configured in master-slave mode one in the robot and one at the controller side. The range of RF communication is in between 50 meters for indoor applications to 100 meters for outdoor communication.

A night vision camera is installed in the front that will capture infrared images and convert it into electromagnetic signals. This camera is very useful for the controlling of robot in case of hardware failure of other components.

IV. RESULT

We have implemented the metal detection circuit on LTSpice software and got the output voltage induced in the coil by varying the value of the capacitors and resistors for a particular frequency.

We have also got the coordinates with 10 meter accuracy range by using Google Earth.
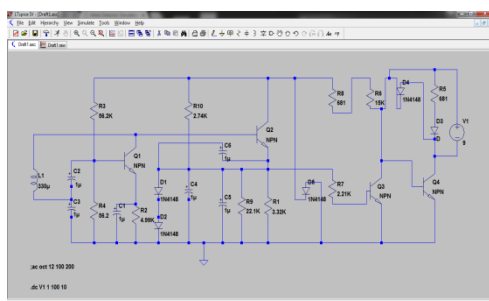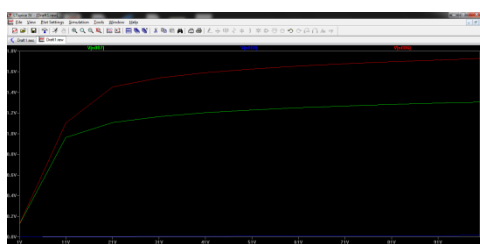

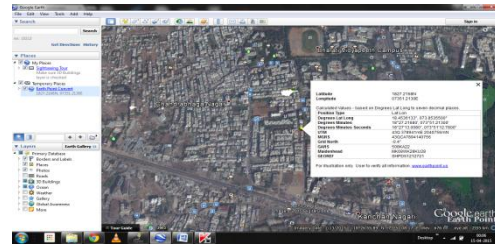Fig : Metal Detection Circuit on LTSpice

Fig : Induced Voltage Curves

FIG : GPS LOCATION

V. CONCLUSION

We have designed "stealth" a surveillance robot. The robot is controlled through radio frequency and a GPS module is installed on it to trace the exact location of the robot. It is equipped with metal detecting capabilities and a night vision wireless camera to detect any unattended or suspicious article like bombs or landmines.

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