WIRELESS MISSILE AND MINE DETECTION AND DESTRUCTION SYSTEM

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Abstract: - "Every human life is precious" our entire project is based on this fundamental. Over the last few decades machines have developed that can do jobs that are risky and dangerous for us. Our project design is an economical robot that can be mass produced and be used in all extensively dangerous situations at all levels such as in warzones, nuclear exclusion zone etc. The main purpose of this prototype project is to design and build an automatic missile and mine detecting and destructing system. The system is designed to detect the target (missile) moving in multiple directions and also to detects mine underneath. Missile is being detected by ultrasonic sensor acting as a radar. Upon fixing the direction, it sends the command to firing mechanism to destroy the target(missile). This system will be able to differentiate between ally and intruder missile then it destroys the intruder one. We can monitor and able to control the movement of the robot through phone via bluetooth.

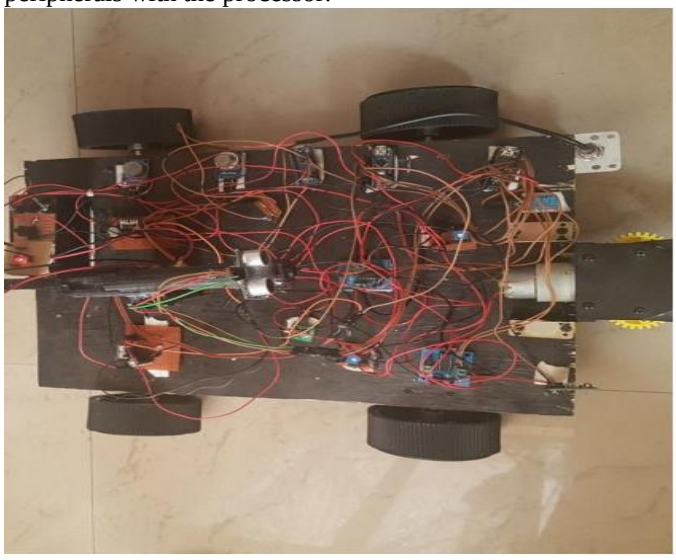
I. INTRODUCTION

We know that a soldier's job is a dangerous. But some of the tasks that soldiers undertake are more dangerous than others such as walking through minefields, deactivating unexploded bombs or clearing out hostile buildings etc. What if we could send robots to do these jobs instead of humans? Then, if something goes wrong, we'd only lose the money it cost to build the robot instead of losing a human life. And we could always build new robots.

In modern world the missile technology is developing very rapidly. In war some missile has the capacity to destroy larger areas. So as to protect our nation from such an attack, A system for detection and destruction of missile need to be developed. We are making a system which will be able to do not only this but it can also detect underground mines.
The system presented in this paper is basically a war robot that can find applications in other scenarios as well. This robot has a myriad of sensors mounted on it that relay critical information such as the temperature, humidity, presence of landmines, etc. to the user on their handheld remote. The mode of communication between the smart phone and the robot is RF. A RF transmitter on the handheld smartphone transmits information whenever a button is pressed on the smart phone to a RF receiver on the robot. Similarly, to transmit the data from sensors to the user, there is a RF transmitter on the robot which sends data to the RF receiver on the smart phone.

To manage the entire amount of electronics on the robot as well as on the smart phone we have used the Atmel Arduino processors. In total we have used three of them (ATmega328p). Three on the robot. We had to use three processors on the robot because we needed more IO pins to connect all the sensors and motors to them. Having multiple processors makes execution of commands faster. Had there been only one processor for all the sensors and motors, it would have processed requests one after the other causing a delay of about 5 to 10 seconds between each command. Using multiple processors solves this problem.

For its locomotion we have used two 12-volt DC motors. They are powering the two rear wheels. We have also used two Servo Motors for the operation of the gun. A 360-degree rotating Servo Motor is placed beneath the gun to rotate it in the direction we want. Another Servo Motor which moves just back and forth a couple of degrees is placed just beside the trigger of the gun to operate it. Another 12-volt DC motor operates the mechanical grappler. When the motor rotates clockwise and anticlockwise It closes or opens the grappler. We have used embedded C language for integrating the peripherals with the processor.



All the electronic components in our project are rated at 5V. Only the DC motor operates at 12V. We have used two power supply circuits for voltage step down. These circuits are made of resistors and capacitors in a bridge configuration. We started out by prioritizing tasks while building the robot. We made each circuit independently first before mounting it on the robot's chassis. After having made a circuit we checked it's working with an external battery. When all our

independent circuits were made and checked we mounted them on the robot's wooden platform using double sided tapes. We used double sided tapes because they are cheap, easy to use and allow reconfiguration in the future. We came to know about it from our seniors and from the web.

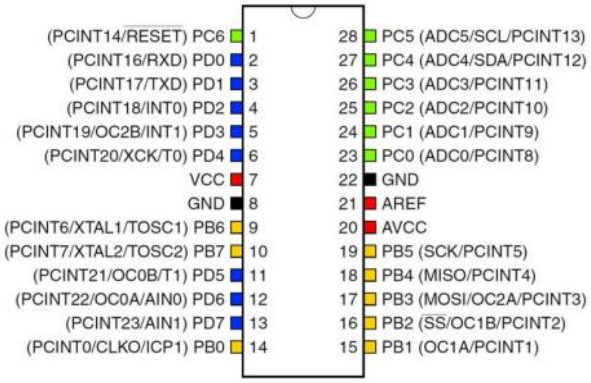
II. HARDWARE

A number of components have gone into making this robot, ranging from a simple LED to a big DC motor. All the components that we have selected for this project had been scrutinized for reliability and cost effectiveness. Majority of the components run on a 5v DC supply except the DC motors that run 12v dc.

ATmega328p PROCESSOR

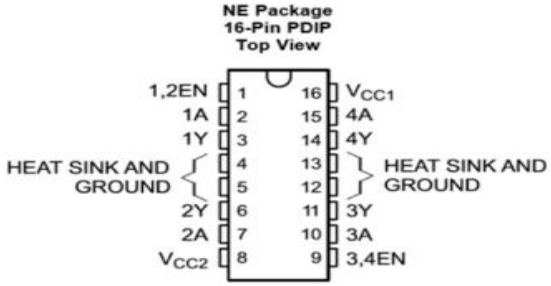
The microcontroller that we have used is the ATmega328p. Arduino is an open-source electronics platform and is simple to use and code. The ATmega328p has 14 digital input/output pins, 6analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller, just by connecting it to a computer or by powering it with an AC-to-DC adapter.

The reason for using three processes is that three processes will make execution of commands work faster. We have connected the different peripherals to different processors. Had all of the electronics been connected to a single processor it would have resulted in a delay of around 5 to 10 seconds between each command. The job of this processor is to decide which peripheral to switch on and off. The first processor controls the RF module and the motors, the second processor controls the gas sensors and the temperature sensor(DHT) and the third sensor controls the servo motors.



L293d MOTOR DRIVE

A motor driver is device that amplifies current. Its function is to take a low-current control signal and process it into a higher-current signal that can be used to drive a motor. L293D is a typical Motor driver that can drive a DC motor to drive in either direction. L293D has 16 pins with which it can control two DC motors at the same time in any direction. This IC is designed to drive inductive loads such as relays, solenoids, DC and bipolar stepping motors, as well as other high current/voltage loads in positive supply applications. The L293D is made to give bidirectional drive currents of up to 600-mA. Inputs at voltages range from 4.5 V to 36V. the operating temperature for this driver is from 0-70 degrees C.



RF MODULE

We have used two sets of RF transmitters and receivers. One pair is on the robot, and the other is on the remote control. The transmitter on the robot sends the data collected by the sensors to the receiver on the robot, which gets displayed on the smart phone. The other transmitter on the remote control sends locomotion and gun operating instructions to the receiver on the robot chassis. The RF module that we have used operates at a frequency of 433MHz. It's frequencies that lie in the range "20 kHz to 300 GHz".

SERVO MOTOR

We have used two DC servo motors in our model. Both are used for the gun's operation. A 180-degree rotating motor is below the gun which is used to rotate the gun in the direction we want. Another motor that rotates only 30 degrees is beside the trigger which only moves to and fro to press the trigger. Both operate at 5V and draw a current of 490Ma. A servo motor is an electrical motor which can push or rotate an object with precision. It draws a high current and produces high torque. Because of its specific applications it has low RPM. It is used to rotate an object at some specific angles or distance. It is a simple motor which runs on the "servo mechanism".

DC MOTOR

This motor converts DC electrical energy to a mechanical energy. We have used three DC motors in total. Two are used

for locomotion while the third one is used for opening and closing the grappler. The motor that we have used is rated at 12V, draws a current of 250mA and has an RPM of 60. The reason behind selecting a motor of this specification was its weight and that it draws less power as compared to other heavy-duty motors. This motor is also powerful enough to drive the two wheels of the robot each measuring 4 inches in diameter.

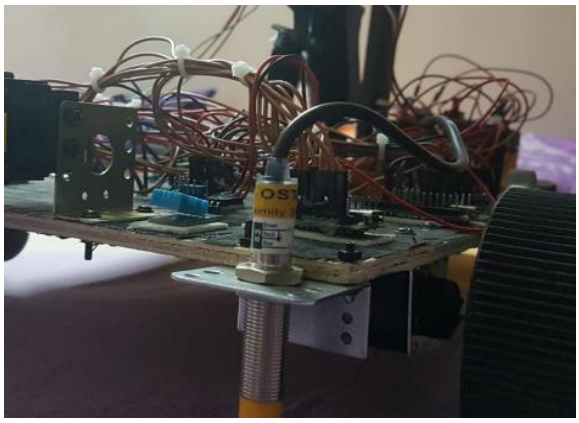
ULTRASONIC SENSOR

This sensor has been added to the model keeping in mind the worst of situations such as hostage rescue or an encounter inside a confined building. The ultrasonic sensor has been mounted on top of the gun. If it detects anything right in front of it, it straight away activates the servo motor responsible for the trigger operation of the gun. In short it will cause the gun to fire as soon as it detects an enemy in front of it. Since our project is just a prototype the ultrasonic sensor that we have used has a very short range of around 6 inches.

Ultrasonic ranging module that we have used is the "HC - SR04". It provides a 2cm-400cm non-contact measurement function and the ranging accuracy can reach to 3mm. The module includes an ultrasonic transmitter, a receiver and a control circuit.

METAL DETECTION

Our robot may be required to operate out in the open where the enemy may have laid mines. Our soldiers can use this robot to make sure that the patch of land out in front of them is clear of mines. For this purpose, we have added a proximity metal detector. We have mounted it right below the chassis. Unlike other peripherals on the top that have been pasted on the board with double sided taped we have bolted this sensor in case it accidentally bumps into some hard obstacles on its course. This sensor is called the "Ostek proximity switch". It operates at 5-40V and draws a maximum current of 300mA. 20 It only sends the value. When it does not detect any metal, it keeps sending a value of 5V. As soon as it detects a metal it gives a value of 0V to the processor. This sensor sends data to the first processor which in turn sends the same information to the remote control via the RF module.



PROGRAMMING

The Arduino ATmega328p can be programmed with the Arduino software (download). Select "Arduino ATmega328p w/ ATmega328p" from the Tools > Board menu The ATmega328p on the Arduino ATmega328p comes preloaded with a bootloader that allows uploading new codes to it without the use of an external hardware programmer. It communicates using the original STK500 protocol. This microcontroller can also be programmed by bypassing the bootloader through the ICSP (In-Circuit Serial Programming).

III. CONCLUSION

Our robot that is fully functional and is operating as per our expectations. In the beginning we were facing problems with the RF module. The communication was being established only when the transmitter on the robot and the receiver on the robot were facing each other. Even the range of was not up to mark. At present the range is around 1m. Due to size and cost constraints we have used components that were cheap. This is the reason for its small range and endurance. This project is a prototype because it cannot do what other heavy duty and expensive robots can do.

The sensors are working fine. We have tested them under various situations and they have always relayed the correct information. The ultrasonic sensor which is used to detect close enemies will trigger the servo motor responsible for the gun's trigger as soon as it finds someone right in front of it. We have kept the ultrasonic sensor's range less than 1 ft., just for representation. Having kept a larger range would have resulted in confusion with other far away objects

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