International Journal of Engineering & Technology, 7 (3.6) (2018) 124-128

International Journal of Engineering & Technology

Website: www.sciencepubco.com/index.php/IJET

Research paper

WAR Field Spying Robot

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Abstract

On aiming to increase the safety because by using this robot we can know their activities by keeping some safe distance from the enemy, the flexibility of attacking will be increased because we can know their activities and there will be a laser that will lock the position of the enemy and guides the missal, this is also contain the metal detector that will helpful in detecting the land mains which will lead to death, and control of this robot will be very easily done because it is controlled wirelessly and by connecting to Bluetooth of any android mobile. We have done this project for our army to detect the land mains safely and for the safety of our soldiers and to attack them without keeping our army soldiers life on the line.

Keywords: *Camera, metal detector, HC-12 bluetooth, arduino mega 2560, specially designed chassis for different landscapes.*

1. Introduction

Everyminute there will be an improvement in the robotics and parallellythere will be many deaths of the soldiers in our country. So if we can design robots that areuseful to our soldiers we can save there livesthere are few robots that are helping to our army and this will be next generation of robot that can handle very easilyby everyone.

This project will be flexible to control at any type of landscapes. And can be controlled up to 800 meters by using the mobile phone. We can send this robot to any building it has the flexibly to climb the steps. By using the camera we can see it in our laptop or computer or in TV and also has the metal detector that will make the movement stop if it detects any landmine we can on and off the metal detector from our controller and also a laser that will lock the area that will guide the missile.

For this robot, chassis has been designed separately. It has the flexibility to run even if it is upside down on the rocks, steps, deserts.

For this purpose, we have used the stepper motor that will be helpful to rotate and stop at a particular angle. To change the direction of the motor to increase and decrease the speed ofthe motor so that we can control the speed of the robot when we want. The wheelshave been designedseparately in 'C' shape that will be helpful to climb steps, stones.

The design of the chassis is done in the solidworks and made by using the 3D printing and we have used the ABS material in 3D printing.

All the motors, blue tooth, laser, A metal detector that are used in our project is controlled by using the Arduino mega 2560 Which contains IC of ATMEGA2560 16AU 0648.

2. Hardware

Bluetooth

In this project, we used the HC-12 Bluetooth module that has the rangeup to the 800m. this module will have the 5 pins VCC, GND, HX, RX, step and there will be an antenna separately that we have to fix. The rated voltage will be 5v and it will work more efficiently in the deserted area up to 1200m. dimensions of this Bluetooth module is 27.4mm x 14.4mm

Figure 2.1: HC-12 Bluetooth module

Stepper motor

in this robot, we will use the stepper motor. It is bipolar stepper motor that can rotate in both clockwise and anti-clockwisedirection. In one step it can only rotate up to 1.8 degree that means it will take 200 steps to complete 360 degrees. It

containstwo coils to run the motor. it has ratted current as 1.5A, ratted voltage as 3.4V, dimensions are42.3mm x 42.3mm x 34mm

Figure 2.2: Stepper motor

Stepper motor module

To control the stepper motor easily we should have module A4988. It will have 16 pins that should connect to Arduino, power supply. Direction pin step pin enables pin and 5v VCC pin and GND pin will go to the Arduino. 1A 1B 2A 2B will connect to the stepper motor. 12v VCC and GND will give power supply to a motor. There will be a potentiometer that will help in increasing and decreasing the voltage supply to the motor.

Figure 2.3: Stepper moror module

Arduino mega 2560

We used Arduino mega 2560 that will control all the circuits according to the coding that we have given. In this, there will be 18 digital pins connected to the Arduino from stepper motor module to control the speed and direction. 3 servomotor pins also connected to control the direction of the laser and two pins will connect Arduino and laser to on and off the laser.

Figure 2.4: Arduino mega

Servomotor

Figure 2.5: Servo motor

Servomotor will be useful to rotate at a particular angle that we want. the servomotor that I used has the 180 degrees angle and can rotate the laser in the angle that we want. servo motor has 3 pins VCC, GND and analog pin that will rotate the servo in a particular direction that we want

Camera

The camera will transmit the video and the audio to our location. It will have the range up to 50Mit is also the night vision camera. It will be very small so that we can decrease the size of the robot. It can be used with wire and without wire.

Figure 2.6: camera

3. Circuit Diagram

This robot is a combination of the metal detector circuit,motor driver circuit, laser controlling circuit, Bluetooth circuit and camera module these all are combined and controlled with the Arduino mega 2560 and by using an android mobile.

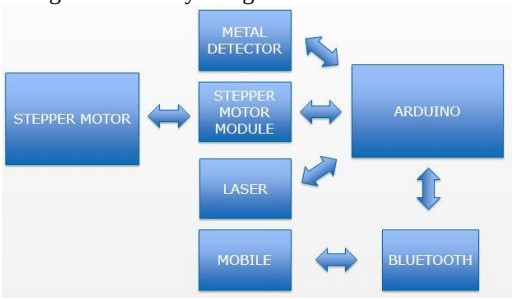

Figure 3.1: Block diagram

Stepper motor circuit

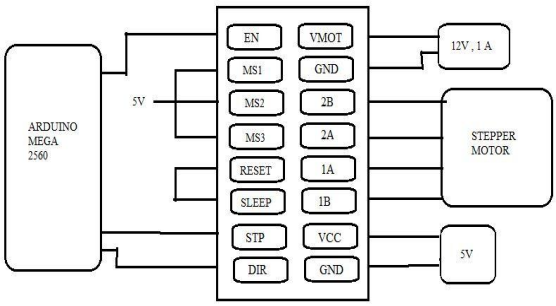

Figure 3.2: Stepper motor circuit

Stepper motor is controlled by the A4988 stepper motor module. Stepper motor module consists of 16 pins. Stepper motor consists of 4 pins for two coils in it which can rotate in both the directions. And 3 pins are connected to the Arduino that will control the direction speed of the motor. Sleep and reset pins are shorted. And there is a 5v pin and it's ground pin that will run the stepper motor module. MS1, MS2, MS3 pins are connected and disconnected according to the need of the torq. Stepper motor has ratted current as 1.5A, ratted voltage as 3.4V, And it has a minimum angle of rotation of 1.8 degrees. It will take 200 steps to complete one complete rotation.

Laser light circuit

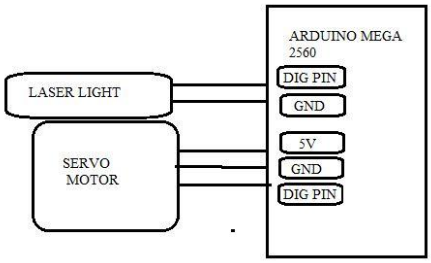

Figure 3.3: Laser light circut

This laser light is used to lock the area that has to be attacked so that it should have the flexibility of rotating in left and right directions so to achieve this there will be a servo motor that can rotate up to 180 degrees. Servo motor and the laser is connected to the Arduino and it will control the servo motor direction and to on and off the laser lightaccording to the Bluetooth signal
Coming from Arduino. Laser light has the range up to 500 meters

Bluetooth circuit

In this, we are going to use the HC-12 Bluetooth module. It has the range up to 800 meters and size of the blue tooth is very small compared to others. TX and RX of Bluetooth are connected to the Arduino RX and TX. This Bluetooth module is connected to the Bluetooth of mobile and transmit the data from our mobile to the Arduino that will control the robot.

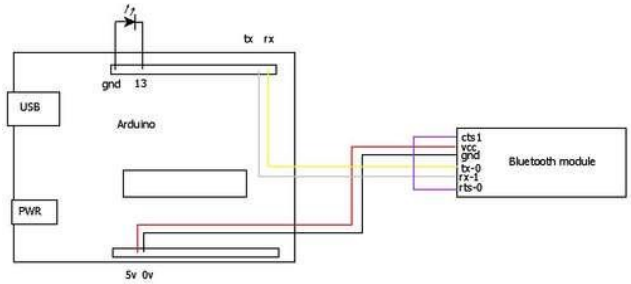

Figure 3.4: Bluetooth circuit

Metal detector circuit

This metal detector circuit will have two coils one will be the reference coil and one will be the normal coil. We should select the sensitivity of the metal detector by changing the value of a variable resistor. Whenever there will be a metal that is detected is normal coil value will change and busser will get activated. It is connected to the Arduino to receive the output of the metal detector. And when the metal detector is activated robot will stop moving. The range of this metal detector will be up to 3cm

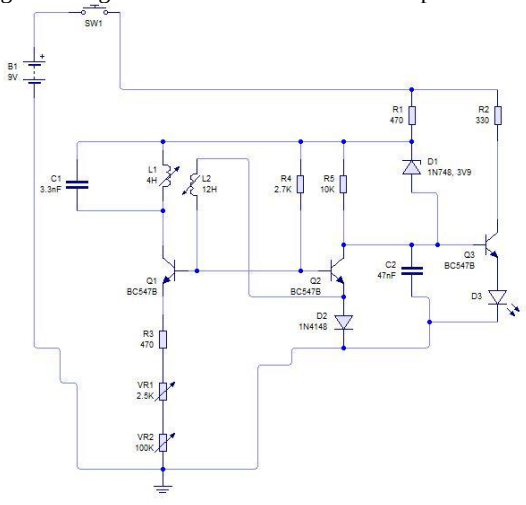

Figure 3.5: Mettal detector

4. About chassis model

About chassis material

There are many many materials that are used to make the 3D model like PLA,ABS,NYLON, FDM PETG, FDM TPU. We can use any material that we want according to the requirementthat we want. I have used the ABS material because it will be weightless and strong. We can also make designs that we want by using the cad modeling and I did this by using the SolidWorks software

About model

There are many robots that will help everyone, but there are only a few models that can handle at all kind of landscapes. If there are steps in the path of the robot it will be difficult for it to moveforward. If it falls down it will be difficult for that to move But in my model, it will come to its normal position.
In all cases there will be round weels to move in my model it is replaced with the 'C' shaped wheels that will make a robot to move easily on stones, sand and also on the steps. If it fell down or upside down it can move easily. The hight of the steps that it can climb will depend on the hight of the 'C' shaped display. In my model hight of the wheels will be 7.5cm so it can climb upto 14cm to a16cmthickness of this wheel will be 1cm In this model, all the wheels can not move synchronously if it is moving synchronously there will be no stability so that front and back wheels from the right side and the middle wheels move at one angle and remaining wheels will maintain 180 degrees difference so that it will gostudy.

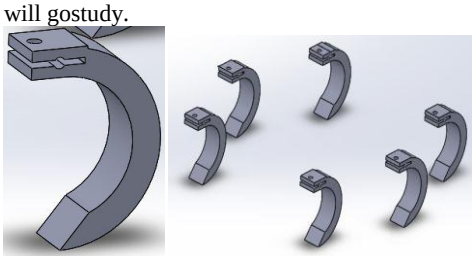

Figure 4.1: C shapped clamps

If it is going at minimum speed stability will be decreased. Since it is stepper motor we can manipulate as we want total dimensions of chassis will be 130mm x300mm x 80mm entire model has been designed according to my requirement by using cad modeling. In this,I'm going to keep the metal detector circuit, stepper motor module circuit, stepper motors, Bluetooth module, servomotor, laser light, and anArduino after calculating the space that will occupy by this modules and circuit I have designed my model. In my model,there will be some holes so that I can keep my camera fixed and wires of the metal detector at outside the chassis will come inside the chassis and fix the motors strongly without any movement. And my 3D model looks like this.

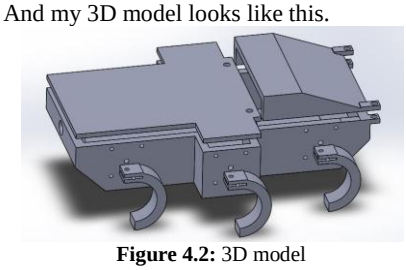

Figure 4.2: 3D model

5. Coding of the Robot

I have used the Arduino so the coding will be almost equal to 'C' coding. In this coding hasto be done for each and every motor separately to move in all directions. We should do coding to follow components

- Bluetooth module to transfer data from mobile to the Arduino.

- Metal detector to on and off whenever we want and to stop motors whenever metal detector got activated.
- To control the movement of the robot and to stop
- On and off the laser light and to move the laser light at a particular angle.

6. Android APP

To make an app I have used the MIT APPINVENTOR it will be very useful to make an app for your project. There will no cod only to drag and drop the statements. It will be easy to learn, to make and to manipulate. We can make some games, soft wares, it will also contain sensors like accelerometer, recorder, video player etc.

My app contains three slide each slide contains different things about our project.

1st slide contains my college name, my department and a button for next slide.

Figure 6.1: First slide

2nd slide contains the controls of our project like the movement of the robot, on and off the metal detector and laser and controlling it angel with servo motor

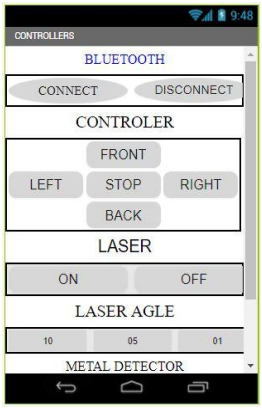

Figure 6.2: Second slide

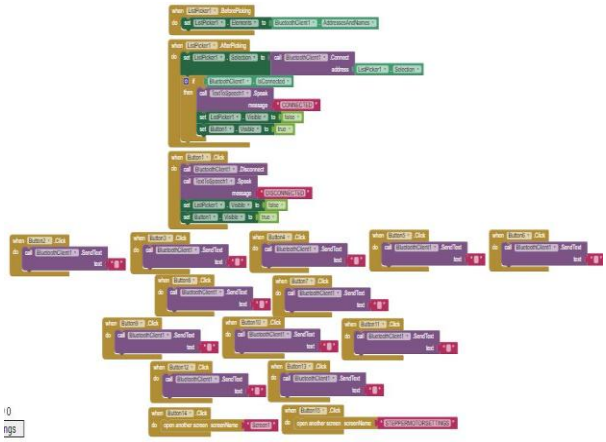

Figure 6.3: Second slide code

3rd slide contains the settings of the motors individually and its speed control.

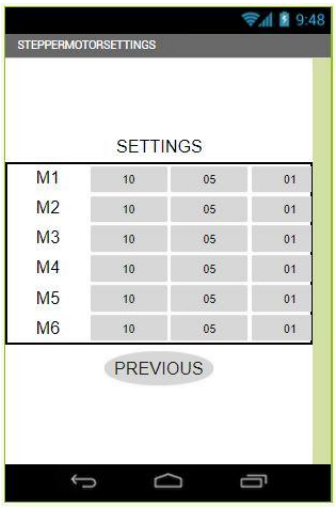

Figure 6.4: Third slide

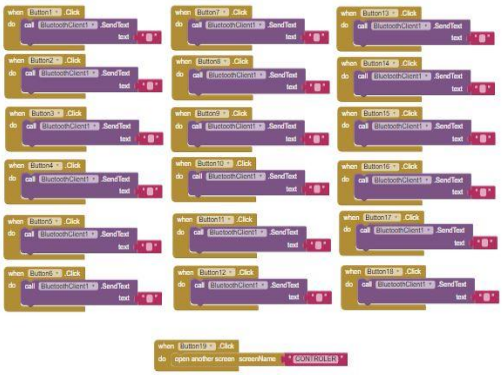

Figure 6.5: Third slide code

7. Working algorithm

Firstly we should on the Bluetooth on the robot. After that on the Bluetooth in your mobile and connect it with your mobile an on all necessary sensor in sensors in the robot like the metal detector, laser and control the servo motor.

Wheels are replased with the C shaped clamps and these are attached to the motors to obtain stability there are 6 clamps. And these clamps has to be move in a perticular angle to obtain the stability of the robot.

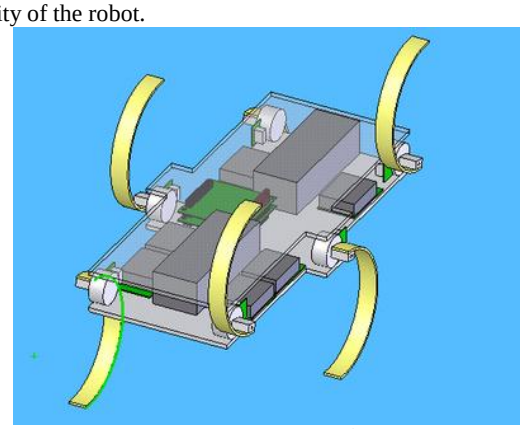

Figure 7.1: Movement of boat

Connect the camera to the robot to your laptop or computer and you can see the robot therewherever itgoes. There will be a metal detector that will sensethe landmines and it will stop the movement of the robot by the command that will already write in the Arduino code. After it reaches the destination if it is required to strike with missile there will be a laser that will guide the missile by fixing the target location. And by using this there will

be no need of a soldier to keep his life on the edge of the line. This is for the safety of our army by using the technology to do the things that are keeping lives on the edge of the death.
The chassis has been spatially designed to move at all kinds of landscapes and even to climb the steps. If it lost it stability and became upside down then also it will move easilywithoutgiving any table.

8. Conclusion

Every day our army soldiers will walk into the death, they will keep their life at risk to save our lives. So I wanted to give them or help them giving something that will reduce their risk. That something is my project war field spy robot. This robot will go anywhere and can also climb the steps, detects the bombs and also contains laser that will guide the missile by locking the coordinates of striking area. Finally, it will reduce the risk of the soldiers walking into the death and helps them do their job.

Acknowledgment

We are thankful for our guide DR.RAJAA VIKHRAM and to our EIE department for the support that we got. We are grateful to DR.J. SAM JEBA KUMAR, DR.CHINNAPALLI LIKITH KUMAR, DR.N.DEEPA for the valuable inputs development of our project.

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