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Design & Development of Ammunition Detection & Border Surviellance Vehicle

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Abstract:- The automation of vehicles has made significant strides in recent years, making it possible for sophisticated robots to undertake a few risky and vital counterterrorism missions. These machines are not only more effective than humans, but they have also saved a few lives. Our "Ammunition Detection & Border Surveillance Vehicle" is designed to carry out tasks like border surveillance and active combat both as a standalone metal detection unit that can also be used for bomb detection (automatic) and in coordination with human soldiers (manual) wirelessly.

It is a model showcasing the constantly growing demand for advanced technology and precision-driven vehicles to meet the needs of a first line of defence in the present. The robot's movement can be easily controlled wirelessly by a person in a distant location, and the vehicle can arrive at its pre-programmed destination on its own when manual control is not sensible. This robot would be equipped with a metal detection sensor that would automatically detect bombs, and a remote operator would receive a live video feed from the camera to assist in manually controlling both rover’s modules.

I. INTRODUCTION

Unmanned ground vehicles (UGVs) are military robots that are employed to increase a soldier's capacity. When used in place of people, this kind of robot can typically operate outside and over a range of terrain. Unmanned aerial vehicles (UAVs) and remotely operated underwater vehicles (ROUVs) are UGVs' naval and aerial combat counterparts, respectively. Unmanned robotics are being actively researched for use in both military and civilian applications to conduct tedious, hazardous, and dirty tasks. There are two types of unmanned ground vehicles:

- Tele-operated
- Autonomous

II. METHODOLOGY & CALCULATIONS

A. Design of Support

Area of rectangular, we had taken a teak wood frame which is available in the market of thickness 4 mm and length, width according to requirement.

Thickness = 4 mm
W= 200 mm
L = 250 mm

The total surface area of the rectangular prism is given by:

A = 2(lb + bh + lh)
= 2((250 x 200) + (200 x 4) + (250 x 4))
= 103600 mm^2

Mass = 0.127 Kg = 0.127 x 9.81 = 1.24587 N

From CATIA v5 software @ Area = 103600 mm^2
= 0.103mm^2
Moment of Inertia ICM
= 1/12 x M (w2 + l2)
= 1/12 x 1.245(2002 + 2502)
= 10634.375 Nmm^2

Force = total load from CATIA = 2.827 X 9.81 = 27.73 N

Total weight = 30 N round off
FOS =1.5 = 30 X 1.5 = 45N

Perpendicular distance = 250 / 2= 125 mm
M = 45 X 125 = 5625 Nmm^2
M = 5625 Nmm^2
I = 10634.375 mm^2
Y = Distance of the layer at which the bending stress is consider=4/2 = 2 mm
Sigma b = M X Y / (I)
= 5625 X 2 / (10634.375)
= 1.057 N/mm^2

Wood Plywood 13.8 Ultimate Yield strength Hence Design is safe.

B. Motor selection on total pay load of component

Total weight on the frame = 80N
No wheels 4
Load is distributed into 4 wheels
Actual load = total load / no. of wheels
=80/4 = 20N
Diameter of inside hole of a wheel 10mm
Torque= ½ Force X Diameter
= ½ X 20 X 10mm
= 100 N.mm
= 0.100 Nm.
= 1.019 Kg-cm

C. Motor Clamp for Rigid Support

Material= Aluminum

- *Properties or specification*

Volume = 7.629x10^6 m^2
Area = 0.006 m2
Mass = 0.021 Kg
I = 3.842 gcm^2

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D. Selection of Dc Motor for Camera Rotation

Torque = ½ X Force X Diameter

Weight of camera = 40 grams

Force = 0.04 kg X 9.81 = 0.3924 N

Diameter of shaft = 2mm = ½ X 0.3924 X 2 mm

Required torque = 0.3924 Nmm^2

Same DC Motor Torque With 10 RPM will be selected for the rotation of camera.

III. PROPOSED SYSTEM

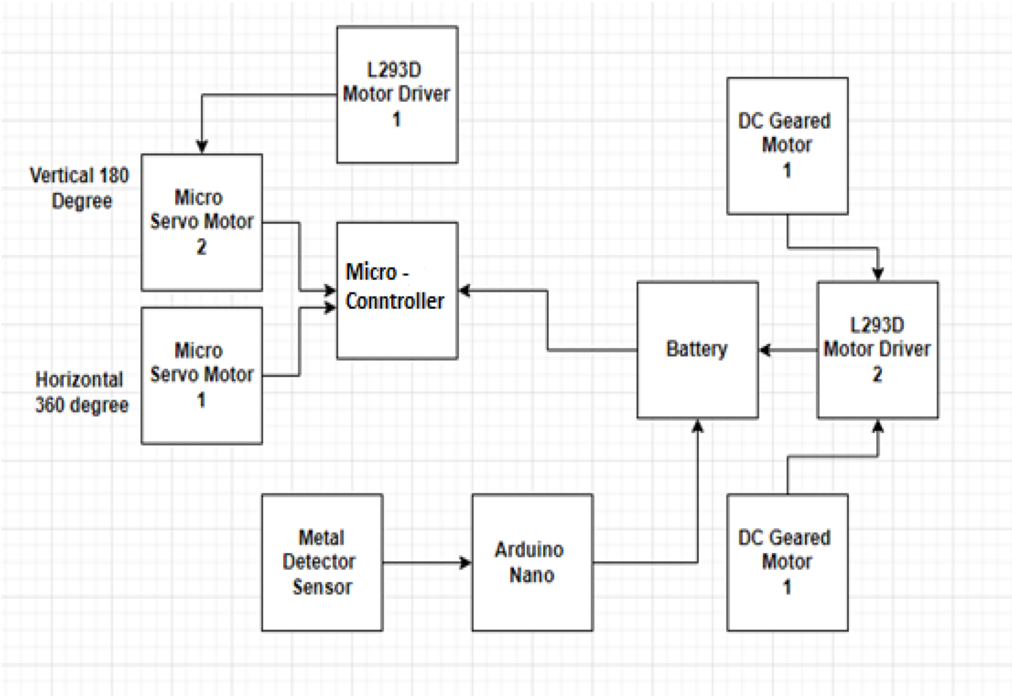

Fig. 1: Proposed System

- Battery is taken to provide the efficient power to the system to operate.
- Micro-Controller is used as a camera to surveillance the borders.
- Metal detection sensor for marking up the bomb site.
- Wireless connector to handle the
- DC motors Their drivers for the movement of unmanned ground vehicle.
- Servo motors for the control of camera.

➢ *Programming language*

- Basics C++ Embedded
- Combined circuit module.

➢ *Arduino IDE software*

IV. COMPONENTS REQUIRED

- ESP 32 CAM Module
- Metal Detector Sensor
- Microcontroller: Arduino Uno
- L293D Motor Driver
- HC-05 Bluetooth Module
- Neo GPS Module 6M
- Battery
- DC Motors

V. CAD MODEL

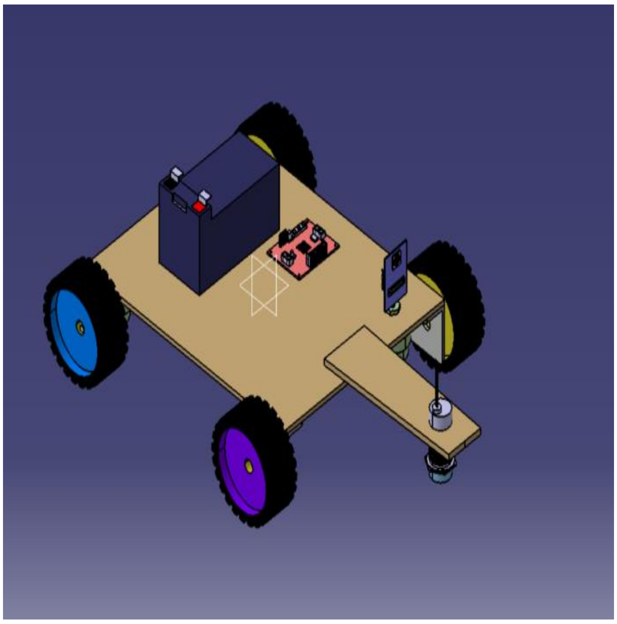

Fig. 1: Isometric View

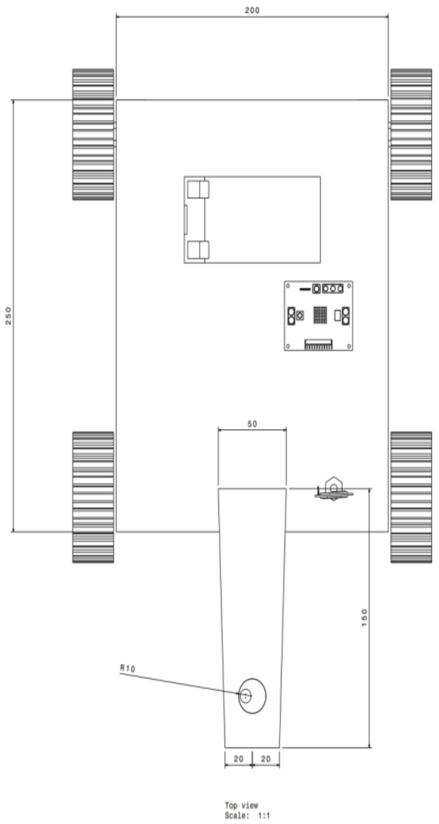

Fig. 2: Top view Drawing

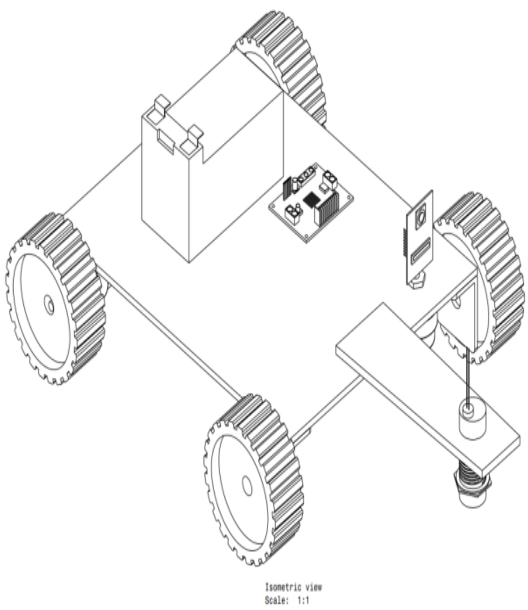

Fig. 3: Isometric view Drawing

VI. CONCLUSION

- This project is embedded and is built with a mechanical frame and electronic code. Unmanned Ground Vehicle, or UGV, is the name given to this system. It is best to use these UGVs near borders or in conflict areas. This kind of module offers both monitoring and metal content from the bomb detector. In places where human involvement is impossible, such as deep groove caves, this system can also be used to detect mines.
- The brain of the system is an Arduino Microcontroller, which is what makes up the system. It features a GPS module that broadcasts the latitude and longitude of the Metal Zone's identified site.
- When operating, the system's front view is made possible by the ESP 32 CAM Module that is included with the system. With the aid of wheels, clamps, and dc motors, this system refers to a mechanical frame that may be moved across the ground. By attaching it to the Android phone using the serial terminal app, this ground movement may be controlled over Bluetooth.

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