International Journal of Scientific Research and Management Studies (IJSRMS)
ISSN: 2349-3771 **Volume 1 Issue 5, pg: 177-182**

DESIGN AND DEVELOPMENT OF ROBOT FOR ELECTRONICS WARFARE

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ABSTRACT

War robots clearly hold tremendous advantages-from saving the lives of our own soldiers, to safely defusing roadside bombs, to operating in inaccessible and dangerous environments such as mountain side caves and underwater. Without emotions and other liabilities on the battlefield, they could conduct warfare more ethically and effectively than human soldiers who are susceptible to overreactions, anger, vengeance, fatigue, low morale, and so on. But the use of robots, especially autonomous ones, raises a host of ethical and risk issues.

KEYWORDS*- Robot, electronic warfare, fabrication, modelling, analysis.*

I. INTRODUCTION

Robots have traditionally been put to use in environments that are too hazardous for man. Merriam-Webster defines robot as "a machine that looks like a human being and perform various complex acts; a device that automatically performs complicated, often repetitive tasks; a mechanism guided by automatic controls." ISO describes a robot as "an automatically controlled Reprogrammable, multipurpose manipulator programmable in three or more axes, which may be either fixed in place or mobile for use in industrial automation applications".
This project Includes designing & fabricating war robot that uses pneumatic system for alternate up & down of inclined flip which is having sharp blade at front closely attached to ground .This is the basic mechanism employed for resisting the enemy. It is small unmanned ground vehicle capable of fitting into small spaces which can be controlled by remote.

Electronic Warfare:- Military Action involving the use of Electro-Magnetic energy to Determine, Exploit, Reduce, or prevent hostile use of the EM Spectrum, and action which retains friendly use of the EM Spectrum. Components of electronic warfare are 1) Electronic Support 2) Electronic Attack 3) Electronic Protection.
Electronic support (ES) is part of EW involving actions taken to search for, intercept, locate and identify radiated EM energy in order to detect, identify and localize threats. Electronic attack (EA) includes use of EM or directed energy to attack personnel, facilities, or equipment. Electronic Protection (EP) involves actions taken to protect personnel, facilities, and equipment from any effects of friendly or enemy use of the electromagnetic spectrum that degrade, neutralize, or destroy friendly combat capability.
Problem identification: The main objectives of using robot for war purpose are

1) **As human cannot work for 24 hours**

Particular system is to be developed that can fight with enemy without any fatigue.

2) **Direct involvement of human in war**

As alternate efficient system is not available, a huge man power is used for war purpose .

3) **Reaching hazardous place is very risky for man**
4) **Lack of manpower**

Building a army of man for war is a big challenge.

II. COMPONENTS

Main components are

a. Frame
b. Double Acting Cylinder
c. 5/2 solenoid operated D.C. Valve
d. Compressor
e. Flip
f. Air Storage Tank
g. Pressure Guage
h. Wheels
i. D.C. Motors
j. Controls
k. Battery
l. Piping

III. CONSTRUCTION

Four motors are mounted in base frame which are connected to four wheels. Wheels on one side are in series. Battery is used for actuation of all motors and controlled by cabinet remote. Cylinder is in inclined position whose one end is located on base frame and other end attached to top frame by means of shaft. Flip touches the ground having sharp edge at corner, Top frame while inclining in downward direction connected to other end of flip. Compressed air from air storage tank enter into double acting cylinder through D.C. Valve by means of piping.

Fig 3.1: Construction

IV. WORKING

When push button of control box is pressed the direction control valve is in first mode compressed air will enter in cylinder at blank end and piston will move to rod end. That will result in movement of flip in upward direction. As the piston moves to extreme position means flip is at extreme up position, solenoid operate the switch and direction control valve is shifted to second position. In second position compressed air will enter in cylinder from rod end, piston will move left .Air available at blank end will come out of the cylinder to the reservoir. Again when the piston will be in extreme left position solenoid operates the switch and cycle will be repeated. That ultimately will result in alternate up & down of flip. That is the basic mechanism used for resisting enemy or for lifting weight. Motion to the wheel is provided by battery and controlled by two button in the cabinet remote. These two mechanism make it perfectly useful for electronics warfare

V. DESIGN CALCULATION

Three components are designed for bending stress

Component No 1-Pin Forward
Component No 2-Pin Backward
Component No 3-Hallow section (Back Frame)
Bending stress calculated is less than yield stress of material.

VI. CAD MODELING

CAD modeling is used by many designers to create elaborate computerized models of objects before they are physically produced. CAD stands for computer-aided design. CATIA (Computer Aided Three-dimensional Interactive Application-V5) has used for modeling

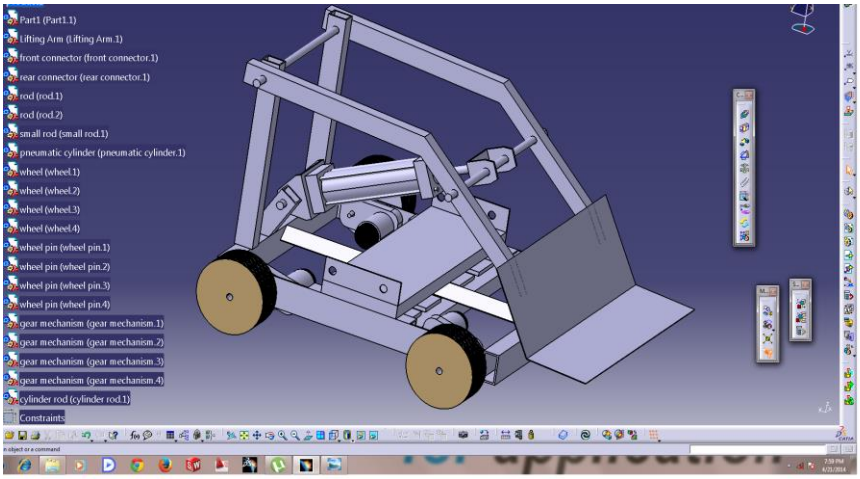

Fig.6.1: CAD Model

VII. WIREFRAME MODEL

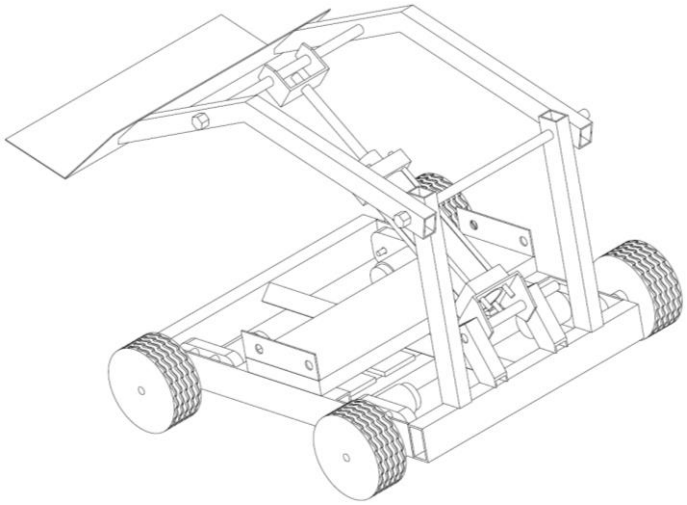

Fig.7.1: Wireframe Model

VIII. ANALYSIS

Finite Element Method is the micro mechanical analysis which is now days used as a powerful and an efficient tool for understanding the stress strain behavior of the structure. ANSYS(13.0) is the best tool for analysis

Step in Analysis

- Dividing whole assembly into number of pixels

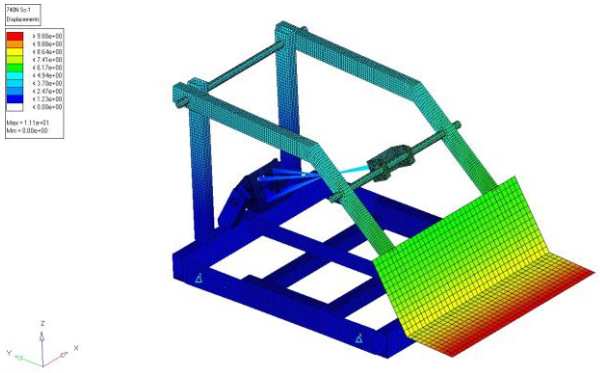

Fig.8.1

- Assembly is fixed at four points in the frame

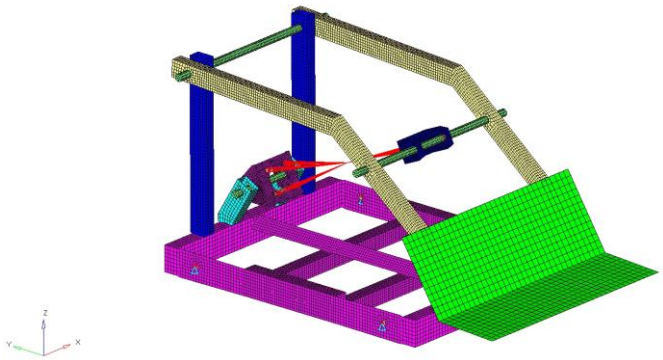

Fig.8.2

- Applying load from different side

A) Loading at front

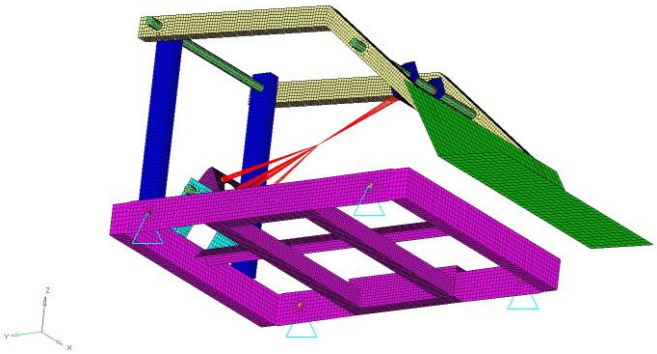

Fig.8.3

B) Plotting displacement variation

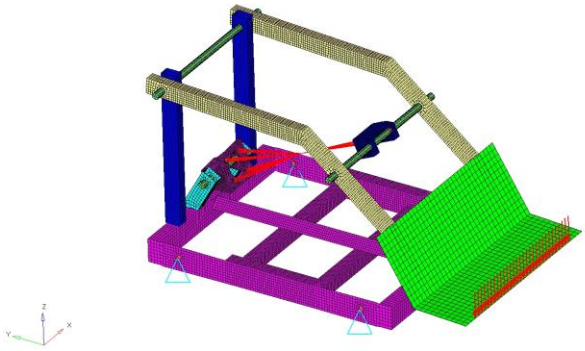

Fig.8.4

C) Plotting stress variation

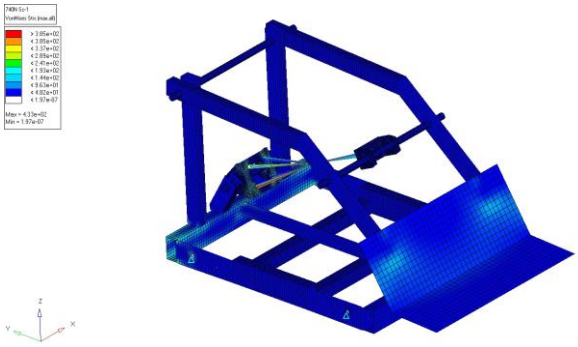

Fig.8.5

Result in tabular form are given below

Table No - 8.6

Colour	Displacement (mm)	Stress (Mpa)
	> 9.88	385
	< 9.88	385
	< 8.64	337
	< 7.41	289
	< 6.17	241
	< 4.94	193
	< 3.70	144
	< 2.47	96.3
	< 1.23	48.2
	< 0.00	$1.97x10^{-7}$
	Max 11.1 mm Min 0.00	Max 433 Min $1.97x10^{-7}$

Similarly side loading and back loading are done and corresponding displacement and stress variation are plotted.

IX. RESULT AND CONCLUSION

This project deals with the design and development of robot for electronics warfare. First The robot is fabricated, assembly have been modeled using CAD software (CATIA). By applying load on different side of machine working assembly have been verified through Ansys 11.0 Software for the displacement and stress which should be below yield stress of the material.

Three component are designed whose bending stress value maximum is 306 Mpa which is less than yield stress value i.e. 924Mpa for given material.

In electronics warfare maximum 30 KG load capacity is allowed but for maximum strength We have considered 740 N .Results are plotted in ANSYS for displacement and stress .Maximum values are observed in front loading.

Displacement Max 11.1 mm (Which is negligible for a big assembly)

Stress Max 385N/mm^2 (Which is below the yield stress of material i.e.924 MPa

So we can conclude that the design is safe.

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