International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 04 Issue: 02 | Feb -2017 www.irjet.net p-ISSN: 2395-0072

DESIGN AND FABRICATION OF AUTOMATED EARTHQUAKE RESCUE MACHINE

Ankit Bagde[1], Sarnath Naik[2], Pratik Deshmukh[3], Mahesh Sherkure[4], Akshay Tiwari[5]

Akshay Deshmukh[6]

[1-5]Department of Mechanical Engineering, DBACER, Nagpur, Maharashtra, India
[6]Asst. Professor, Department of Mechanical Engineering, DBACER, Nagpur, Maharashtra, India

---

Abstract –

An automated earthquake rescue machine is a reprogrammable multifunctional model designed to move material and debris from earthquake places. Our concept id to design and develop a simple and flexible machine to work in any conditions which are hazardous or non hazardous to the human beings. The basic objective of our project is to develop a versatile and low cist model to eliminate hazardous or non hazardous problems related to human beings. The machine is a remote operated motorized equipment model which specially designed and fabricated for the purpose of removing debris from the places where the earthquake occurs. The machine is equipped with track system to overcome any type of ground conditions. For the purpose of removing debris from disaster site it will have armed system which will be servo operated and hydraulically assisted. The machine will able to lift 1 kg amount of debris and has 3 degree of freedom.

Key Words*: *automated rescue machine, earthquake rescue, automatic robot.

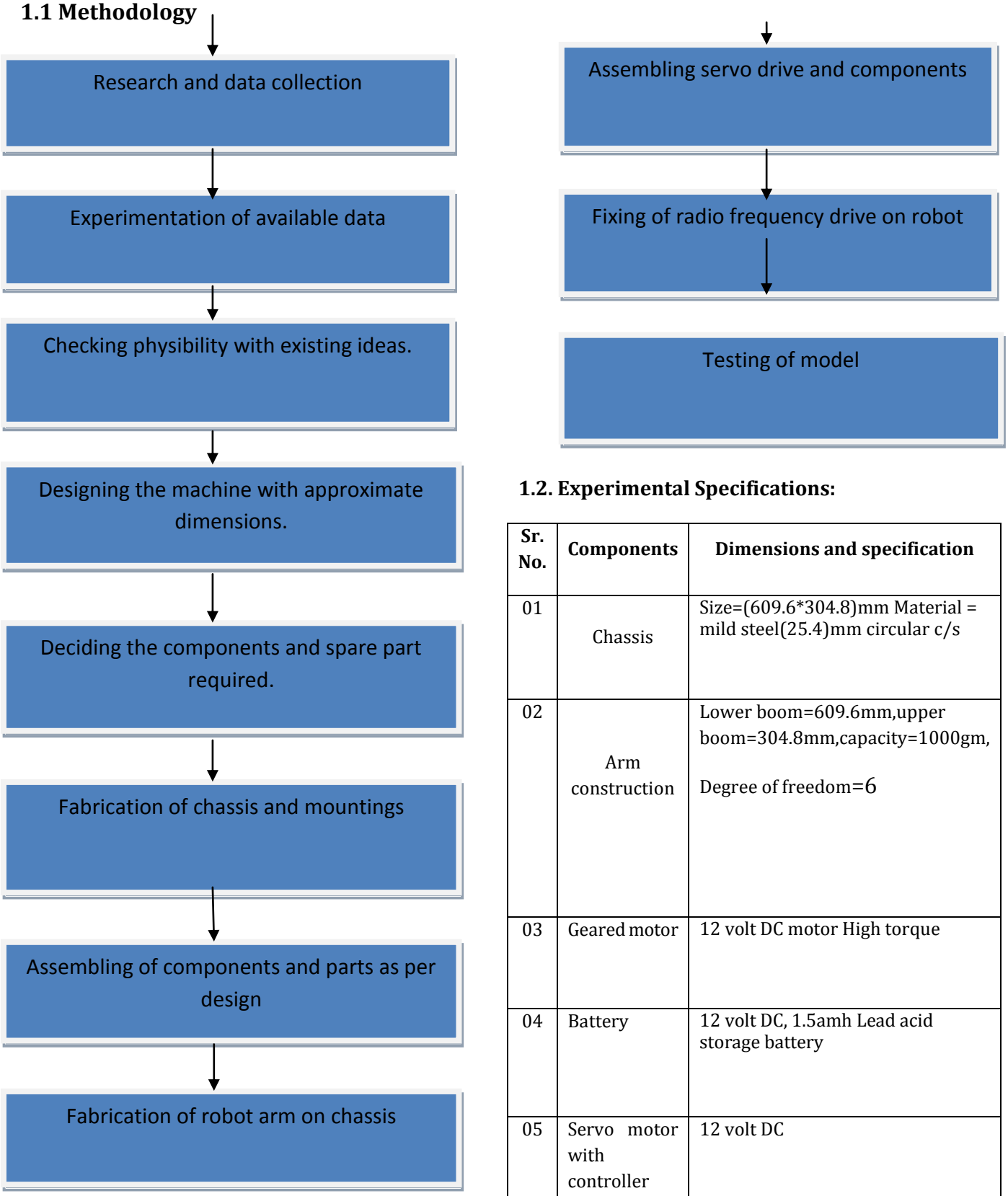
1. INTRODUCTION

During great Japan earthquake disaster, japans rescue robot was used for actual disaster site for the first time. Many robot technologies were used and tested mainly along the sanriku coast and at the fukishima diaichi nuclear power plant. They were used along the sanriku coast to inspect critical infrastructure, to search for missing person driven underwater by tsunami to debris in water and disaster site and to inspect buildings that were in danger collapsing. At the Fukushima diaichi NNP; unmanned construction technology used to remove outdoor debris and several robot and rescue robots were modified for radiation damage investigation and removal of radioactive debris.

Humanitarian search and rescue operation can be found in most large scale emergency operations. tele operated robots search and rescue systems consists of tethered mobile robots that can navigate deep into rubbles to search for victims and to transfer critical on site data for rescues to evaluate at a safe spot outside of the disaster affected area has gained the interest of many emergency response institutions, distributed wireless sensor network applied in many different fields including medical, civil and environmental research has demonstrated its value in conveying data over a large area with high level of power efficiency, particularly suitable for the location of search and rescue robot in large search field. So we keep our focus on removal of debris from disaster sites without human assistance and at faster rate and human safety.

An automated earthquake rescue machine will consist at all track wheel system, so as to overcome any type of ground condition for the purpose of handling the material. It will have an arm system which will be servo operated. The arm will have degree of freedom in many directions. At the front at the arm it will have a multi jaw gripper attached to accommodate the object of any shape or geometry shape. This machine will be electrical power assisted and remote operated. Machine also consists of robotic arm which will be servo operated and hydraulically assisted. At the front multi jaw gripper is attached. The DC motor used for driving the track system with the help of belt drive. The arduino controller is used for giving angular motion. The RF module is used control and monitors the working of machine.

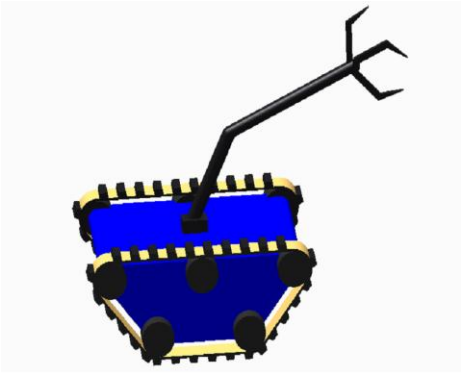
1.1 Methodology



1.2. Experimental Specifications:

Sr. No.	Components	Dimensions and specification
01	Chassis	Size=(609.6*304.8)mm Material = mild steel(25.4)mm circular c/s
02	Arm construction	Lower boom=609.6mm,upper boom=304.8mm,capacity=1000gm, Degree of freedom=6
03	Geared motor	12 volt DC motor High torque
04	Battery	12 volt DC, 1.5amh Lead acid storage battery
05	Servo motor with controller	12 volt DC
06	Gripper	3 jaw type

1.3 Experimental model



2 EXPERIMENTAL RESULTS:

- Load lifting capacity of hydraulic system
- Mode of operation = hydraulic operated
- Hydraulic cylinder used = 20 ml syringes

Inside diameter = 19.13mm = 0.7531 inch

- Outside diameter= 21 mm = 0.826 inch
- Stroke length =125 mm = 4.921 inch
- Rod diameter = 15.39 mm = 0.6059 inch
- Pressure developed by syringe = 30.32 psi
- Cylinder blind end area
- Diameter = 0.7531 inch
- Radius = d/2 = 0.7531/2 =0.3765 inch
- Cylinder blind end area = ∏*(cylinder radius)2

  = ∏*(0.3765)2

  = 0.4453 inch2
- Cylinder rod end area = blind end area – rod area
- Rod diameter = 0.6059 inch
- Radius of rod = 0.6059/2

  = 0.3029 inch
- Rod area =∏r2

  = ∏*(0.3029)2

  = 0.288 inch2
- Cylinder rod end area = 0.445-0.288

  = 0.157 inch2
- Pounds to be lifted by system

  = pressure * cylinder diameter

  = 32 * 0.157

  = 5.024 pound = **2.278 kg**

3. CONCLUSIONS

This paper has undergoes various aspects to design earthquake rescue machine based on technology considering various aspect of it, and basics of machine designing are observed that are explained clearly. These rescue machines have a wide range of disasters applications.

This invention is designed to accomplish the above and related end results, and comprises elements and features here in after set forth. An illustrate embodiment of prevent invention is described in relation to accompanying drawings of the same. It is to be understood that these illustrate embodiments suggest only a few of the various ways in which the principles of the invention may be employed.

4. ACKNOWLEDGEMENT:

We would like to acknowledge our H.O.D Dr. S. V. Prayagi, Mechanical Dept., DBACER, SVSS for his immense support.
Also we would like convey our thanks to Prof. A. S. Deshmukh , Asst. Prof. DBACER, SVSS.
Also at last but not the least we would like to thank entire professors of Mechanical Dept. at DBACER for support and knowledge

5. REFERENCES

[1] Hisashiosumi, application of robot technologies to the disasters sites, JSME, research committee, 20 Feb-2014.

[2] Mr. S.P. Vijayaragavan, live human detecting robots for earthquake rescue operations, International journal of business intelligent, June-2013.

[3] Hisashiosumi, Hitachi review 62(2013) no.2, use of construction machine in earthquake recovery work. November-2014.

[4] European centre on prevention and forecasting of earthquake (ECPPE) technical handbook for search and rescue operation in earthquakes, ATHENS, 1999.

[5] Mr. W.Durfee, Arduino microcontroller guide, university of Minnesota, Oct-2011.