

Design and Fabrication of Stair Climbing Mechanism

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Abstract - This Research on 6-wheeled mars rover bogie which combines two rocker wheel mechanisms which form the rocker bogie mechanism along with other four spider-leg wheels. It is small model of stair climbing mechanism. It has six wheel used to climb the stairs and uneven surfaces. In stair climbing mechanism project there are number of components are used such as wheels, PLC, motor, battery, pipes, wires, remote controller etc. In this 12-volt battery, 12-volt and 30 rpm motor dc side shaft motor. The spider legs ensure that it can travel through terrains with heights much greater than the rover itself. The wheels are actuator-powered which helps the rover to adjust the slope in such a way that it does not stumble for larger inclination and allows the rover to travel over uneven and highly raised terrains. It can be useful in the important space mission; because it can travel on uneven surfaces and it is own path finder. Recently it is used in the mars rover, because this mechanism takes consideration on un-evenness of the surface. This rover has larger wheels as compare to the obstacles; it can easily operate over most of the Martian rocks. It is also used in the coal mines, act as spy robot and the military operation, Bomb Diffusing Squad, large model can transporting man and material through a rough terrain or obstacles containing regions like stairs. We could develop it into a Wheel Chair too. It can be send in valleys, jungles or such places where humans may face some danger.

Key Words: Mars rover bogie, PLC, battery, stairs, space mission etc.

1. INTRODUCTION

The project aims to develop a mechanism for easy transportation curved and uneven surface of heavy load over stairs. The need of such system have increased day to day requirement in our society. Using of this vehicle the labor cost can be reducing as well as large amount of load can be transfer. It has designed in such a way that it can be climb a stepped path with its modified wheel structure. In stair climbing mechanism project there are number of components are used such as wheels, PLC, motor, battery, pipes, wires, remote controller etc. In this 12-volt battery, 12-volt and 30 rpm motor dc side shaft motor. It provides a significant amount of traction or friction with the ground where there is slope against gravity around 1m using a spring-damper suspension mechanism. This project proposes 6-wheeled rover bogie which combines two rocker wheels which form the rocker bogie mechanism along with other four spider-leg wheels. The wheels are actuator-powered which helps the rover to adjust the slope in such a way that it does not stumble for larger inclination and allows the rover to travel

over uneven and highly raised terrains. One of the major shortcomings of current rocker-bogie rovers is that they are slow. In order to be able to overcome significantly rough terrain without significant risk of flipping the vehicle or damaging the suspension, these robots move slowly and climb over the obstacles by having wheels lift each piece of the suspension over the obstacle one portion at a time.

2. METHODOLOGY

2.1 Arduino UNO R3 Based 20A rhino robot control wireless with remote control:

The Arduino UNO R3 based 20A robot control board is a versatile motor controller for driving dual dc motor rated upto 20A each. Key features include multi-functionality, incorporation of ATmega328P-AU microcontroller (Arduino uno R3 based) and 20A motor driver into a single control board designed for robotics applications. It can drive 2 robot driving motors (Connected two motors in parallel for 4 wheeled robot) in skid steer control with analog speed control. Also can control up to eight servo motors connected at servo port and motor connector-3.

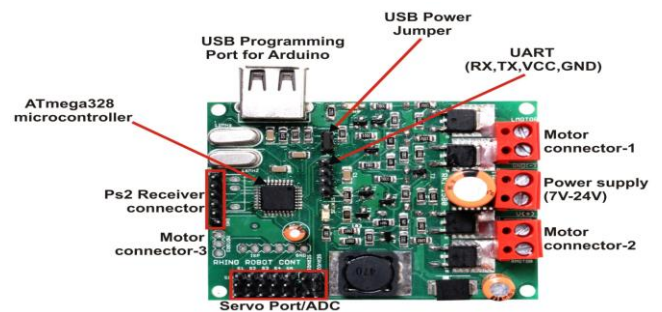


Fig -1: Arduino



Fig -2: Remote control

2.2 PVC pipes

It is the white plastic pipe commonly used for plumbing and drainage. As PVC is a low carbon plastic, PVC pipes require

less energy and fewer resources to manufacture. Due to their low weight, less energy is used when transported. PVC pipes last long with a minimum of maintenance and they are easily recyclable with strength, durability, easy installation, and low cost. 1. 18 cm, 2. 15 cm, 3. 13 cm, 4. 10 cm, 5. 9 cm, 6. 5 cm.

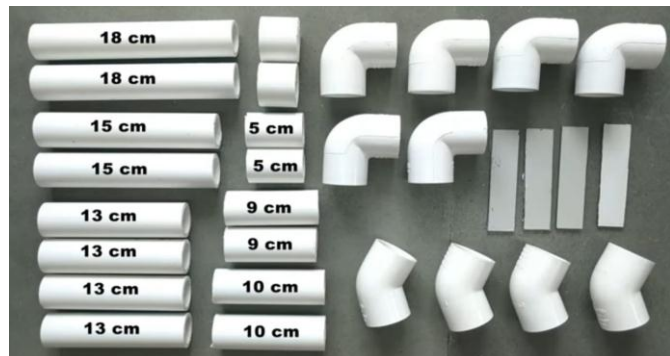


Fig -3: PVC pipes

2.3 Side Shaft Motor

It has sturdy construction with gear box built to handle stall torque produced by the motor. This motor will be bit noisy while running for long life. 30 RPM Side Shaft 37mm Diameter Compact DC Gear Motor is suitable for small robots/automation systems. Drive shaft is supported from both sides with metal bushes. Motor runs smoothly from 4V to 12V and gives 30 RPM at 12V. Motor has 6mm diameter, 22mm length drive shaft with D shape for excellent coupling.



Fig -4: Side Shaft Motor

2.4 Battery

A typical car battery with 12 volts rating has a capacity of 48 Ah. It means that when fully charged, the battery can deliver one amp for 48 hours, two amps for 24 hours and so on. Commonly used in UPS or Uninterruptible power system that is usually used with computer. These batteries can also used as portable power sources to run amplifier on outdoor situation. These are also used in small vehicles and sometimes power the self-start type generators. A 12V battery means that the voltage that is supplied under nominal load is 12V. A 2A 12V battery can provide $12V \times 2A = 24W$. A battery also has ever a capacity given by mAh which is how much current for how much time it can provides



Fig -5: Battery

2.5 Robot wheels

High quality 125mm diameter Rubber wheel for Robots, RC cars and other projects. It provides excellent grip on all kinds of surfaces and also provides nice suspension due to its flexibility. Suitable for vehicles weighing upto 3 Kg (on 4 wheels).



Fig -6: Robot wheels

3. SYSTEM DEVELOPMENT

The Stair climbing wheel mechanism adjusts itself to stair to climb different floors by vehicle and also on rough, uneven ground. Even though main researchers investigated on fabrication and design of stair climbing trolley less effort where it is future requirement to implement to perform analysis on cabin structure and wheel alignment.

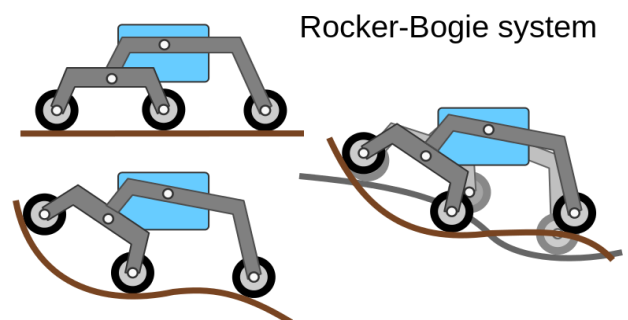


Fig -7: Rocker Bogie system animated work



Fig -8: Detailed parts required for mechanism



Fig -9: Assembled stair climbing mechanism

steps having less height but there is a difficulty to climb on the large height steps.

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4. APPLICATIONS

- With some developments like attaching arms to the rover it can be made useful for the Bomb Diffusing Squad such that it can be able to cut the wires for diffusing the bomb.
- By the development of a bigger model it can be used for transporting man and material through a rough terrain or obstacles containing regions like stairs.
- We could develop it into a Wheel Chair too. It can be send in valleys, jungles or such places where humans may face some danger.
- In military operations as a weapon carrier.
- For locating coal deposits in coal mines.
- It can be used in building construction.
- It can be used in transportation of luggage from one floor to another on stairs in hotels, malls, hospital etc.

5. CONCLUSIONS

This work shows how stair climbing mechanism works on the stairs and different uneven surfaces. By assuming accurate stair dimensions, accurately dimensioned stair climbing mechanism can climb the stairs with great stability. The future scopes of this are in the military operations as a weapons carrier and for locating coals deposits in the coal mines. After this assembled project mechanism can climb stairs. It can also move on the curved surfaces. It can climb on