

MODELLING AND FABRICATION OF SURVEILLANCE TERRAIN VEHICLE USING ROCKER BOGIE MECHANISM

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ABSTRACT

The main aim of the project is to design a small terrain vehicle which is easy to handle. As a new class of vehicle , they are made to go to terrains which would be difficult for normal vehicles. Also it can be used as a surveillance robot to alert people in areas with security threats like national borders, where it is difficult for humans to work. It is used for the defense purpose for video surveillance at the borders and detecting the enemy location with the help of camera. The terrain vehicle will be having a Rocker Bogie Suspension system with 6 wheels for greater stability which is capable of operating in multi terrain surfaces while keeping all the wheels in contact with the ground surface.. Instructions are sent to the terrain vehicle by a remote computer connected over Wi-Fi. The rover is equipped to send a live video feed and sensor data to the remote computer.

Keyword – Terrain Vehicle, Surveillance.

1. INTRODUCTION

The rocker-bogie suspension is a mechanism that enables a six-wheeled vehicle to passively keep all six wheels in contact with a surface even when driving on severely uneven terrain. There are two key advantages to this feature. The first advantage is that the wheels' pressure on the ground will be equilibrated. This is extremely important in soft terrain where excessive ground pressure can result in the vehicle sinking into the driving surface. The second advantage is that while climbing over hard, uneven terrain, all six wheels will nominally remain in contact with the surface and under load, helping to propel the vehicle over the terrain. Exploration rovers take advantage of this configuration by integrating each wheel with a drive actuator, maximizing the vehicle's motive force capability.

1.1 Objective

- The objective of the project is to design a small, terrain vehicle and easy to steer and handle.
- It will be designed for working on different platforms like rough terrains, smooth surfaces, overcoming obstacles in its path and climbing over obstacles of certain height.
- It can be use for live video feed and image capturing in borders.
- It can be send for reconnaissance purpose, which is exploring the surrounding to give visualization to a person .

1.2 Material Selection

Our main deal is to travel across uneven surfaces and uneven plains so the frame has to be tensile and hardened enough to withstand the road surfaces. So the material has to be tough and hard. Thus stainless steel is selected because of its high unique self healing property , which is tough ,ductile with cryogenic and high temperature properties to withstand hot and cold temperatures that's the main reason we selected the stainless steel as the main material for the frame..

2. COMPONENT SELECTION

2.1 Rocker Frame

The rocker-bogie design has no springs or stub axles for each wheel, allowing the rover to climb over obstacles, such as rocks, that are up to twice the wheel's diameter in size while keeping all six wheels on the ground. As with any suspension system, the tilt stability is limited by the height of the center of gravity. Systems using springs tend to tip more easily as the loaded side yields. Based on the center of mass, the Curiosity rover of the Mars Science Laboratory mission can withstand a tilt of at least 45 degrees in any direction without overturning, but automatic sensors limit the rover from exceeding 30-degree tilts. The system is designed to be used at slow speed of around 10 centimetres per second (3.9 in/s) so as to minimize dynamic shocks and consequential damage to the vehicle when surmounting sizable obstacles.

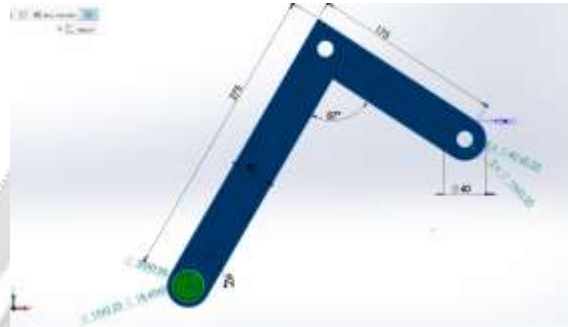


Fig -1: Rocker Frame

2.2 Bogie Frame

The term bogie refers to the links that have a drive wheel at each end. Bogies were commonly used as load wheels in the tracks of army tanks as idlers distributing the load over the terrain. Bogies were also quite commonly used on the trailers of semi trailer trucks. Both applications now prefer trailing arm suspensions.

The rocker-bogie system is the suspension arrangement used in the Mars rovers mechanical robot introduced for the Mars Path finder and also used on the Mars Exploration Rover and Mars Science Laboratory missions. It is currently NASA's favored design. The term rocker comes from the rocking aspect of the larger links on each side of the suspension system. These rockers are connected to each other and the vehicle chassis through a differential. Relative to the chassis, when one rocker goes up, the other goes down. The chassis maintains the average pitch angle of both rockers. One end of a rocker is fitted with a drive wheel and the other end is pivoted to a bogie.

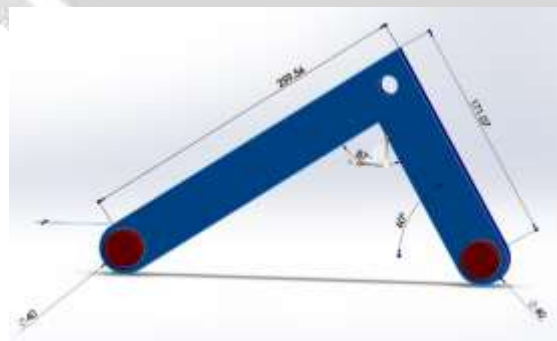


Fig -2: Bogie Frame

2.3 Wireless Camera

Wireless cameras are proving very popular among modern security consumers due to their low installation costs (there is no need to run expensive video extension cables) and flexible mounting options; wireless cameras can be

mounted/installed in locations previously unavailable to standard wired cameras. In addition to the ease of use and convenience of access, wireless security camera allows users to leverage broadband wireless internet.



Fig -3: Wireless Camera.

2.4 Battery

Battery is used to power the over all set up and working of the set up. A battery converts energy stored in the chemical bonds of a material into electrical energy via a set of oxidation/reduction (commonly abbreviated to redox) reactions. Redox reactions are chemical reactions in which an electron is either required or produced by the chemical reaction. For primary batteries, this is a one-way process – the chemical energy is converted to electrical energy, but the process is not reversible and electrical energy cannot be converted to chemical energy. This means that a primary battery cannot be recharged. Examples of primary batteries are alkaline consumer batteries used in flashlights, etc. In a secondary battery, the conversion process between electrical and chemical energy is reversible, – chemical energy is converted to electrical energy, and electrical energy can be converted to chemical energy, allowing the battery to be recharged. For photovoltaic systems, all batteries used must be rechargeable or secondary batteries. Common examples of secondary batteries are lead acid batteries and lithium-ion batteries used in higher power consumer electronic equipment such as computer laptops, camcorders, mobile phones, and some digital cameras.

3. WORKING

The rocker-bogie design has no spring or stub axles for each wheel, allowing the rover to climb over obstacles, such as rocks, that are up to twice the wheel's diameter in size while keeping all six wheels on the ground. As with any suspension system, the tilt stability is limited by the height of the center of gravity. Systems using springs tend to tip more easily as the loaded side yields. Based on the center of mass, the rover of the mission can withstand a tilt of at least 45 degrees in any direction without overturning.

The high pressure gas exiting the cylinder initially flows in the form of a “wave front” as all disturbances in fluids do. The exhaust gas pushes its way into the pipe which is already occupied by gas from previous cycles, pushing that gas ahead and causing a wave front. Once the gas flow itself stops, the wave continues on by passing the energy to the next gas downstream and so on to the end of the pipe. If this wave encounters any change in cross section or temperature it will reflect a portion of its strength in the opposite direction of its travel. The basic principle is described in wave dynamics. A heat chamber makes use of this phenomenon by varying its diameter (cross section) and length to cause these reflections to arrive back in the cylinder at the desired time in the cycle. An approximation of a heat chamber in operation. It does a good job illustrating the positive portion of the exhaust pulse; however, there are several errors in this animation: The exhaust would not go all the way through the pipe. Neither does it show the suction wave generated by the diverging section. The fresh mixture drawn into the header pipe cannot go all the way down the header pipe



Fig -4: Three Dimensional Diagram

4. CONCLUSIONS

This work shows how rocker bogie system works on different surfaces. As per the different weight acting on link determines torque applied on it. By assuming accurate stair dimensions, accurately dimensioned rocker bogie can climb the stair with great stability. The design and manufactured model can climb the angle up to 45° . Also we tested for the Web cam with AV recording mounted on rocker bogie system and found satisfactorily performance obtains during this test camera has rotated around 360° . During stair climbing test for length less than 375 mm (15 inch) system cannot climb the stair. It can be possible to develop new models of rocker bogie which can climb the stairs having low lengths.

5. REFERENCES

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