

“Rover - Remote Operated Vehicle for Extraction and Reconnaissance”

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Abstract: Inspired from differential drive mechanism of army tank and chain drive of tank for movement of rover.

Try to deploy the concept of crane working in rover for extraction purpose.

Use the camera for the security purpose and surveillance in rover for the reconnaissance purpose.

Use “pro-engineering software” for designing purpose of rover.

It is prototype to explain the concept of differential drive mechanism and its use in robotics.

Keywords: rover, security robot, surveillance, extraction robot, multi- function robot

I. Introduction

The problem is to deploy the concept of differential drive mechanism, crane lifter mechanism and security mechanism in the rover. The interesting part of the project is that we can operate it from the remote and perform various functions. The purpose of the rover design is that it may help in the research field by astronaut. For solving these problems we divide our project in 3 parts:

1. Differential drive mechanism for rover.
2. Crane arm with jaw for rover.
3. Camera system for survey purpose in rover.

I will explain the working process of above 3 parts one by one

II. Differential drive mechanism for rover

A differential is a device used in cars for distributing the power in the wheels of a vehicle by employing gears. The differential allows the wheels of vehicles to rotate at different speed which is necessary for the wheels while making a turn the wheel which is near the turn has to cover the smaller radius in comparison to a farther wheel. A single shaft is connected to the engine for its angular velocity. This shaft is further connected to the other two shafts for distributing its power in the wheels. The speed of the two wheels can vary but the sum (or average) of both the wheels cannot vary when the engine is running at constant speed.

2.1 Power Source

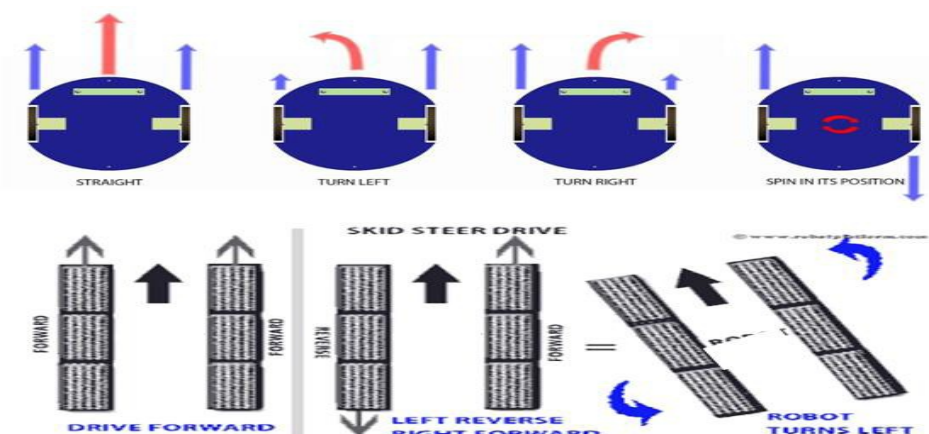
The source of power in our prototype project of “ROVER” we used the simple DC MOTORS each wheel has its own motor and the power is given to each motor by battery. The dc motors provide torque which is given to the wheel while moving.

But in actual differential drive mechanism the engine is the main source.

2.2 Working of Differential Drive

In this project we try to replace the conventional steering system of driving to the differential driving system by which our rover can be controlled by distant without any need of driver. In this differential drive system each wheel has equal power. As we all know that the dc motor rotate in a clockwise direction when connected normally and rotate anticlockwise when the terminal are reversed. The following table gives the working description for the movement of rover.

Motion	Right side motor	Left side motor
Forward	Clockwise	Anticlockwise
Reverse	Anticlockwise	Clockwise
Right	No power	Anticlockwise
Left	Clockwise	No power

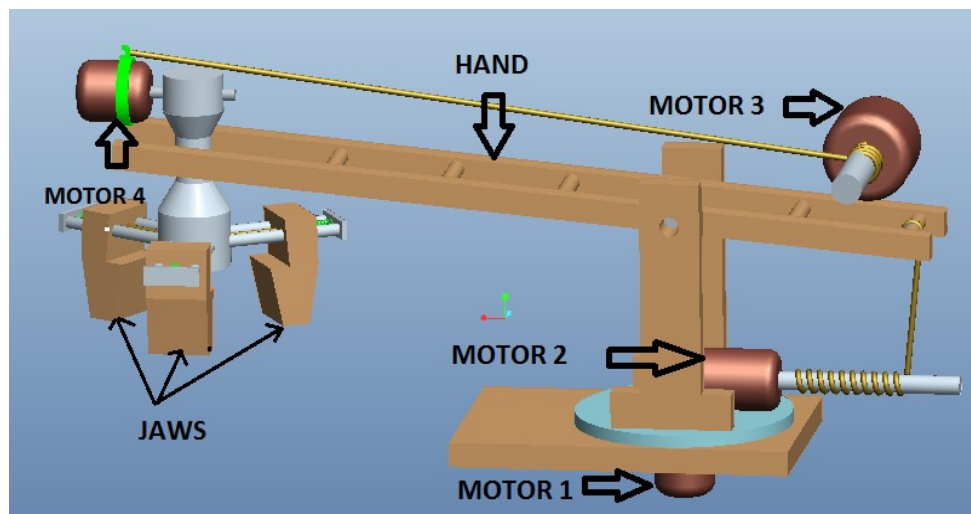


From the above table and diagram it is clear that the rover can be made to move left, right, forward and backward just by changing the power supply on pair of left and right side wheels. An observation is also found that we can make our rover turns about its own axis and decreases the turning radius just the reversing the power supply to the pair of wheel i.e. is shown in the table below

Motion	Right wheel	Left wheel
360° right	Reverse	Forward
360° left	Forward	Reverse

III. Crane Arm with Jaws for ROVER

The working of the arm of a rover is shown by the help of the diagram which is designed in pro-e. Basically there are 4 motors which completely control the movement of the rover arm for traction purpose. I will try to explain the working of all the motors one by one and motors are also shown by name on the below diagram.



3.1 Motor 1

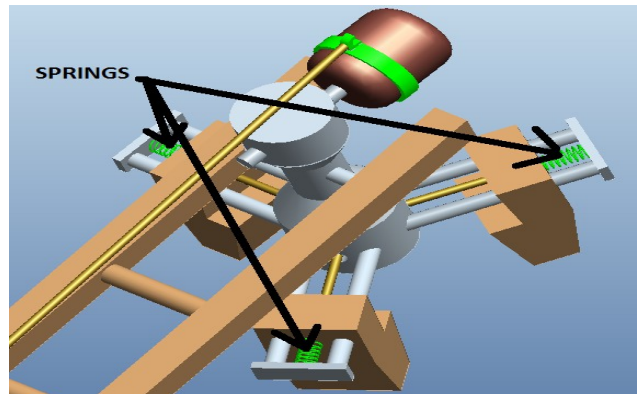
This motor control the 360° movement of the rover arm we have taken the concept of army tank on which the weapon on the top can rotate at 360° without any problem. We used the dc motor for my prototype. The motor rotate the base which is in **blue** color in above diagram.

3.2 Motor 2

This motor controls the upward and downward movement of the rover hand which is shown in above diagram.

3.3 Motor 3

This motor controls the jaws assembly for movement about its axis by simply applying the concept of torque. The jaw assembly can move to about 180° from down to top which is shown in the below diagram.



3.4 Motor 4

This motor has its main role in the rover which controls the 3 jaws movement in the jaws assembly. The motor 4 is connected to the jaws by the use of threads. When this motor rotate then due to the tension in the thread the threads will wind up in the motor shaft and the spring will get expand due to which the restoring energy will get stored in the springs of the jaws and when the motor is stopped the restoring force of the spring will make the spring to contract and the jaws will return to its initial position.

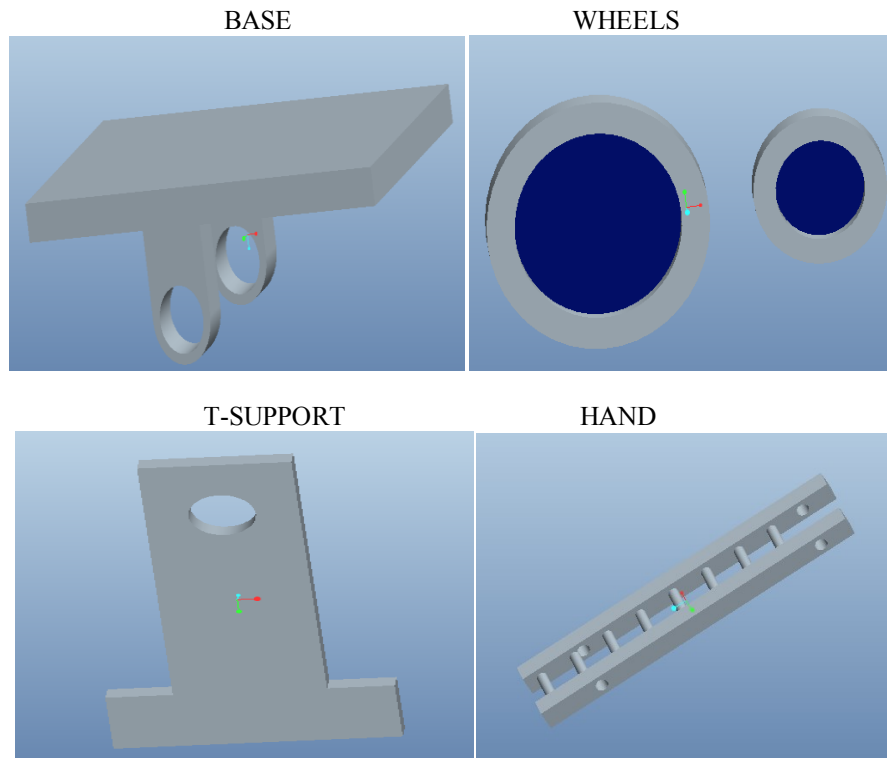
IV. Camera system for survey purpose in rover

In my prototype the recording camera is installed in the rover in the front and the data is stored in the memory card and the data can be fetched through the memory card and through this process the surveying can be done. Camera is shown in the prototype model at last.

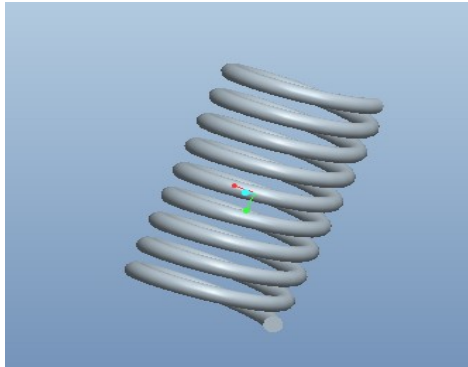
V. Experiment Performed

“Designed in pro-engineering software”

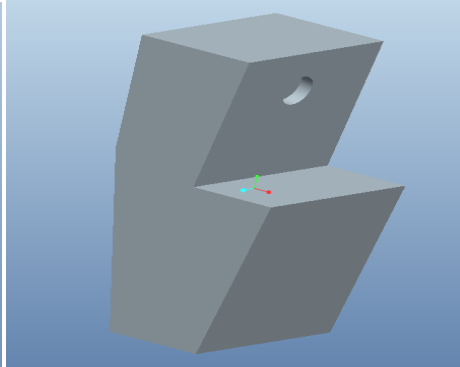
PARTS:



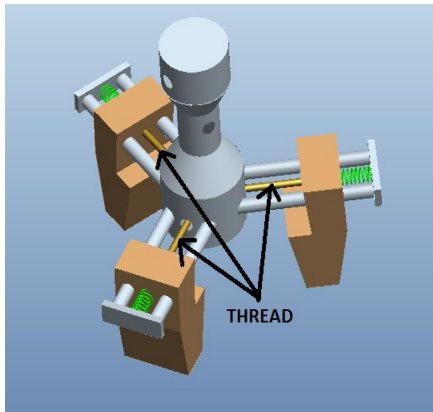
SPRING



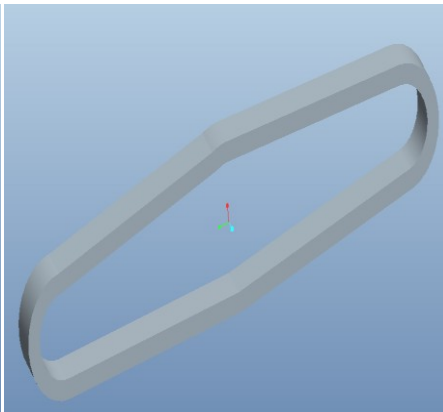
JAWS



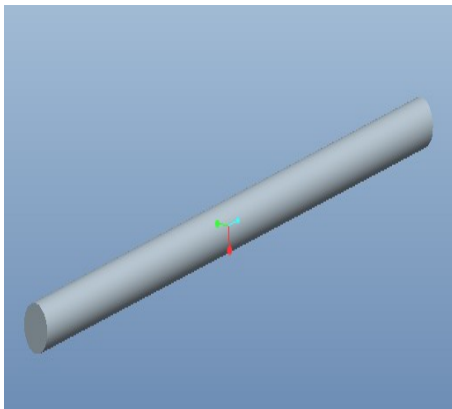
JAW MECHANISM



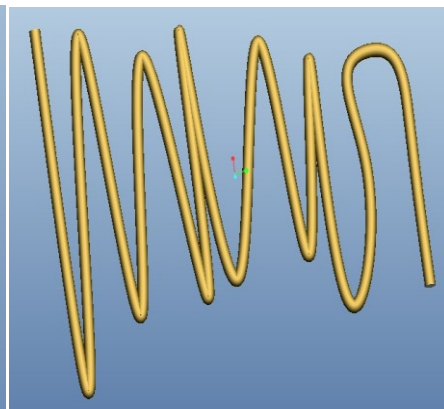
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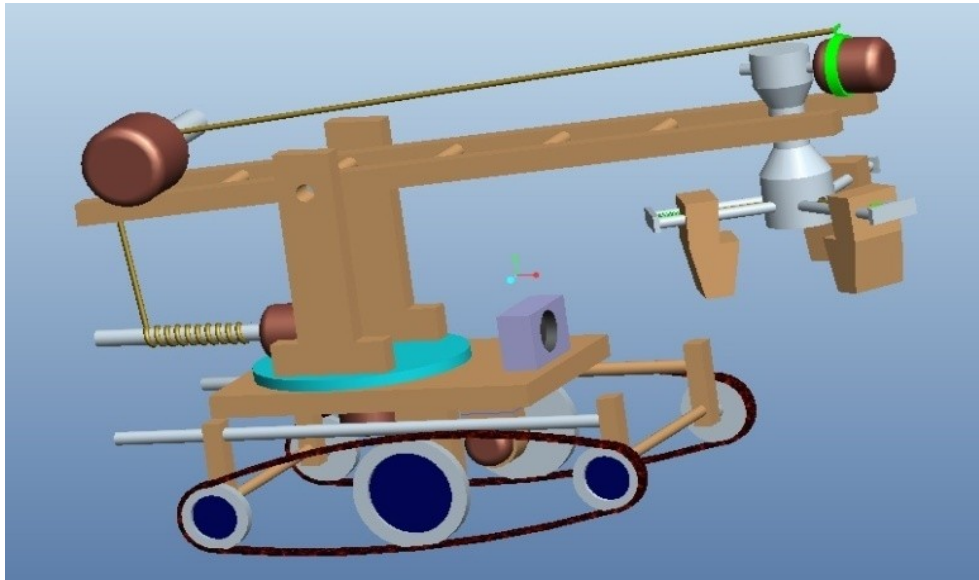
SUPPORTING ROD



THREAD



“FINAL PROTOTYPE DESIGN”



VI. Application of rover

- The rover can be used by the space industries for using it in the space for the traction and surveying purpose during the research in various planets.
- The design of rover is done in such a way so that it can work in the rough fields of a planet.
- The recording of the fields on the planet is done by the rover through its camera and the astronaut is able to know about the different parts of planets.
- The sample of rock or sand can be taken by the rover hand and bring back so that various research work can be done on the soil of the planets.

VII. Uses of rover in various others fields:

In my prototype we have used the motor but in actual the hydraulic must be used for the better and proper functioning of the rover parts without any failure. This prototype can work on any field of on the hill side, on the rough road etc. it has many application of it

1. Work as a crane like lifter.
2. used as a robotic arm in the factories for working to increase the efficiency of work.
3. used by the military for surveillance purpose.

VIII. Conclusion

Our aim in this project is to help the astronaut in the space for doing the research work on the soil of the planets by taking sample of soil from various part of the planet by using rover application as a crane. And performing the surveying the planets and bringing back the recorded information of the various section of the planet. It decreases the effort of the astronaut on walking on foot to the planet and doing research work.