

Rocker Rover And Its Implementation In The Field Of Agriculture: A Review

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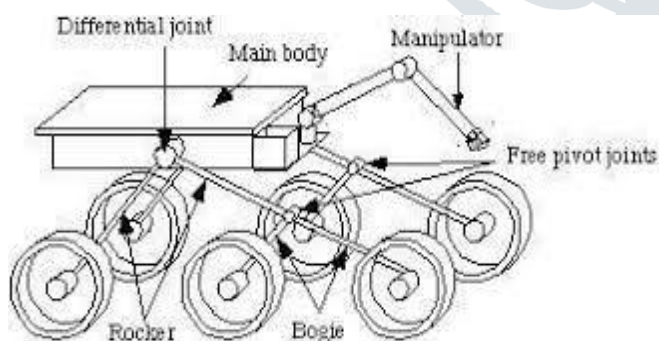
ABSTRACT

The Project work **"STUDY ON ROCKER ROVER AND ITS IMPLEMENTATION IN THE FIELD OF AGRICULTURE"** deals with the important aspect of improving the rover from its previous designs. The **ROCKER** rover has to operate on rough and harsh environments like exploring the Moon's surface and other expeditions alike for which it was designed. But the implementation of the rocker rover can be further extended in the areas of work where the land upon which the operations needs to be executed like in the field of Agricultural farming. The focus of our research is based on the modification of the rocker rover to applicable in the field of Farming making the agricultural industry much more automated. The rover has been completely made from PVC to increase its capacity to withstand shocks, vibrations and mechanical failures caused by working on the large rough fields where it is operated on. Using AUTOCAD software the design of the rover has been fine-tuned and by experimenting with prototypes and models of the rover in the experimental setup of the live test, improvements and feature were included into the rocker rover.

KEYWORD: Farming, Agriculture, Automation, PVC Pipe Fitting, Suspensionless system, all-terrain.

INTRODUCTION:

A rover or sometimes planetary rover is a space exploration vehicle designed to move across the surface of a planet or other celestial body[2]. The rocker-bogie suspension design has become a proven mobility application known for its superior vehicle stability and obstacle-climbing capability[1]. 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 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 design has no springs or stub axles for each wheel, allowing the rover to climb over obstacles, such as rocks, that is 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 centre of gravity[3]. The primary mechanical feature of the Rocker Bogie design is its drive train simplicity, which is accomplished by two rocker arms. In order to go over an obstacle, the front wheels are forced against the obstacle by the rear wheels[4].



(Source: ijsrt.com)

LITERATURE REVIEW:

The initiation of the rocker-bogie suspension system can be traced to the development of planetary rover which are mobile robots, specially designed to move on a planet surface. Early rovers were teleoperated like the Lunokhod I while recent ones are fully autonomous, such as FIDO, Discovery and recently developed Curiosity Mars exploration rover. The rovers needed to be very robust and reliable, as it has to withstand dust, strong winds, corrosion and large temperature changes under mysterious conditions. Maximum rovers remain powered by batteries which are recharged by solar panels during the day installed over there surface[5].

NASA developed the rocker-bogie suspension system for their rovers and was implemented in the Mars Pathfinder's and Sojourner rover. The rocker-bogie suspension system passively keeps all six wheels on the robot in contact with the ground even on uneven surfaces. This creates great traction and manoeuvrability[6].

Ashish U. Bokade. *et.al*, proposed a method for controlling a wireless robot for surveillance using an application built on the Android platform. The Android has a video screen for surveillance and buttons to control robot and camera. Android Smartphone and Raspberry pi board are connected to Wi-Fi. An Android Smartphone sends a wireless command which is received by Raspberry pi board and accordingly robot move. The Raspberry pi programming is done in python language[4].

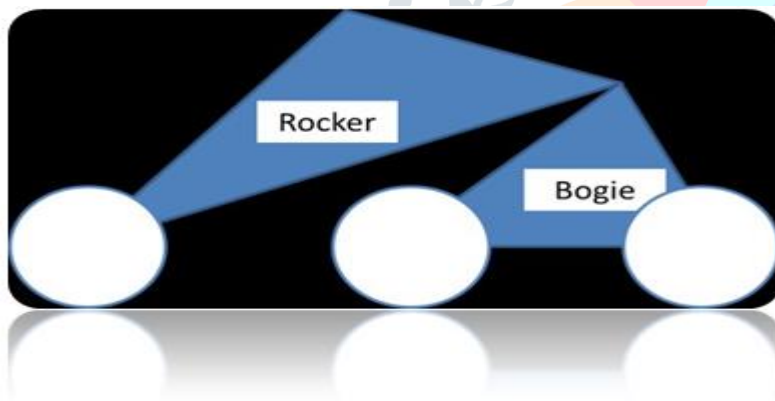
Rover named ALIVE is designed to monitor and maintain the garden. In a multispecies garden, attention to individual plant species is necessary to enhance the plant growth. Rocker-Bogie suspension system is integrated in the rover design thereby increasing its manoeuvrability. It also decreases the maintenance-related expenses involved for a suspension system[7].

ROCKER ROVER AND AGRICULTURE:

Cultivating might be one of the most distressing occupations in India. Water shortage, inconsistent power supply and lack of work have reliably prompted poor yield, reverberating an a lot bigger emergency that proceeds with quite a long time after year. The weight of credit on farmers further expands this cycle of hardship. India is ranked at #1 position in terms of global ranking in agricultural productions and most of this ranking is majorly due to the crop farming carried out in India. Still, the agriculture sector is not that much into automation. Especially, in the field of farming, the farmers need to carry out most of the work with their own hands.

With the introduction of the Automation, the farmers, working on the fields can generate a greater amount of the yield every year. The concept of rocket-rover, a driverless all-terrain mobile technology is really one of the best engineering marvels ever created and its applications in the other fields to will work in the favour of mankind by a long shot.

With the implementation of the Rocker Rover in the field of agriculture, basic time taking processes like-seed distribution can be resolved at ease with less manpower, just to operate the rovers on the fields. The “bogie” of the Rocker Rover can carry the seeds which are required for distribution and sowing. The seeds placed on the rover will be distributed uniformly on the field which will drastically limit the wastage of the seed and also result in uniformly scattered.



(Source: S.F.Toha, Zakariya Zainol “System Modelling Of Rocker-Bogie Mechanism for disaster relief”)

The rocker-rover concept can be implemented in this field of agriculture as the cost of rocker-rover will be a lot less in comparison to that of a tractor, making it really affordable and its locomotive ability in rough terrains without the use of suspensions will result in good efficiency in crop fields.

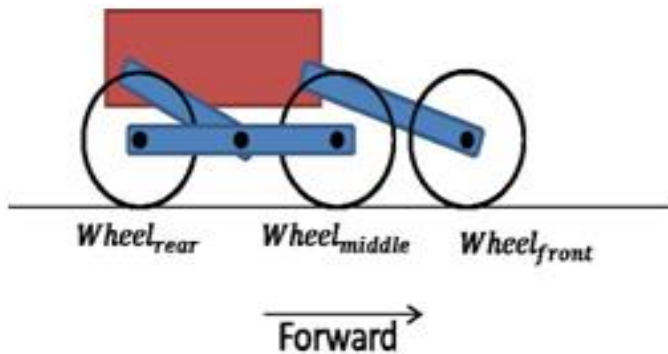
Rocker Rover has certain **Advantages** which align very fine with the needs and demands to the cultivation sector and the farmers as well, making it suitable to the industry.

1. Reduced Jerks without the use of suspensions.
2. Less maintenance required.
3. Cost-efficient.
4. Works on alternate sources of energy.
5. Fewer movable components.

6. Rocker bogie system can bear a tilt of 50 degrees in any direction.
7. The design is simple and reliable.
8. The front and back wheel have individual drives for climbing, enabling the Rover to traverse obstacle without slip.

WORKING PRINCIPLE:

The rocker-bogie design consisting of no springs and stub axles in each wheel which allows the chassis to climb over any obstacles, such as rocks, ditches, sand, etc. That is up to double the wheel's diameter in size while keeping all wheels on the ground maximum time. As compared to any suspension system, the tilt stability is limited by the height of the Centre of gravity and the proposed system has the same.



(Source: S.F.Toha, Zakariya Zainol "System Modelling Of Rocker-Bogie Mechanism for disaster relief")

LIMITATIONS OF ROCKER ROVER:

1. One of the major shortcomings of current rocker-bogie rovers is that they are slow.
2. In order to be able to overcome significantly rough terrain without significant risk of flipping the vehicle or damaging the suspension.
3. 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.

FUTURE SCOPE OF ROCKER ROVER IN THE FIELD OF AGRICULTURE:

Implementation of rocker rover in the field of agriculture has great potential in the near future. Since the cost of the equipment in the field of agriculture is in its prime and will keep on increasing because of the current and upcoming economic structure. Therefore, the agricultural sector could appreciate a device which is in favour of cost-effectiveness as well as automation and reduction in the area of energy consumption.

The rocker rover is designed as an all-terrain vehicle without the use of suspension which is great in terms of making a rover in the field of agriculture low maintenance as well as more cost-efficient device hence more affordable.

The rover that will be used for the farming purpose will be a driverless vehicle will save energy and labour cost required in the process of distribution of the seeds throughout the fields. The rocker rover is also provided with solar panels and rechargeable batteries rather than the use of convention sources like diesel which is obtained from fossil fuels which leads to large scale production of carbon footprints which can be experienced in the case of tractors and other driven machinery used in the agricultural fields.

CONCLUSION:

The implementation of Rocker Rover Mechanism in the field of Agricultural Farming has good potential in the near future. The crop plantation in the foreseeable future will be more evenly distributed, effective and efficient with the help of rocker rovers in terms of all the plausible parameters. The rocker-bogie mechanism will be driverless reducing the labour cost, and also suspensionless which will reduce overall cost of the Machinery making it more susceptible to this particular industry.

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