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# Fabrication of Spraying Robot Using Rocker Bogie Mechanism

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**ABSTRACT:** A research project aims to design and develop a mobile robot for agricultural applications by fabricating a spraying robot using a rocker bogie mechanism. The robot can navigate rough terrain while staying stable thanks to a type of suspension system called a rocker bogie mechanism. A spraying mechanism on the robot can be used to spray crops with fertiliser and pesticides. The fabrication procedure involved creating the mechanical framework of the robot, integrating the electronics, and testing its functionality in a controlled environment. The manufacturing of the spraying robot entails the choice of suitable materials, the design of the mechanical components, the assembly of the robot, and the performance testing of the robot. Once the robot has been successfully built, the agricultural sector can use it to boost productivity and cut labour costs.

**KEYWORDS:** Rocker bogie mechanism, frame, Arduino UNO, Sprayer, Agricultural, Economical.

## I. INTRODUCTION

Robots that can function in severely uneven terrain and unstructured surroundings are becoming more and more necessary. The majority of the duties that these robots perform are hazardous and impractical for humans. Any robot that performs these tasks must have a mobile system that is appropriate for the environment. One of these mobile systems is the rocker-bogie suspension system, which NASA currently chooses as the preferred design for rover wheel suspension. It was first used to the Sojourner Mars rover. The installation of a rocker-bogie suspension was a no-brainer when the Mars Exploration Rover (MER) Project was first proposed because of its lengthy history. The six independently powered wheels of the rocker bogie suspension system are mounted to a frame. During obstacle courses, systems with springs have a propensity to topple more easily as the weighted side yields. The main advantage for any heavy-loading vehicle is that, depending on the centre of overall weight, any vehicle built on the basis of a Rocker bogie suspension may survive a tilt of at least 50 degrees in each direction without overturning. The technology is designed to prevent dynamic shocks and any associated damage to the vehicle when passing substantial obstacles in low-speed work vehicles, such as bulldozers and heavy trucks, which travel at speeds under 10 centimetres per second (3.9 in/s).

It might be necessary to employ a remote-control system to operate the robot from a distance, or it might entail programming the robot's onboard computer to follow a particular path or spray pattern. It takes knowledge of mechanical engineering, electronics, and computer programming to construct a spraying robot using the rocker bogie mechanism. The final robot, however, is extremely adaptable and has a variety of applications.

## II. LITERATURE REVIEW

Few research papers are published on the concept of rocker bogie mechanism and the following information which they presented.

**Sebastian Pecolt et.al.** constructed an autonomous control of a mobile robot to explore areas with difficult terrain. They used rocker bogie suspension for stability and raspberry pi microcontroller to control the robot. Rapid prototyping using 3D printing technology allowed to test the mechanical solutions of the mobile robot in a real environment and allowed for quick modifications. In the future some elements which have insufficient strength can be replacement by solid metal parts.

**Para Bimal Saraiya** studied the Rocker Bogie Mobility system. His paper describes a method of driving a Rocker - Bogie vehicle so that it can effectively step over most obstacles rather than impacting and climbing over them. Most of the benefits of this method can be achieved without any mechanical modification to existing designs only a change in control strategy. The concern during the development of Rocker Bogie was to optimize the speed of the rover such that it does not flip at higher speed. Further development will enable this mechanism to be used for defence operation, wheelchairs for climbing stairs etc.

**Prof. RoheshkumarLavate et.al.** presented a paper on Metal Detecting Rover Vehicle using rocker bogie suspension system. They designed and analysed in SolidWorks software and showed that the different systems apply different forces on the linkages of the suspension system which results in different torques produced. It could climb up to angle of 45 degree. Their project produced prototype landmine detection and marking robot that used GPS localization, autonomous navigation, and a prototype metal detection system and novel landmine marking system. Army needs better border security and security form naxalite which involves less risk of life of soldiers.

**S.Muruganatham et.al.** proposed a paper field mobile robot which uses the bogie mechanism. The motive of their paper is to understand mechanical design and its advantages of rocker-bogie suspension system in order to find suitability to implement it in post disaster management finally physical prototype of Rocker Bogie mobile robot is built which can climb staircase of height 150mm and length 350mm and tested in various conditions of surfaces including vertical obstacle, inclined surface and uneven terrain outdoor condition.

### III. METHODOLOGY

First, we base our work on the problem statement. In the problem statement, we address a social issue or problem and we review relevant literature. Following the foundation of a literature review, we gather the necessary materials, then construct solutions to the problem. After we construct and manufacture a product, it will be tested. Trial and error will occur throughout testing. If a problem surfaces during further testing, the fabrication or problem statement will be used. When testing is finished, the product will be displayed. The robot spraying machine is made up of a number of components, including a Bluetooth transmitter, motor, battery, Arduino, pump, and supporting elements. A little water pump is stored within the plastic box to pump the water, and a nozzle is connected to the pump to spray fertiliser or pesticides. These tools are used to run the wheels via motors, together with an L298N motor driver and a Bluetooth module. When in operation, a vehicle sprays fertiliser through an Arduino-controlled nozzle. Arduino Bluetooth module is used to control the vehicle's mobility. The goal of our project is to build a rocker bogie drive system inspired by NASA's designs. In the agricultural industry, this method can be employed to spray fertiliser.

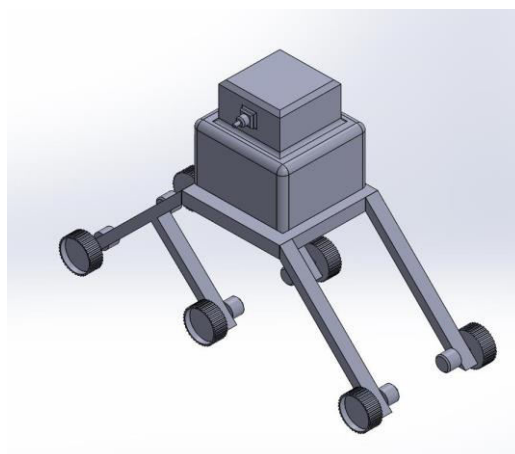


Fig.1 CAD model

### IV. CONSTRUCTION AND WORKING

The main components of the manufactured spraying robot are the motor, wheels, GI pipes, battery, mini water pump, L298N motor driver, Arduino UNO and Bluetooth module, etc.

The robot's movement is controlled by the rocker bogie mechanism. A fixed frame, two rocker arms, and a central bogie assembly make up this system. The bogie assembly, which is supported by six wheels, is joined by the rocker arms. A motor powers the wheels, which the control unit can use to move the robot in any direction. The spraying device is in charge of applying the spraying substance. Water, insecticides, or other chemicals used in agriculture can be utilised as the spraying medium. A spraying tank, a pump, a nozzle, and a control valve make up the mechanism. The substance to be sprayed is kept in the spraying tank and is pumped through the nozzle by the pump.



Fig.2 working model

## V. CONCLUSION

The rocker-bogie system would be advantageous for a spraying robot in several ways. It would be better equipped to navigate challenging terrain, opening up access to previously inaccessible locations. Second, even when spraying over slopes or uneven terrain, it would be able to maintain its steadiness. It would be able to cover a lot more ground faster and more effectively than a human worker. Building a spraying robot using the rocker-bogie system has some additional difficulties. Making sure the spraying system is appropriately linked with the rocker-bogie mechanism is one issue, as it enables the robot to spray effectively without sacrificing its stability or mobility. Making a control system that can concurrently run the robot and the spraying equipment is another difficulty.

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