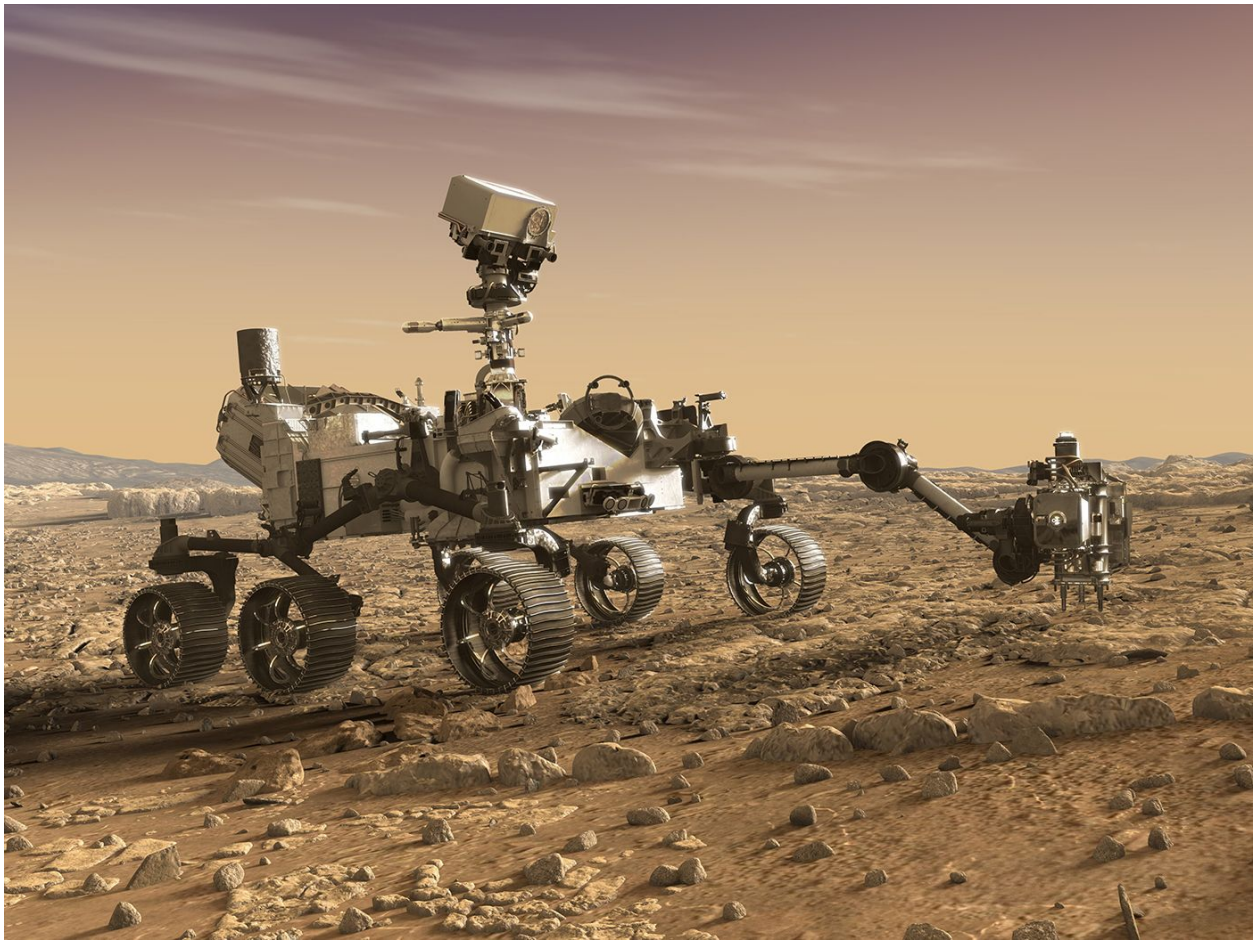


Rocker Bogie mechanism

- Kinematics and Dynamics of Machinery Project

Project by

Nellipudi Poojitha Reddy- 131701018

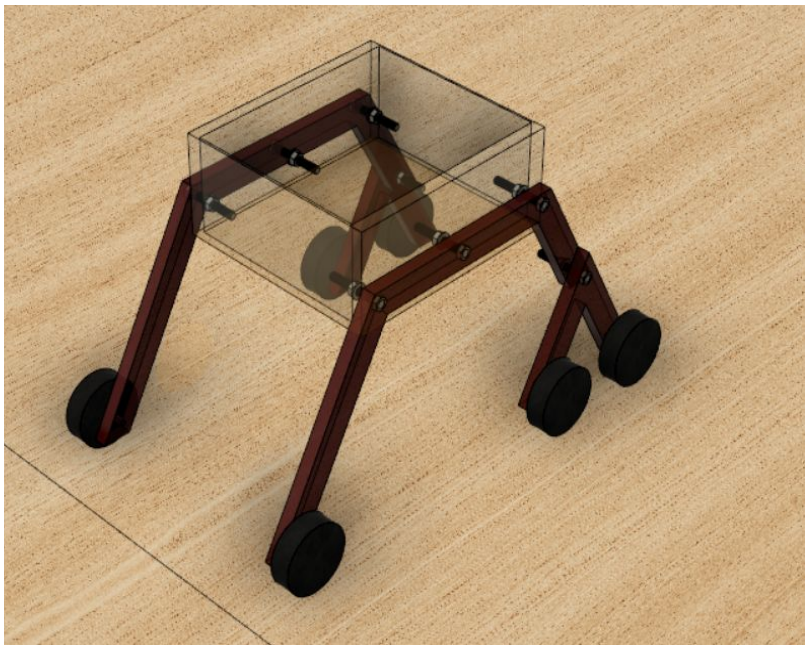
Palla Rimo Rithwik- 131701020

Kapil Raj Meena- 131701016

Abstract :

Over the past decade, the rocker-bogie suspension design has become a proven mobility application known for its superior vehicle stability and obstacle-climbing capability. Rocker-bogie mechanism has a wide range of applications. This mechanism is still being used in all-terrain vehicles. Mars rover named CURIOSITY which was designed and developed by NASA as a part of Mars Science Laboratory mission works based on rocker-bogie mechanism. The main objective of this project is to design, develop and test a rocker-bogie mechanism.

Description :



The above shown figure is a rocker-bogie mechanism. It totally consists of six wheels with three wheels on each side. Each side of rocker-bogie has a rocker and bogie. The rocker is connected to the rear wheel, and the middle wheel and the front wheel are connected by the bogie. The two sides of rocker-bogie are attached to the main body, which ensures that the six wheels are in contact with the ground all the time providing a stable platform for the scientific instruments and sensors.

Rocker bogie mechanism contains more than one independent rocker arrangement and joins such a number of independent rocker into a single bogie. The main advantage is that every wheel on this device is independent in motion when

compared to axle drive in vehicles like train etc. Any wheel alone can move up a steep or down a valley without affecting other wheels.

At low speeds, this mechanism can climb the obstacles of height which is equal to the diameter of the wheel. It is highly unstable at high speeds. At high speeds, the wheels experience head on collision with obstacles. Due to this, high impulsive force acts on the wheels. This leads to damage of the vehicle. Thus, the Rocker-Bogie Mobility system was designed to be used at low speeds.

For complete Fusion 360 model, click here

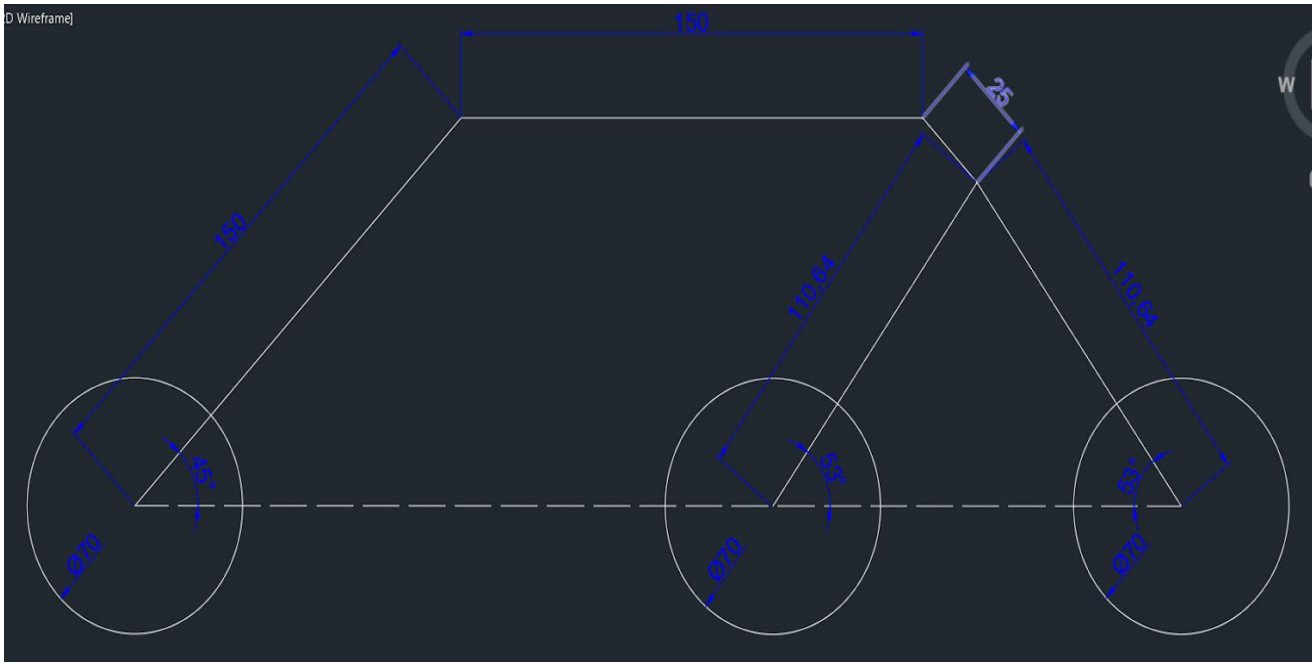
Consider, the rocker-bogie mechanism on either side of the vehicle, then the mechanism is planar. We can calculate degrees of freedom for planar mechanisms using Gruebler's equation.

$$m = 3*(n-1) - 2*(J1) - J2$$

where, n = number of bodies or links
J1 = Number of lower pair joints
J2 = Number of higher pair joints

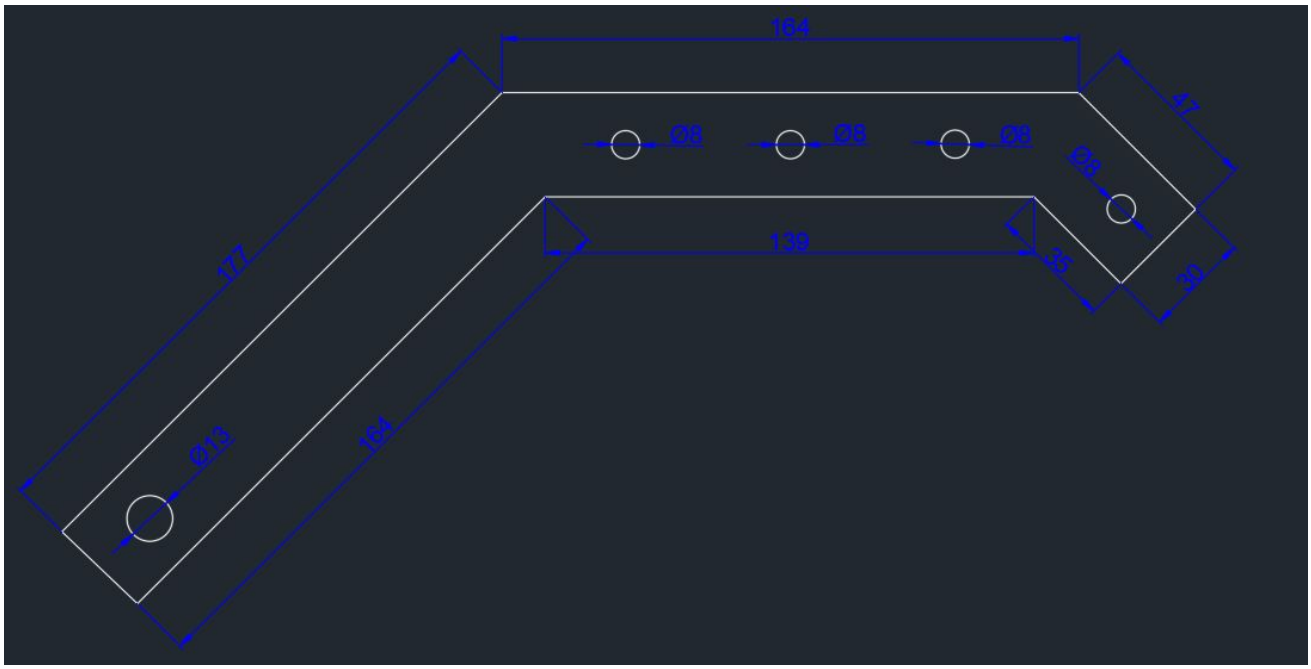
Calculating degrees of freedom using the above formula, we get mobility equal to two that implies the mechanism can move in x-direction and the wheels rotate about y-direction. The combination of sliding along x-direction and rotation of wheels about y-direction leads to the vertical motion of the whole body.

Dimensions :



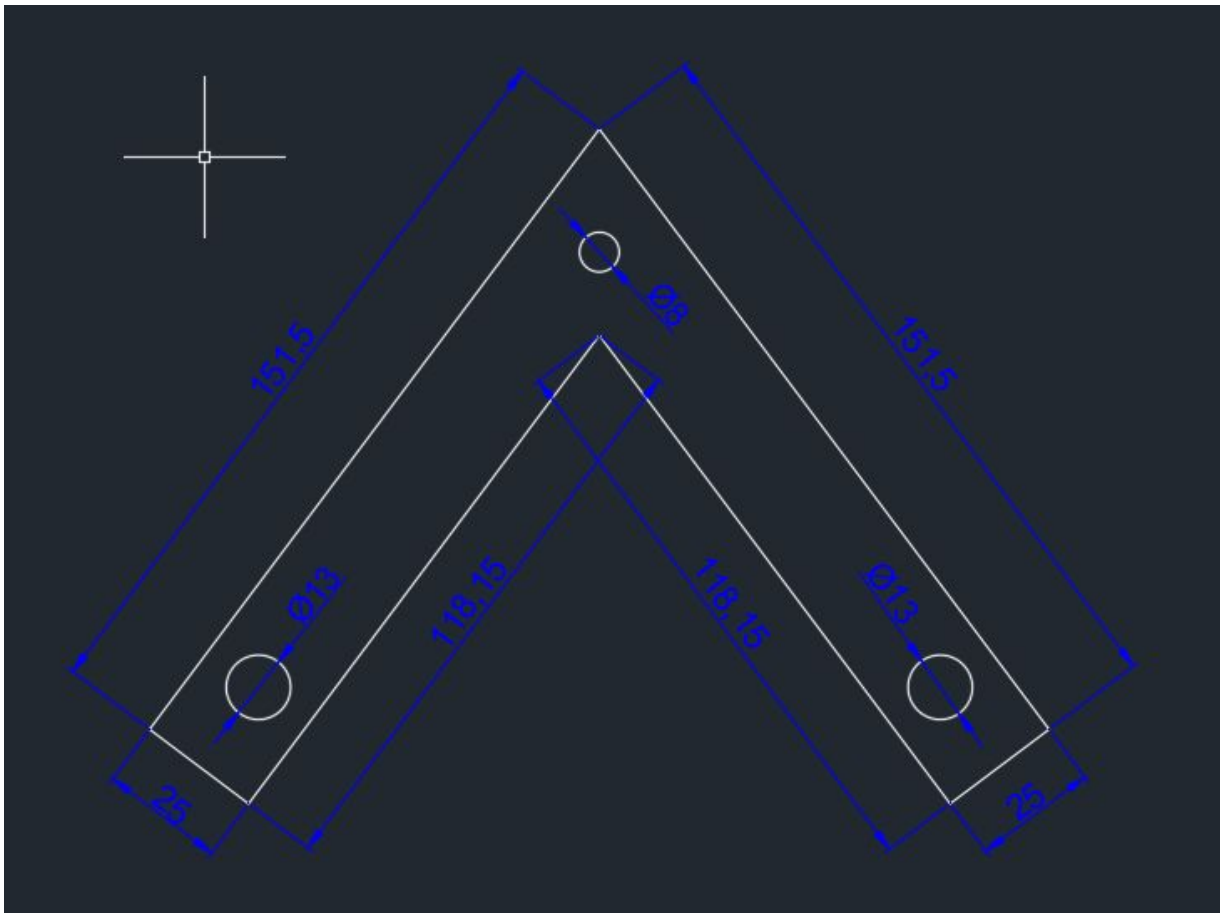
Kinematic diagram of rocker bogie

For complete dimensions of the kinematic diagram, click here



Dimensions of Rocker link

For complete dimensions of the rocker link, click here



Dimensions of Rocker link

For complete dimensions of the rocker link, click here

Applications :

- Rocker-bogie mechanism is primarily used in the mars rovers to overcome the rough terrains while maintaining the stability
- This mechanism can be used in stair-climbing robots
- It can be used in military vehicles for visualizing the scenario where the bomb is planted
- It can also be used in vehicles for material delivery purposes