

# SAMARTH - A Multi Foldable Stair Climbing Wheel Chair for Differently Abled

Johny Abraham

Novel Solution, Indigenous Design to a Problem, Challenge

## 1. Rationale

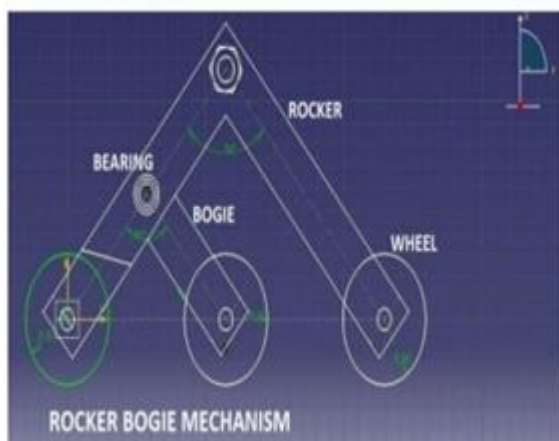
Disabilities have affected thousands of families in the world. As of today, 650 million people are suffering from disability. Their disabilities can be empowered and enable them to live a normal and independent life with the help of wheelchair. Wheelchair is one of the easiest modes which serves the purpose of transportation for patient and is considered as basic necessities in hospital. Studies showed that 40% of the helpers who helped physically challenged person for the translation from bed to chair and vice versa are suffering from the back and joint pains.

The exhibit is a prototype of a stair climbing wheel chair which can also be converted into a stretcher, especially designed for differently abled people. A stair climbing wheel chairs forms a basic necessity almost everywhere where we do not find ramps for differently able people. Not every place is constructed keeping in mind the needs and comforts of these disabled people. It facilitates them become more independent/self - dependent. The mechanism not only facilitates climbing of stairs but is designed in a way that it can easily walk through uneven terrains, along with the additional feature of converting itself into a stretcher.

## 2. Scientific Principle (s) / Concepts:

The scientific principle behind the prototype of the exhibit is 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. Rocker bogie mechanism makes use of a suspension mechanism that

### 2D SKETCH:



In order to overcome vertical obstacle faces, the front wheels are forced against the obstacle by the centre and rear wheels which generate maximum required torque. The rotation of

consists of several rigid elements connected through joints of a certain number of degrees of freedom. This enables them to move along uneven terrain without losing contact with the ground. The rocker - bogie suspension system was first used for the Mars Rover Sojourner and is currently NASA's favoured design for rover wheel suspension.

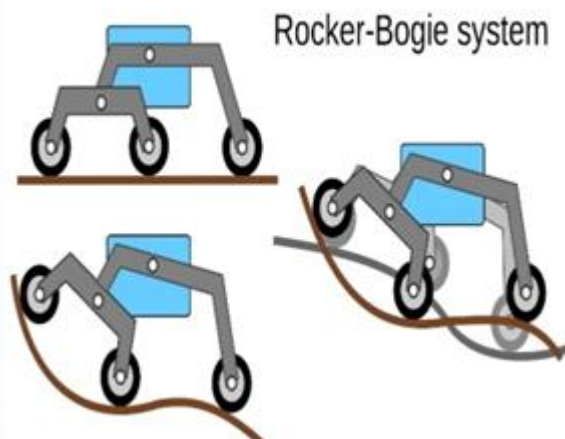
In this prototype, power screw mechanism is used to convert a wheelchair into stretcher and vice versa. When power screw mechanism is operated, the foot rest which is downward goes till the level of seat of wheelchair and simultaneously the back support goes down to the same level making it a stretcher and vice versa, when it is converted into wheelchair from stretcher.

## 3. Materials Used:

The main components involved in this project consist of DC gear motor, castor wheels, metal strips for fabrication of the wheel chair prototype, wooden staircase, power screw set, battery, two way switches.

## 4. Procedure / Description

The rocker bogie suspension design has 6 wheels with symmetric structure for both sides. Each side has 3 wheels which are connected to each other with two links. The main linkage called rocker has 2 joints, while first joint connected to front wheel, another joint assembled to another linkage called bogie, which is similar to train wagon suspension member.



the front wheel then lifts the front of the vehicle up and over the obstacle and obstacle overtaken. Those wheels which remain in the middle, is then pressed against the obstacle by

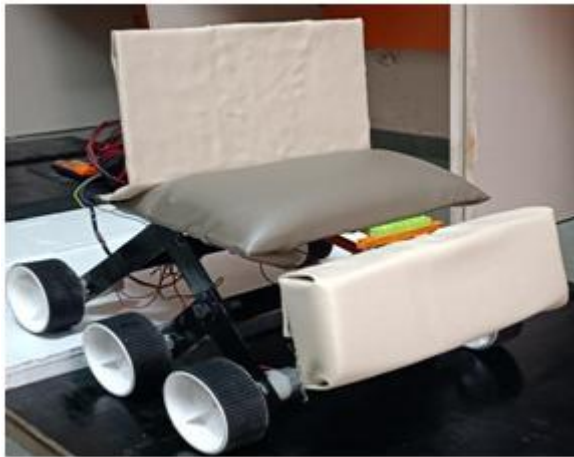
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the rear wheels and pulled against the obstacle by the front till the time it is lifted up and over. At last, the rear wheel is pulled over the obstacle by the front two wheels due to applying pull force. During each wheel's traversal of the obstacle, forward progress of the vehicle is slowed or completely halted which finally maintain vehicles centre of gravity.

The model also uses a power screw mechanism for converting it into a stretcher mode from the wheel chair mode and vice versa. A power screw or translation screw is a screw used as a linkage in a machine to translate turning motion into linear motion. When lead screw mechanism is operated, the foot rest which is downward goes till the level of seat of wheelchair and simultaneously the back support goes down to the same level making, it stretcher and vice versa, when it is converted into wheel chair from stretcher



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