**International Journal of Innovative Research in Engineering**
*Volume 3, Issue 4 (July-August 2022), PP: 200-205.*
*www.theijire.com*
***ISSN No: 2582-8746***

# Design, Analysis and Fabrication of 360-Degrees Wheel Rotating Automobile

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**How to cite this paper:**
Bathula Leyander[1], P. Satish Kumar[2], "Design, Analysis And Fabrication Of 360-Degrees Wheel Rotating Automobile", IJIRE-V3I04-200-205.



***Abstract:*** *The fabrication of a 360 degrees-wheel rotating automobile is to decrease the turning time from one direction to another. By using cogwheels dc-motor bearings, transmission-chain and control switches it can move in all directions by locating in the same place. The key role of this automobile is to move from one direction to other direction in an ease manner without any external effort and also to decrease the rotating radius of an automobile. Initially the automobile will stop and wheels are rotated in the desired angle with aid of controlling switches, transmission chain and dc-motors. It has a rotating radius that is almost the same as the length of the automobile. This automobile used to transfer the products from one position to another position in many sectors like industries etc.*

***Key Word:*** *Automobile, Dc-Motor, Controlling Switches.*

## I.INTRODUCTION

Production vehicles almost seldom over steer and are built to understeer. The driver will benefit from neutral steering under a range of driving circumstances if the vehicle can automatically correct for the under steer/over steer issue. Automobile engineers make a major effort to achieve neutral steering by using all-wheel steering. Additionally, because of the huge wheelbase and track width of the vehicle, driving becomes more challenging in scenarios like slow turning, parking, and city driving in a congested environment. As a result, a mechanism that results in a reduced turning radius is needed. This may be accomplished by using a four-wheel steering system rather than the standard two-wheel system.

Building a vehicle that can spin 360 degrees is the goal of this project. Customers, many individuals who use this vehicle to carry products, patients, etc., benefit from increased convenience and time savings due to its design, which allows it to go in all directions. However, they often encounter issues like z, etc. Therefore, a vehicle with 360-degree wheel rotation should be created to lessen and eventually remove platform and industry issues. When a vehicle has a zero-degree turning radius, it means that it rotates along an axis that passes through its center of gravity, or H. Starting from a standing posture, the vehicle spins. No more room is needed for the vehicle to turn. Therefore, a space the length of the vehicle should be used to spin the vehicle.

### STEERING SYSTEM

To obtain the ideal steering position and provide the necessary travel, the steering mechanism is used. Before negotiating a turn, the steering system's primary goal is to move the wheels in an angular direction. It is used for steering gears and connections that change the front road wheels' angular motion from the steering wheel's rotation.

### STEERING REQUIREMENT

1. Steering should be simple to operate and very accurate.
2. The driver shouldn't get too exerted.
3. It ought to provide directional stability. This suggests that following the turn, the car should resume its straight-ahead propensity.

### FUNCTIONS OF STEERING SYSTEM

1. To guide the vehicle's direction of travel
2. To provide the car directional stability when it is moving straight.
3. To switch on the car's straight-ahead mode after coming out of a bend.
4. As much as you can, wet the road imperfections. The driver should be able to sense the road's condition without experiencing the repercussions of being driven over if it has road feel.
5. To prolong tire life and lessen tire wear.

### ZERO TURNING CIRCLE RADIUS – 360 DEGREE MODE

The Jeep Hurricane concept car adds a new kind of four-wheel steering to the list of steering techniques, which will have a big influence on how we park cars in the future. This is seen in the illustration below [1]. Despite having a very complicated engine and steering arrangement that uses twotransfer cases to operate the left and right wheels independently, this vehicle offers the three steering modes mentioned above. To guarantee that the vehicle is spinning on its own axis, each of the four wheels has total independence in its direction of rotation.

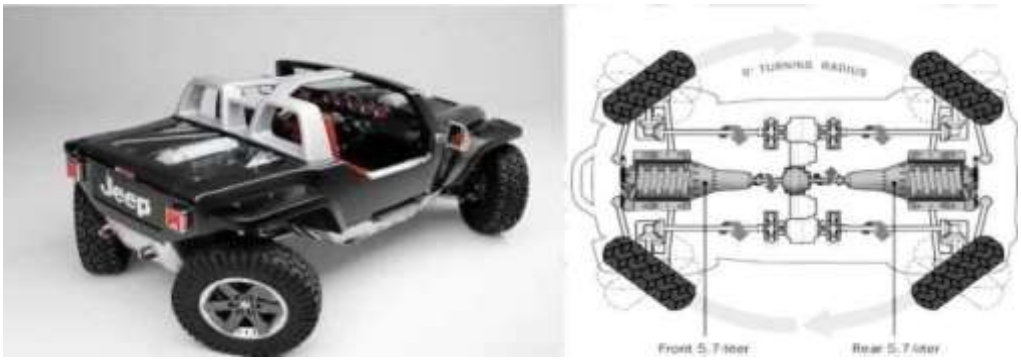


*Fig. Jeep Hurricane*

**WHEEL CONFIGURATION:**

The many steering wheel combinations are shown here.

- **Two-wheel steering:** Only one axle is operated in this mode.
- **All-wheel steering:** Although each axle is driven in a different direction, both are.
- **Crab steering:** This occurs when all the wheels are turning in the same direction.
- **Zero Turn Steering:** The car travels in a circle while in this mode.

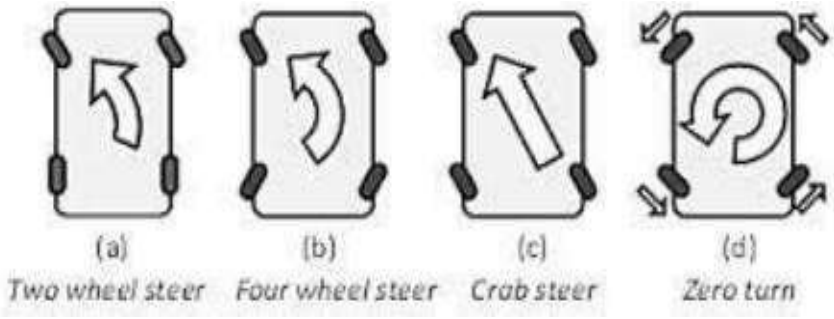


*Fig. Wheel Configuration*

**OBJECTIVE:**

1. Creation of a car that can rotate 360 degrees.
2. The car may be parked in less space.
3. Having a limited turning radius while turning
4. Offer a solution that saves time and gasoline.
5. To make the car's turning radius smaller.
6. To get around parking issues
7. To lessen weariness in drivers.

## II. LITERATURE REVIEW

**Bansode S.Petal:** worked on “Zero turn vehicle”. This paper describes how to avoid the difficultyin the steering system by the new concept of zero turn vehicle with pneumatic operating system. After analysing the system, they concluded that by using this technology the turning radius of vehicles is reduced and causes advantages like easy parking, easy removal of vehicles from traffic-jam etc.

**Er. Amithesh Kumar patel:** worked on “Zero turn four-wheel steering system”. This paper describes that wheels connected to the front axle turned opposite to each other and so are connected in the rear axle. The various functions of the steering wheel is to control angular motion of the wheel andprovide directional stability to the vehicle. They concluded that modification led to decrease in time required for turning and more suitable parking at home and multiplex.

**Dilip S Choudhari** "All-Wheel Steering for the Future" design and production. All-wheel steering is referred to as quadra steering in this text. The three steps—negative, positive, and neutral phases— are used to characterise the Quadra steering system. Negative phase is utilised while travelling at a low speed, positive phase when travelling at a high speed, and neutral phase is used to convert a vehicle to two-wheel steering. After testing this vehicle, he discovered that the Quadra steering reduced the turningradius by 21% and improved control and stability at high speeds.

## III.MTERIALS USED

**Main Components:**

1. DC Motor
2. Frame
3. Bolt
4. Wheel
5. Speed Regulator
6. Controlling Switches.
7. Iron Pipe

**1.DC motor:**

Each wheel on this vehicle contains a DC motor that allows it to go forward and backward. The motor's specifications are 12V and 60RPM. The DC motor moveseither clockwise when power is produced from the battery to the motor or counter clockwise when power is transferred flexibly from the battery to the motor.
It moves the vehicle's development forward and backward.

*Fig. Motor*

**2.Frame:**

- "Chassis" is another name for the car's supporting structure.
- The vehicle's full weight is supported by the frame (chassis).
- It forms the framework of the car.

*Fig. Frame.*

**3.Wheel:**

This vehicle's wheels are constructed of plastic. The front wheel turns 360 degrees utilisingthe controls, sprocket, chain drive, and bearing strategy when the wheel are utilising the controls, sprocket, chain drive, and bearing strategy when the wheels are coupled to a DC motor. With the assistance of a DC motor, sprocket, and chain drive, the rear wheels may be turned 90 degrees to the left and 90 degrees to the right from a certain position. Each wheel may go forward and backward thanks to the DC motor.

*Fig. Wheels*

**4.Speed regulator:**

Current speed is measured using speed controls. The frequency output of speed controllersoften has to be converted to an analogue signal, such as 4-20 mA. A goal value is compared by speed controllers to the present reading speed. The user specifies this value.

*Fig. Speed Regulator*

**5.Battery:**

Battery is one of the important components of a 360-degrees wheel rotating Automobile. Itstores the electric energy and supplies electric energy to Dc-motor, where the battery and DC-motors are connected with the help of some electric wires. By supplying the electric energy, the vehicle can move forward and backward directions. Batteries are made out of minimum one cell, each contains a positive anode, negative cathode, separator, andelectrolyte. It is essential to separate the cell into two

significant classes.

*Fig. Battery*

**MODELLING:**

The main frame support structure is fabricated by using welding. The material considered for thisframe making varies accordingly with considerations. Presently we are using High Strength Structural Steel material for considerable strength.

*Fig. Frame*

*Fig. Automobile*

**ANSYS ANALYSIS:**

- The following is a description of the procedure to be carried out in ANSYS: In ANSYS software,create a geometry model of the Automobile frame with the necessary dimensions and forms.
- To achieve a comprehensive set of precise material characteristics, meshing is performed on asizable portion of an unlimited number of components.
- The Automobile frame's whole body receives equal force.

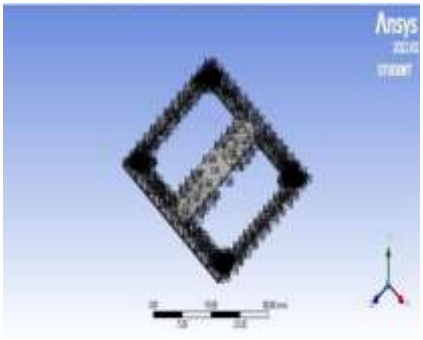


*Fig. Frame Meshing*

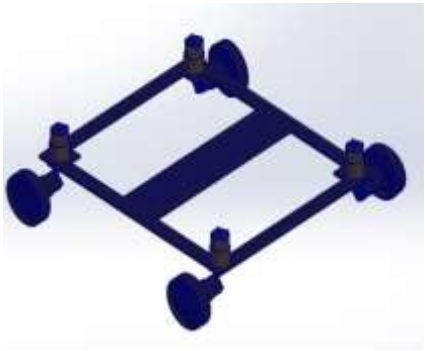

*Fig. Automobile Meshing*

## IV.WORKING PRINCIPLE

DC motor, wheels, frame, battery, and control switches make up this project. In this technique, thewheels are initially moved in the desired direction by the drive system and DC motor after the vehicle has been stopped. Four motors, one on each wheel, assist the vehicle's forward motion. The zero-turn radius mechanism is only used when it is necessary. Four more motors make up this system, which tiltsthe wheel assembly to the necessary angle. In the same spot, the car is turned 360 degrees. When the device is no longer needed and the car is travelling properly, the mechanism may be switched off.

**MATERIALS:**

| S No | Materials | Number of Parts Used |
|---|---|---|
| 1 | Wheels | 4 |
| 2 | Motors | 8 |
| 3 | Frame | 1 |
| 4 | Bush | 4 |

## V. RESULTS AND DISCUSSION

*Fig. Design Model*

**ANALYSIS:**

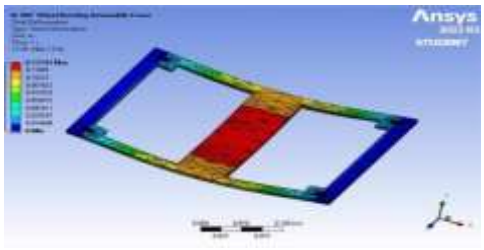


*Fig. Total Deformation of Frame*

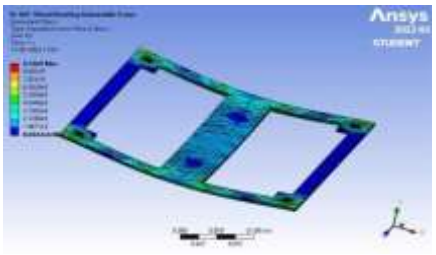


*Fig. Equivalent Stress of Frame*

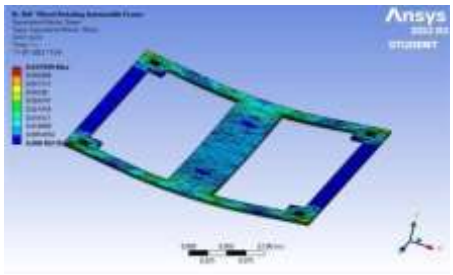


*Fig. Equivalent Strain of Frame*

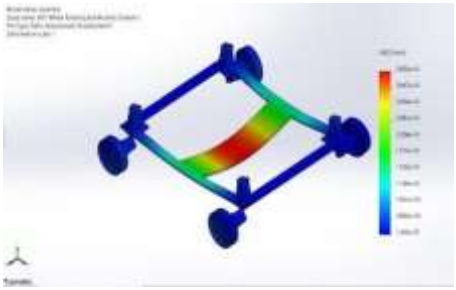

*Fig. Total Deformation of Automobile*

*Fig. Equivalent Stress of Automobile*

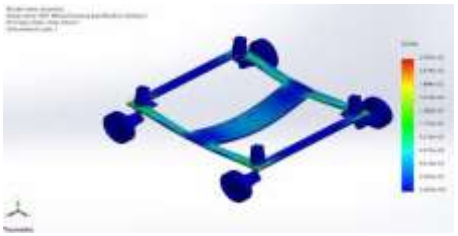

*Fig. Equivalent Strain of Automobile*

**FABRICATED MODEL:**

Several scientists' studies have shown that a four-wheel steering system or a zero-turn vehicle is more comfortable than a two-wheel steering system. A four-wheel steering system has a lower turning radius than a two-wheel steering system, and it also makes quicker turns.

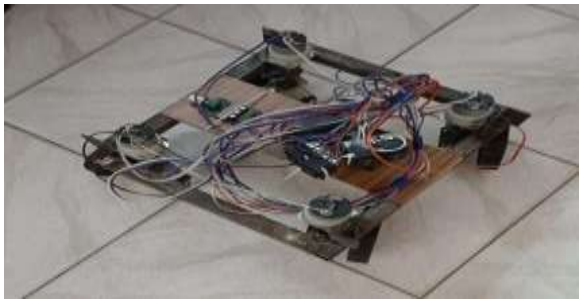

*Fig. Fabricated Model of 360° Wheel Rotation Automobile*

**TIME ANALYSIS:**

| | Time taken for 360°Mechanism | Time taken for normal SteeringMechanism |
|---|---|---|
| 360° | 32 | 189 |
| Parallel Parking | 43 | 121 |

## VI.CONCLUSION

Due to its battery-powered operation, this vehicle is quiet and environmentally friendly. The 360°-wheel rotation of this car speeds up parking and U-turns. In a tiny space with a turning radius thatis equal to the length of the vehicle, it can make turns. This vehicle's front and back wheels both rotate360 degrees, and the rear wheel's revolution further reduces the turning radius. Even on slick roads, thisvehicle is ideal for modest speeds. All chakras are within our control.

**ADVANTAGES:**

1. Changing from one direction to another takes less time.
2. You can effortlessly park this car in any direction.
3. It is inexpensive.
4. It is battery-powered, therefore there is no pollution.
5. Since it is battery-powered, fuel is not necessary.
6. Minimal noise
7. More productive.

**DISADVANTAGES:**

1. It is unsuitable for lifting high loads.
2. To move an automobile, you'll need a battery
3. Wheel wear happens gradually over a short time.
4. There is less friction when the car spins 360 degrees.

**APPLICATIONS:**

1. In industries using autonomous transport trucks to automate the movement of raw commodities
2. In applications for automobiles.
3. For the transportation of raw materials in large-scale businesses.
4. Leaving the automobile in a congested area.
5. Perform a basic 360-degree rotation.
6. Moving products from one location to another despite limited space.

## VII.SCOPE OF FUTURE WORK

This little, compact, and 360-degree spinning automobile is incredibly easy to assemble. In comparison to other automobiles on the market, its pricing is relatively reasonable. Traffic issues are decreased with this automotive component. The car needs a smaller turning radius and improved parking assistance. When combined with this technology, ideas like "Jeep Turn" propulsion from the "Tata Pixel" and "360° Rotation" from the "Jeep Hurricane" boost agility and further improve driver access.

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