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360-Degree Wheel Rotating Vehicle

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***Abstract*—** With the rapid growth of urbanization and increasing traffic congestion, the need for vehicles with better maneuverability has become more important than ever. This project presents the design and development of a 360-degree wheel rotating vehicle that can move in any direction without relying on the large turning radius required by conventional vehicles. The system is designed using an omnidirectional wheel arrangement, DC motors, a chain drive mechanism, and a specially developed steering system that enables forward, backward, sideways, diagonal, and rotational movements. A prototype of the vehicle was fabricated and tested under various operating conditions to evaluate its performance. The results showed significant improvements in maneuverability, parking efficiency, and space utilization compared to traditional vehicle designs. The vehicle can easily navigate confined spaces and perform precise movements, making it suitable for smart parking systems, industrial material handling, emergency response applications, and future urban transportation solutions. The proposed design demonstrates a practical and cost-effective approach to enhancing vehicle mobility in modern environments.

Keywords: Omnidirectional Vehicle, Zero Turning Radius, 360-Degree Steering, Smart Parking, Vehicle Maneuverability, Mechanical Design.

I. INTRODUCTION

This project is about 360-degree rotating vehicle. This vehicle moves in all directions and this design provides better comfort and also saves the time, most of the people uses this vehicle to carry goods, emergency patients etc. The normal wheel vehicles face lot of problems like parking, U turn and much more which consumes more time. So, we have designed a 360-degree wheel rotating vehicle to reduce and eliminate problems in the industry as well as common life of people. This vehicle moves every which way and this plan gives better solace and furthermore spares the season of clients, the vast majority of the general population utilizing this vehicle to convey products, understanding and so on. In any case, more often than not, they need to confront the issue like taking U turn and so forth. So need to structure a 360degree wheel turning vehicle to lessen and dispose of issues in the business and at the railroad stage. This structure will give better solace and furthermore spares the season of clients, that is the reason it is additionally the dependable for the client.

II. LITERATURE REVIEW

1 Shirsath Sachin and Jadhav Kiran- Study of zero turn vehicle. The most important characteristics of a vehicle, such as steerability and handling that create an alternative to tradition al two-wheel steering systems, have become an integral part of today's world.

2. Vivek singhrai and Deepti Kushwaha- Zero-turning steering system A car with an easy-to-use steering mechanism and a reasonable price has been introduced. The car has been introduced as a battery-operated, low-noise, environmentally friendly vehicle. At low speeds and on wet or slick road surfaces, the cornering movement of the vehicle becomes more stable and controllable.

3. Sumeet Shah, Nikhil Wadgane and Chaitanya Patil, Design and Fabrication of Zero Turn Vehicle As the world's population grows, so does the need for vehicles. People are experiencing issues such as automobile parking in congested area as a result of the growth in the number of vehicles on the road. The major qualities of a vehicle, such as steering ability and handling, have become a huge serious concern in the current day. Parking has become a major issue in the country. To address the issue, a different approach is offered, and the notion of Zero Turn Vehicles is established

4. Patil R.V, Jadhav K.R Shirsath S.V, zero turn vehicle The goal of this study is to come up with an alternative to the traditional two-wheel steering method. The major qualities of a vehicle, such as steering abilities and handling, to be become major aspect in the modern period. Conventional steering's uses of the Davis steering or Ackerman systems, both of which have the drawback of not being able to make a minimal radius turn. For automakers, provide zero turning steer without sacrificing steering ability zero-turn, vehicle handling is a big challenge.

III. PROBLEM STATEMENT

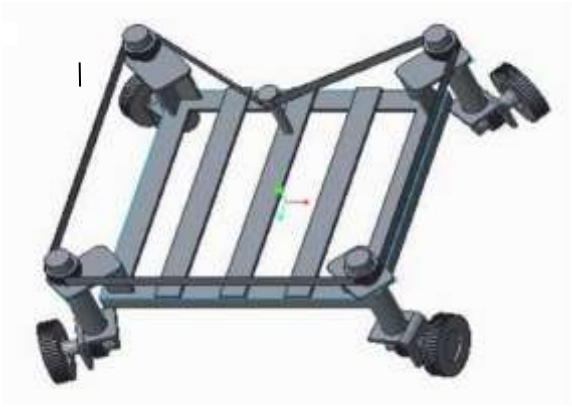
In today's urban environment, the increasing number of vehicles has led to severe parking and maneuverability challenges. Conventional vehicles rely on the Ackermann steering mechanism, which requires a significant turning radius to change direction. As a result, drivers often face difficulties while parking in narrow spaces, navigating congested roads, and maneuvering in confined environments such as parking lots, warehouses, hospitals, and industrial facilities.

IV. OBJECTIVES

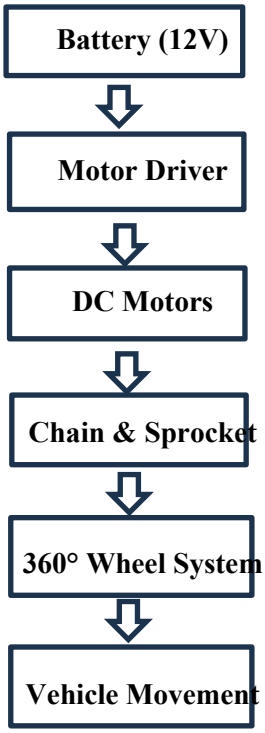
1. Overcome parking problem.
2. To rotate the vehicle without leaving its center of gravity.
3. Enhanced control and precision.
4. Designing model system.

V. PROPOSED SYSTEM

A. CAD Model



B. Block Diagram



C. System Overview

Chasies: It is the back bone of the system. All the systems and parts are attached to it. The main part for the waste collector is the structural base. It is made up of mild steel L angler. The major purpose for using this mild steel bar is because it is widely available at low cost and provides much strength to carry the weight of the whole system. The L angler is used for avoiding buckling of the bar at heavy weight.
Total length of chassis : 1250 mm Total width of chassis : 500 mm Total height of chassis : 640 mm Material used : Mild Steel or Carbon Fibre

Wheels: A wheel is a circular block of a hard and durable material at whose center has been bored a circular hole through which is placed an axle bearing about which the wheel rotates when a moment is applied by gravity or torque to the wheel about its axis, thereby making together one of the six simple machines.

Sprockets : A sprocket or sprocket-wheel is a profiled wheel with teeth, or cogs, that mesh with a chain, track or other perforated or indented material. The name 'sprocket' applies generally to any wheel upon which radial projections engage a chain passing over it. It is distinguished from a gear in that sprockets are never meshed together directly, and differs from a pulley in that sprockets have teeth and pulleys are smooth.

Chain drive: A chain drive consists of an endless chain wrapped around two sprockets.it is a series of links connected by pin joints.it has some features of belt drives and some of gear drives-chain drive can be used for long as well as short center distances and they have good flexibility in all directions. Chain drives compared with belt drives

Bearings : Bearing is a mechanical element that permits relative motion between two parts, such as the shaft and the housing, with minimum friction. The functions of the bearing are as follows: The bearing ensures free rotation of the shaft or the axle with minimum friction. The bearing supports the shaft or the axle and holds it in the correct position. The bearing takes up the forces that act on the shaft or the axle and transmits them to the frame or the foundation

Wires : Wires are flexible metallic conductors used for transmitting electrical power and signals between various components of the system. In the proposed 360-degree wheel rotating vehicle, insulated copper wires are used to connect the battery, switches, motor driver, and DC motors. Copper is preferred due to its high electrical conductivity, flexibility, and low resistance. Proper wire sizing is essential to ensure safe current carrying capacity, minimize power losses, and prevent overheating. The use of insulated wires also provides protection against short circuits and electrical hazards, thereby improving the reliability and safety of the vehicle's electrical system.

VI. Design calculations

1. Motor calculation

Specification and calculation :- Speed:60 rpm, Voltage: 12V Power :18W Torque of motor:

Torque of motor: $\tau = P \times 60 \div 2 \times 3.14 = 18 \times 60 \div 2 \times 3.14 \times N = 2.866\text{Nm}$

If load apply on the vehicle is 4 kg and length 385mm width of vehicle 270 mm. Find the reaction developed by each wheel and find the torque of each Wheel. Weight=4 kg Length=385 mm Width=270 mm

To find the reaction force on each wheel (r)

$$R = \sqrt{\left(\frac{l}{2}\right)^2 + \left(\frac{b}{2}\right)^2}$$

$$R = \sqrt{\left(\frac{385}{2}\right)^2 + \left(\frac{270}{2}\right)^2}$$
$$R = 235.11$$
$$R = 236\,mm$$

Weight=Mg=1×9.81

$$= 9.81N$$

Torque on each wheel (T)

$$T = R \times r$$
$$T = 9.81 \times 236$$
$$T = 2.315\,N.m$$

2. Wheel Reaction Calculation:

Vehicle Weight:

$$W = mg$$
$$W = 4 \times 9.81$$
$$W = 39.24N$$

Assuming equal load distribution on four wheels:

$$R = \frac{W}{4}$$

R=439.24

$$R = 9.81N$$

Therefore,

$$R_1 = R_2 = R_3 = R_4 = 9.81N$$

Reaction at each wheel = 9.81 N

3. Shaft Design Calculation

Assume:

- Shaft Diameter = 12 mm

Maximum Shear Stress:

$$\tau = \frac{16T}{\pi d^3}$$
$$\tau = 8.43\text{MPa}$$

For mild steel:

$$\tau_{allow} = 40\text{MPa}$$

Since:

$$8.43 < 40MPa$$

Shaft is safe.

4. Chain Drive Calculation

Assume:

- Driver sprocket teeth = 12
- Driven sprocket teeth = 24

Velocity Ratio:

$$VR = \frac{T_2}{T_1}$$
$$VR = \frac{24}{12}$$
$$VR = 2$$

Output Speed:

$$N_2 = \frac{N_1}{VR}$$
$$N_2 = \frac{60}{2}$$
$$N_2 = 30rpm$$

Speed reduction ratio = 2:1

5. Motor Selection Justification

Required Load:

$$W = 39.24N$$

Available Torque:

$$T = 2.86N.m$$

The selected 12V DC geared motor provides sufficient torque to move the prototype safely while maintaining low power consumption and smooth operation.

Therefore:

- Motor Speed = 60 rpm
- Motor Torque = 2.86 N·m
- Power = 18 W

are suitable for the proposed vehicle.

6. Factor of Safety

For shaft design:

$$FOS = \frac{\tau_{allow}}{\tau_{actual}}$$
$$FOS = \frac{40}{8.43}$$
$$FOS = 4.74$$

Factor of Safety = 4.74

Since:

$$FOS > 2$$

the design is considered safe.

6. Specifications Table

Component	Specification
Motor	12 V DC, 60 RPM
Power	18 W
Chassis Material	Mild Steel
Vehicle Length	385 mm
Vehicle Width	270 mm
Load Capacity	4 kg

VII. TESTING

Test Setup

The prototype was placed on a flat surface and controlled using the designed control system. Each movement mode was tested individually to ensure proper operation of the motors, wheel mechanism, and control circuitry.

Performance Evaluation

Manoeuvrability Test

The vehicle successfully moved in all intended directions without requiring steering adjustments.

Parking Test

The prototype demonstrated easy side parking and movement in confined spaces.

Rotation Test

The vehicle rotated about its own axis with minimal space requirements.

Stability Test

The system maintained stable operation during continuous movement and directional changes.

VIII. RESULT

The 360-Degree Wheel Rotating Vehicle prototype was successfully designed and tested. The vehicle demonstrated omnidirectional movement, including forward, backward, sideways, diagonal, and rotational motion. The system achieved smooth operation with precise control of individual wheels. Testing showed improved maneuverability, reduced turning radius, and efficient parking in confined spaces.

CONCLUSION

The 360-Degree Wheel Rotating Vehicle provides an effective solution to the maneuverability limitations of conventional vehicles. The proposed system successfully demonstrates omnidirectional movement, enabling efficient parking and navigation in restricted environments. The results indicate that the vehicle offers improved mobility, reduced turning radius, and enhanced operational flexibility.

REFERENCES

[1] Jaishnu Moudgil, Shubhankar Mengi and Mudit Chopra, 360 Degree Rotating Vehicle to Overcome the Problem of Parking Space, International Journal of Research in Mechanical Engineering and Technology, 5(2), 2015, 22-25.

[2] Sudip kachhia, Design of 360 Degree Rotating Car, International Journal of Advance Research and Innovative Ideas In Education, 2(5), 2016, 15–16.

[3] K. Lohith, K. Lohith, Dr. S. R. Shankapal, M. H. Monish Gowda, Development of Four Wheel,Scholars Journal of Engineering and Technology,12(1), 2013, 52-53.

[4] Er. Amitesh Kumar, Dr.Dinesh.N.Kamble, Zero Turn Four Wheel Steering System, International Journal of Scientific & Engineering Research,5(12), 2014, 22-24.

[5] Mr. Sharad P. Mali, Mr. Sagar Jadhav, Prof. D.U.Patil, Zero Turn Four Wheel Mechanism, International Engineering Research Journal,2(2), 2016, 484-486