Design and Fabrication of Three Dimensional Spherical Wheels

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Abstract:- The main aim of the project is Design and fabrication of three dimensional spherical wheels. The invention of a three dimensional spherical wheel and tire combination for the new innovative product of vehicles. In every innovation or an introduction of alternate system for the conventional ones often tends to possess lot of problem and condition. This paper will describe the possibilities of using this system, will answer the above question and will also provide certain solutions to the cons the idea faced.

Spherical wheel was designed to behave in a manner where the steering and driving mechanisms are independent of one another. For a vehicle to be able to move in any direction regardless of orientation, the steering and driving mechanisms must be mechanically independent. It is only controlled by two motors a turning and a driving motor. The turning motor rotates the entire inner assembly of the vehicle along a rim at the equator and the driving motor shifts the centre of gravity of the vehicle.

INTRODUCTION

The main cause of an accident is the loss of control of the car which is directly connected with the tyres. The company "Goodyear" presented a conceptual "smart" tyres Eagle 360 Urban for self-driving cars at the International Motor Show in Geneva. Their installation is possible only on vehicles with magnetic levitation. It is possible to achieve a new level of driving and safety and comfort for the driver and passengers due to the unique shape of tyres They have a spherical shape and can rotate in any direction. According to forecasts of the company a market of self-driving cars is to be about 85 million units annually by 2035. They conclude that the use of tyres of unusual design will be one of the most promising innovations. They will be produced according to an individual design using a form of additive manufacturing technologies – 3D-printing, for example, their properties will be set depending on the location of the car and driving style of its owner.

The main idea of this concept is to provide tyres with artificial intelligence and functions of data exchange with the car, other road vehicles and the environment. To make driving more efficient and safer sensors will be integrated into Eagle- 360 to monitor the condition of the road surface and can react to obstacles that may arise. Also, the tyres will transmit data about level of their deterioration and damage to the central control system of self-driving car information on the extent of its deterioration and damage. In addition, the tyres can receive data about traffic and location of the vehicle in real-time.

LITERATURE SURVEY

Wheel Based The first spherical mobile robot was developed by Halmeetal. in 1996 . The propulsion was derived from a wheel in contact with the bottom of the sphere as Above the wheel is the Inside Drive Unit (IDU) with power and communications. The wheel and IDU are integrated into a single axis support. On the opposite end of the powered wheel is another stabilizing wheel. By steering the powered wheel, the sphere has the ability to turn. This design was also configured with two wheels in contact with the bottom Surface ,in 1997, A. Bicchietal. proposed a design that was propelled by a small car resting at the bottom of the sphere illustrated . The car could be steered to change the direction of the sphere. The robot was modeled using a combination of unicycle kinematics and ball-plate kinematics. The advantages of the wheeled design are that it is a simple mechanical structure and the motors can be smaller since they do not require much torque. The system can also be holonomic or non- holonomic depending on the wheel configuration. It is also helpful that the system can be modeled by well known mathematical models, making control easier.

DESCRIPTION OF EQUIPMENTS

The lead-acid battery was invented in 1859 by French physicist Gaston Plant and is the oldest type of rechargeable battery. Despite having a very low energy-to- weight ratio and a low energy-to-volume ratio, its ability to supply high surge currents means that the cells have a relatively large power-to- weight ratio. These features along with their low cost makes it attractive for use in motor vehicles to provide the high current required by automobile starter motors.

As they are inexpensive compared to newer technologies, lead-acid batteries are widely used even when surge current is not important and other designs could provide higher energy densities. Large-format

lead-acid designs are widely used for storage in backup power supplies in cell phone towers, high-availability settings like hospitals, and stand-alone power systems. For these roles, modified versions of the standard cell may be used to improve storage times and reduce maintenance requirements. Gel-cells and absorbed glass-mat batteries are common in these roles,

WORKING PRINCIPLE

Spherical wheel was designed to behave in a manner where the steering and driving mechanisms are independent of one another. In a pendulum-based designed, the steering and turning mechanisms are dependent on each other, creating a non- holonomic robot. For a vehicle to be able to move in any direction regardless of orientation (holonomy), the steering and driving mechanisms must be mechanically independent. HIT is only controlled by two motors: a turning and a driving motor. The turning motor rotates the entire inner assembly of the robot along a rim at the equator, and the driving motor shifts the centre of gravity of the vehicle, causing it to move. sphere can be used in chairs, rear view mirrors of vehicle, television stand and many more. It provides us the convenience of mobility for the products used in day to day life. Here fibre composites materials are used to create a 3 dimensional spherical wheel by using palm fibre and isopolymer composites. Also it includes such mechanical tests are involved to predicts the nature of properties and to examine the wear and friction factors of the 3 dimensional spherical wheel .

MERITS & DEMERITS

- Spherical rubber tires that can move in any direction. For a self-driving car without a steering wheel.
- Tires would allow self-driving cars to navigate tight spaces, such as parking spots or busy city roads.
- Instead of axles, they'll connect to the car using magnetic levitation -- potholes would no longer ruin your suspension, since your car would essentially float above its tires.
- Smooth and quiet ride for passengers.
- The spherical tires also have the advantage of having way more surface area than cylindrical tires, so your treads won't wear out quite as quickly.
- And the tires could intelligently rotate themselves to provide even greater tread life.

APPLICATIONS:

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LIST OF MATERIALS

The various factors which determine the choice of material are discussed below.

1. *Properties:*

The material selected the necessary properties for the proposed application. The various requirements to be satisfied Can be weight, surface finish, rigidity, ability to withstand environmental attack from chemicals, service life, reliability etc.

The various physical properties concerned are melting point, thermal Conductivity, specific heat, coefficient of thermal expansion, specific gravity, electrical conductivity, magnetic purposes etc.

The various Mechanical properties Concerned are strength in tensile, Compressive shear, bending, torsional and buckling load, fatigue resistance, impact resistance, elastic limit, endurance limit, and modulus of elasticity, hardness, wear resistance and sliding properties.

2. *Manufacturing case:*

Sometimes the demand for lowest possible manufacturing cost or surface qualities obtainable by the application of suitable coating substances may demand the use of special materials.

3. *Quality Required:*

This generally affects the manufacturing process and ultimately the material. For example, it would never be desirable to go casting of a less number of components which can be fabricated much more economically by welding or hand forging the steel.

4. *Availability of Material:*

Some materials may be scarce or in short supply. It then becomes obligatory for the designer to use some other material which though may not be a perfect substitute for the material designed. The delivery of materials and the delivery date of product should also be kept in mind.

5. *Space consideration:*

Sometimes high strength materials have to be selected because the forces involved are high and space limitations are there.

CONCLUSION

Spherical wheels have an abundant number of usages with an equal number of methods to control them. based on three main principles: offset of centre of gravity (barycentre offset), outer-shell deformation, or conservation of angular momentum. Compared with the other methods, the designs based on barycentre offset tend to be the least complex and can be controlled relatively easily. Generally speaking, barycentre offset designs can be analyzed with a single model. However, the power in these wheel is limited

because the centre of gravity cannot be moved outside of the shell. Common types of barycentre offset designs include a single wheel model, car model, universal wheel model, and a pendulum model. Designs can either utilize the counter rotational force generated when spinning a CMG faster or slower (single-axis).

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