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Gyro Assissted Steering System using Arduino

Sukumar. K. R[1], Babu. C[2], Kishore. M[3], Aravindan. K[4], Krishna Kumar. U[5]
AMIE[1], Student [2, 3, 4, 5]
Department of Mechanical Engineering
IFET College of Engineering, Villupuram, Tamilnadu, India

Abstract:
In automotive design, steering is a serious effort on the part which provide less turning radius. Most of the steering is done by front wheel. These turning movement is limited to half rotation during an opposite direction which is controlled by arduino system with servo motor. Our aim is to provide a low cost to create devices that interact with this environment using sensors. In our system, the steering linkage i.e., rack and pinion is fixed which gives the half turning movement to front wheels that connected with gyro sensor and arduino board. Gyro assisted steering system provides a mean to actively steer the front wheels during turning regulated movement and improves the handling performance and makes the vehicle for tighter turns at low speed.

Keywords: Steering, Arduino, Rack and pinion, Sensor

1. INTRODUCTION TO GYRO ASSISSTED STEERING SYSTEM

In conventional steering system the driver required more space for turning the vehicle which increases the turning angle. In Two Wheel Steering system the wheels of vehicle are turn at same time but rear wheels turn in opposite direction.

Steering?

Steering is the term applied to the collection of components, linkages, etc. which will allow a vessel (ship, boat) or vehicle (car, motorcycle, and bicycle) to follow the desired course. An exception is the case of rail transport by which rail tracks combined together with railroad switches provide the steering function. The most conventional steering arrangement is to turn the front wheels using a hand–operated steering wheel which is positioned in front of the driver, via the steering column, which may contain universal joints, to allow it to deviate somewhat from a straight line. Other arrangements are sometimes found on different types of vehicles, for example, a tiller or rear–wheel steering. Tracked vehicles such as bulldozers and tanks usually employ differential steering that is, the tracks are made to move at different speeds or even in opposite directions, using clutches and brakes, to bring about a change of course or direction. The basic aim of steering is to ensure that the wheels are pointing in the desired directions. This is typically achieved by a series of linkages, rods, pivots and gears. One of the fundamental concepts is that of caster angle - each wheel is steered with a pivot point ahead of the wheel; this makes the steering tend to be self-centering towards the direction of travel.

Figure. 1. Rack and pinion steering mechanism

1 Steering wheel;
2 Steering column;
3 Rack and pinion;
4 Tie rod;
5 Kingpins.

2. COMPONENTS:

Stepper Motor

A stepper motor is a brushless DC electric motor that divides a full rotation into a number of equal steps. In our project stepper motor is used to move the rack at the rear.

Arduino Uno System

The aim of arduino uno system is to provide low cost to create devices that interact with their environment using sensors and actuators. It sends the output signal to battery for actuating the motor with respect to movement of sensing pinion.

Steering Wheel

The steering wheel is the part of the steering system which is controlled by the driver. The rest of the steering system works with respect to the steering input.


Steering column

The steering column is a device used for connecting the steering wheel to the steering mechanism. It transfer the driver's input from the steering wheel to steering mechanism

Rack And Pinion Steering System

Rack and pinion steering system converts rotational motion of the pinion into linear motion of rack. Rotational motion applied to the pinion causes the rack to move pinion.
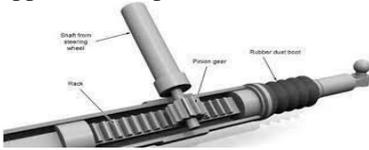
Front and Rear Axle

Front And Rear Axle are supporting members which supports the stub axle and it carries the weight of the vehicle.

Battery

An battery is a device that supplies electric energy to an automobile. It is used in automobile to start the engine. In our project battery is used to actuate the stepper motor.

3. WORKING PRINCIPLE

In our project we have provided Rack And Pinion Steering System at the rear side of the Differential which is connected to rear stub axle. Stepper motor is connected to Pinion and controlled by Arduino Uno System. Battery is used for power supply. A pinion is provided at the steering column which works as a sensing element and send signal to Arduino Uno System. When the front wheels turns the sensing pinion is also rotate with the steering column and send the signal to the Arduino Uno System which allows the battery to supply the electric current to the stepper motor. When motor rotates in either clockwise or anticlockwise direction the rack also rotate in left or right direction according to the direction of motor. The direction of motor is controlled by the Arduino Uno System with gyro sensor. If the steering wheel turns at right side then front wheels also turns at same direction with accurate angle of rotation.

4. CIRCUIT DIAGRAM
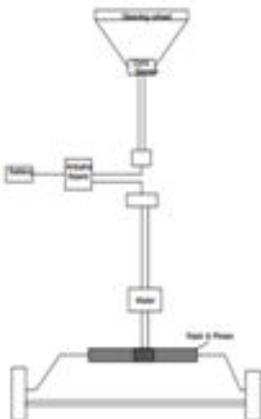
5. ADVANTAGES

- Improve turning performance at low speeds.
- Directional Stability at high Speeds.
- Increase handling performance.
- High sensitivity.

6. DISADVANTAGES

- Over sensitiveness
- If electric motor fails, the operation also fails.

7. CONCLUSION

The main advantage of two wheel steering system is to improve parking performance of a vehicle. It also improve Steering response to driver. It improves the turning performance at low speeds and directional stability at high speeds. It also increases the handling of car and gives more comfort to driver as the turning effort is very less. The two Wheel Steering System is used where high degree of accuracy is required such as in racing car and sports car. It is used where turning of vehicle is very difficult in less space like trucks, busses and some long cars like limousine. It is also used where more comfort is required such as passenger car or family car.

8. REFERENCE

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