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ADVANCED MODES OF STEERING MECHANISM IN FOUR WHEELS FOR SAFETY

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ABSTRACT
The main aim of this project is to steer the vehicle according to the requirement during parking. The four wheel steering is more required in critical roads and in desert roads. In this project we implement three steering modes in a four wheelers and these modes can be changed as needed.An eco-friendly vehicle which can steer through 90 degrees, thus reducing the turning radius with low efforts has to be defined. Automotive of present time does not have the ability to steer through 90 degrees. These vehicles can help peoples for parking easily on populated areas. The steering mechanism uses rack and pinion in defined gear ratios with the help of some bevel gears. The rear wheels are mounted in such a way that the power is transmitted even when it is being steered through 90 degrees. Advantages of this system are that it can work in limited space and it reduces the time and effort for steering through 90 degrees thus making the system more flexible. It can be used for other applications such as farm vehicles, trucks, forklifts, heavy vehicles etc.

INTRODUCTION

Steering is the term applied to the collection of components, linkages, which will allow for a vessel or vehicle 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, through 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 tanks usually employ differential steering that is, the tracks are made to move at different speeds or even in opposite directions to bring about a change of course.

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LITERATUREREVIEW

In an active four-wheel steering system, all four wheels turn at the same time when the driver steers. In most active four-wheel steering systems, the rear wheels are steered by a computer and actuators. The rear wheels generally cannot turn as far as the front wheels. There can be controls to switch off the rear steerand options to steer only the rear wheel independent of the front wheels. At low speed (e.g. parking) the rear wheels turn opposite of the front wheels, reducing the turning radius by up to twenty-five percent, sometimes critical for large trucks or tractors and vehicles with trailers, while at higher speeds both front and rear wheels turn alike (electronically controlled), so that the vehicle may change position with less yaw, enhancing straight-line stability. The "Snaking effect" experienced during motorway drives while towing a travel trailer is thus largely nullified. Four-wheel steering found its most widespread use in monster trucks, where maneuverability in small arenas is critical, and it is also popular in large farm vehicles and trucks. Some of the modern European Intercity buses also utilize four wheel steering to assist maneuverability in bus terminals, and also to improve road stability. Previously, Honda had four-wheel steering as an option in their 1987–2000 Prelude and Honda Ascot Innova models (1992–1996). Mazda also offered four-wheel steering on the 626 and MX6 in 1988.General Motors offered Delphi's Quadrasteer in their consumer Silverado/Sierra and Suburban/Yukon. However, only 16,500 vehicles have been sold with this system since its introduction in 2002 through 2004. Due to this low demand, GM discontinued the technology at the end of the 2005 model year.Nissan/Infiniti offer several versions of their HICAS system as standard or as an option in much of their line-up. A new "Active Drive" system is introduced on the 2008 version of the Renault Laguna line. It was designed as one of several measures to increase security and stability. The Active Drive shoul d lower the effects of under steer and decrease the chances of spinning by diverting part of the G -forces generated in a turn from the front to the rear tires. At low speeds the turning circle can be tightened so parking and maneuvering is easier.

DESIGN OF MODEL

The model is designed considering the same wheel base and track width.The model is designed using the software CATIA V5.

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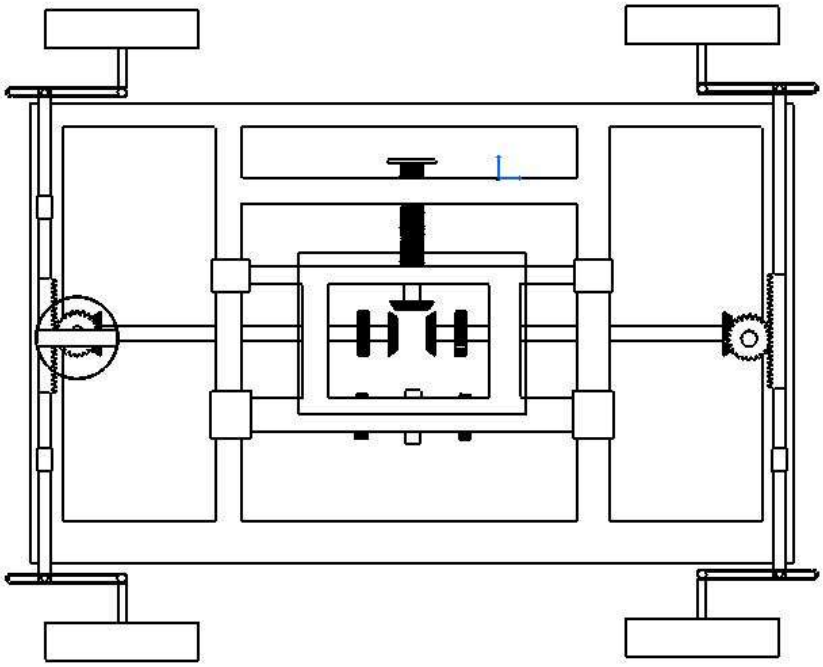

Fig 1 Designed 2D CATIA model

The model shown in figure is designed in CATIA by using the options surfacing, the model is designed considering four tires and four stub axles, here we are placing two steering set one at front and the other at the rear so the stub axle considered at rear wheels are exactly the same as front stub axles. There is a shaft connecting between the front steering box and the rear steering box and double wishbone suspension type is considered for suspension and only one degree of freedom is applied for the suspension motion, rest all the degrees are constrained.

Here two bevel gears are considered, one bevel gear is attached to the steering column of the front steering box and the other bevel gear is attached to the intermediate shaft. The input is given at the steering wheel by the driver which rotates the steering column, as steering column rotates the gear attached to it will rotate, the other bevel gear coupled with the bevel gear of steering column rotates in opposite direction, so with respect to the second bevel gear attached to the intermediate shaft.

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The shaft rotates in the direction of the second bevel gear. The rear steering column is attached with the intermediate shaft also rotates as per the shaft such that the rear wheels attached to the rear steering column rotates as per the rear steering column, so the rear wheels rotates in opposite direction to the driver input to the steering wheel.

FINAL MODEL CREATING JOINTS

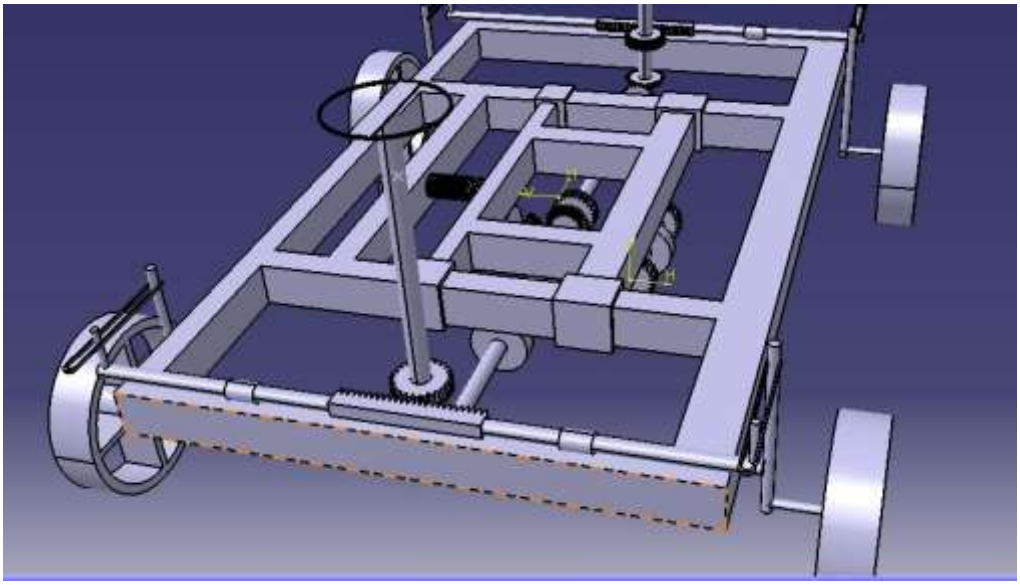

Fig 2 Final model after creating the joints

The final model after creating all the joints withrespect to all parts. The joint given for front steering is replicated at the rear steering, there is bevel gear joint provided between steering column and intermediate shaft. This intermediate shaft provides the rotation moment to the rear steering through rear body,the shaft gets the rotational moment from the bevel gear and this bevel gear gets the rotational moment from steering column.

Table 6.1 Joints connected to the parts

PART	PART	JOINT
Steering wheel	Rack body	Revolution
Steering wheel	Steering column 1	Hooke
Steering column 1	Steering column 2	Hooke

Steering column 2	Rack body	Cylindrical
Rack	Tie rod	Translation
Tie rod	Ball joint	Spherical
Ball joint	Wheel	Fixed
Wheel	Tire	Fixed

The two wheel steering (2WS) vehicle is proven that it is still low compared to the four wheel steering (4WS) system car. So, this project is base on how to prove that the 4WS is better than 2WS in terms of turning radius

DESIGN OF FRAME

For building of prototype model, the designed model is considered along with that a frame is built to support the steering, suspension and seat.The frame is designed considering the wheelbase and track width of prototype and also it has to support for the suspension part as the suspension is welded to the frame, seat is also welded to the frame, the support structure for steering column and rack body is welded to the frame. The frame also takes the roadload and load of the driver, so considering all the factors the frame is designed and developed. The rear steering column is attached with the intermediate shaft also rotates as per the shaft such that the rear wheels attached to the rear steering column rotates as per the rear steering column, so the rear wheels rotates in opposite direction to the driver input to the steering wheel. We conclude that all the four wheels are turning at an angle, the front wheels turn as per the steering wheel turns and the rear wheels turn opposite to the front wheels

CONCLUSION

The project carried out by us made an impressing task in the field of automobile industries. It is very usefully for driver while driving the vehicle. This project has also reduced the cost involved in the concern. Project has been designed to perform the entire requirement task which has also been provided.

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