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A design To Control the Center Of Gravity and Friction of A Tricycle

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Abstract:- *A Tricycle (recumbent trike) is cheap means of short distance transportation both in urban and rural areas. It is generally propelled by human energy. Traditional tricycles are also used by handicapped persons for transport, but they use out dated technology. An effort has been made to design a light weight strong electric powered vehicle with speed control, regenerative braking, frictional brake, hand brake, head light, horn, tail light. It can be charged throughout night and used during day time. Manual pedaling can also be resorted when battery is fully discharged. To improve battery life, it will have protection to prevent over charging. The proposed model will be driven by 650W DC motor. The proposed system is designed for safe operation and high efficiency.*

Key Words: Transportation, Tricycle, Brakes, Regenerative Braking, charging system, batteries.

1. INTRODUCTION

The very fast reduction of fossil fuels due to exponential in demand increase and global warming due to the emission of CO2 made scientists and engineers to look for a possibility source of energy which is renewable, eco-friendly, upscale and convenient. Among the renewable origins like solar, wind, ocean, geothermal and other green energy, solar power increasing in nations like India which is in the all regions. India spending amount in large for exchange from foreign countries for crude oil. By the help of solar power based vehicles, the reciprocity on the ship in of crude oil can be turn down and affordable amount of foreign exchange 5can be saved. The carbon dioxide outage is high from twelve billion metric tonnes to thirty two billon metric tonnes from 1965 to 2017. The rate of emission of carbon dioxide is an indication of global warming. India has abundant solar power, 2015 kWh/m2.the researchers have specially designed solar assisted racing cars. These cars are not in reasonable cost for a common man. Cycle Rickshaws are one of the type of transportation in different places. By placing the solar panel which is arranged by mounting to trike that will assist the riding cycle, reduce fatigue, speed increase and also gives the top like shadow to rider. The only major problem is with trike is that climbing the slopes. By changing the design of a tricycle into motor based tricycle that can make run of both human effort and motor power and also the climbing slope up to the hills or roads is suitable for the rider. Even this motor assist has the difficulty in charging the battery especially in rural areas. So that the battery which supplies power to the motor is charged in two modes by electric supply and solar panel so that the problem of charging the battery is solved. Hence the solar power based tricycle gives a feasible alternative for short and joy trip. The advantage that is most important is by this solar trike the cost is low and pollution free ride.

1.1 PROBLEM SUMMARY

To overcome the factors that are underlying limits existing recumbent trike durability performance of the cycle and performance. Trike Design and fabrication an economically available recumbent cycle that is safe and easy to operate for a variety of users.

1.2 AIM AND OBJECTIVE OF PROJECT

The proposed trike model concept was select to sync the motion of traditional bicycle while advantages from the ergonomics and recumbent stability. The trike which is designed as especially for all age groups any one can ride it. The trike handles and tilting are manoeuvrable are accomplished by simple learning to the turn. The main advantage of the proposed design concept over earlier models is simple and best stability control is achieved.

2. MECHANICAL DESIGN

Recumbent tricycles are comes in two different arrangement the tadpole having both wheels forward and another one back and the delta type is having one wheel front. These two types are having configurations their advantages and weaknesses.

2.1 SAFETY

The Vehicle is human powered which is close of for the aerodynamic benefit and protection from environment, collisions. The Distribution of Weight of a trike recite how good it grips. The weight is distributed 60:40 ratio on the back and behind wheels correspondingly. It produce good acceleration intended driving. Dynamic Vehicle Weight –low weight chains and sprockets are elect to decrease the dynamic weight of the trike. Peddler is arranged to allow his weight to be on the same vertical plane of the trike centre of

gravity. This makes certain that the stability during not reasonable turns.

2.2 SEAT AND SEAT ADJUSTABILITY

Peddler support is managed by a wood mounting seat which was designed by according to which shaped is requirements of the vehicle. Especially racially into the seat base is a iron hallow to the back of the seat frame. The hollow pipe was welded for strong and adjusted holes with series to reduce weight.

2.3 STEERING AND MANEUVERABILITY

The angles of steering is developed by the use of force balance methods for each planar angle: camber, caster and toe. Each steering angle has a benefits and a drawback, the advantages with the drawbacks. We attain the design method gets in balancing this by balancing forces and moments applied to each wheel.

2.4 CENTER OF GRAVITY POSITION

Appraise first a four Wheels as saw from the back, like here to the right. If the vehicle is turned towards the left, for example, that can think that a centrifugal force (red colour) is exerted on the centre of gravity (black and yellow circle) of the vehicle-inhabitant system, while the vehicle's weight reach a downward gravitational force (blue colour).

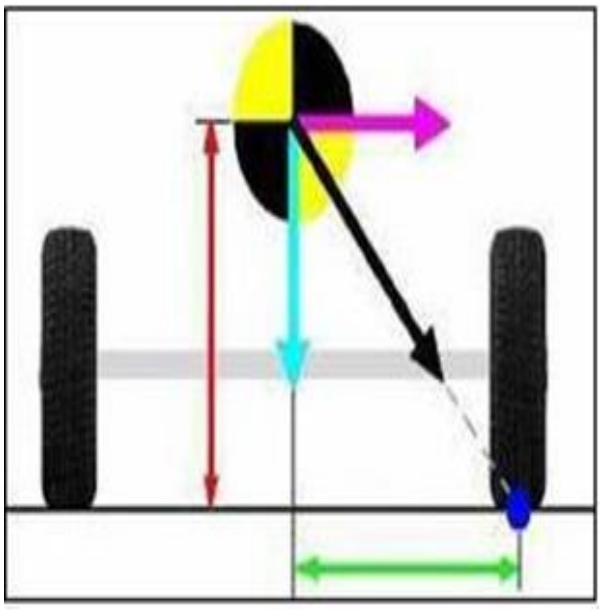

Figure 1 : centre of gravity

2.5 STEERING MECHANISMS

Direction Mechanisms gives in a less basic types: Over Seat Steering, Under Seat Steering and Direct Knuckle Steering. Each of type steering systems has special configurations and has its registered advantages and disadvantages.

2.6 TRIKE FRAME

The Vehicle frame has been fabricated keeping in point of the all safety of the peddler. It was also put in consideration that the various systems that have to be assimilate in the trike like hanging system, braking system, transmission system, power train etc. The frame of the trike similar with the head of an arrangement. The trike has an unfamiliar Under Seat Seating Steering system which gives both the peddlers to steer the vehicle. This tilting system that has been used in similar to give the peddler a freedom to ride the vehicle from either left side or right side.

2.7 FRONT STEERING VS. REAR STEERING

In the front steering which is in the delta type trike and rear steering is the tadpole and delta type. The single stratagem that pops up recurring is a rear steering HPV. The rear type steering concept is suitable for both type of trikes. Although the uprightness of rear wheel steering include a simple design, lower weight, a less turning radius, and an thrill and joy riding experience. However, the thing that the trike transmit like a loft truck makes it a missing position every time. Since people have a interested with tricks, the rear steering trike will always have a place in the HPV industry.

Table -1: Difference between FWS Moving BB, FWS Twist Chain and RWD

Parameters	FWD Moving BB	FWD Twist Chain	RWD
Limitations	Steep Grades	Steep Grades	-
Psi	Manageable	Minimal	-
Chain line	Simple	Complex	Complex
Adjustability	Easier	Harder	Harder
Steering Behaviour	Oversteer	Oversteer	Understeer

The table gives information to compare the same benefits and drawbacks of each design, however these are divided, catalogue, and the devil, as always, is in the details. First and

main the pointed limitation of Front Wheel Drive designs is their aim to loose friction on hills.

2.8 PEDAL INDUCED STEERING

One important pointing issue for Front Wheel Driving designs is the relative of string on dynamic stability and pedal steering induced (PSI). To demonstrate this, the draft above illustrate the elaboration looking down on a 20 feet front wheel that is moves forward down the road. It has a 75°high split angle, 20mm of spilt offset and is turnover 30° to the left. As the front wheel turns, the attachment joint moves to the inside of the pivot axis. This is because the jointing patch is moves around the outside of the wheel.

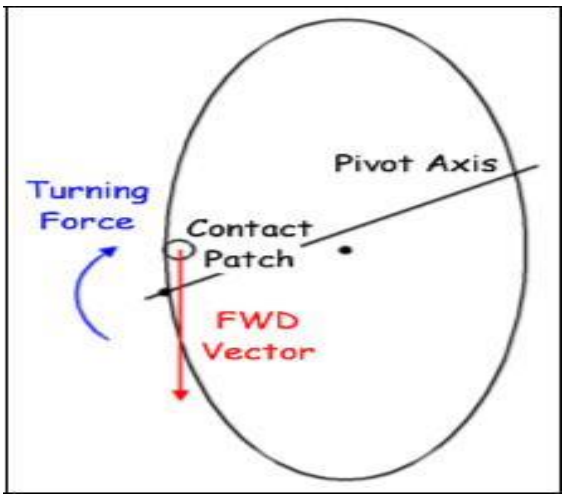

Figure 1: Effect of Trail on FWD

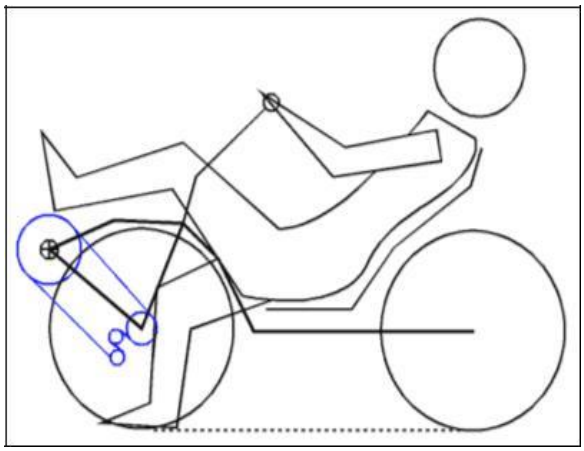

Figure 2: Forward moving

Reverse Wheel Drive trikes have a likelihood to lower steer. This is because the drive force is pushing the trike vertical line in forward, and the front wheels slip front side as they change the direction. It is only movement of forward wheels on the reduced, not the driving force that turns the trike. The point of the optimal Centre of gravity G also indicate a weight splits that advantages understeer.

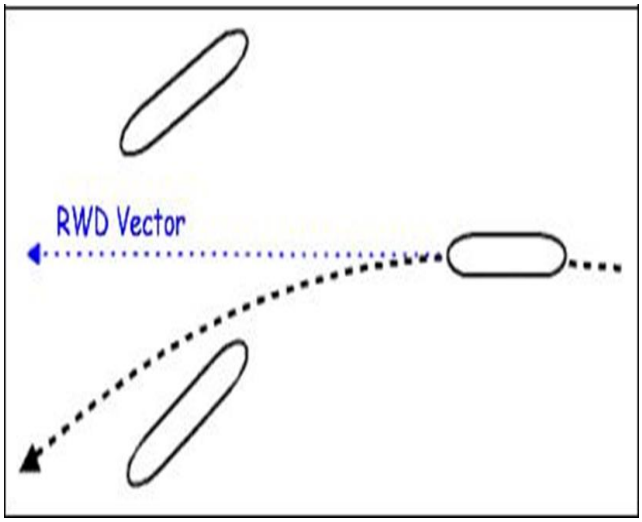

Figure 3: Reverse understeer behavior

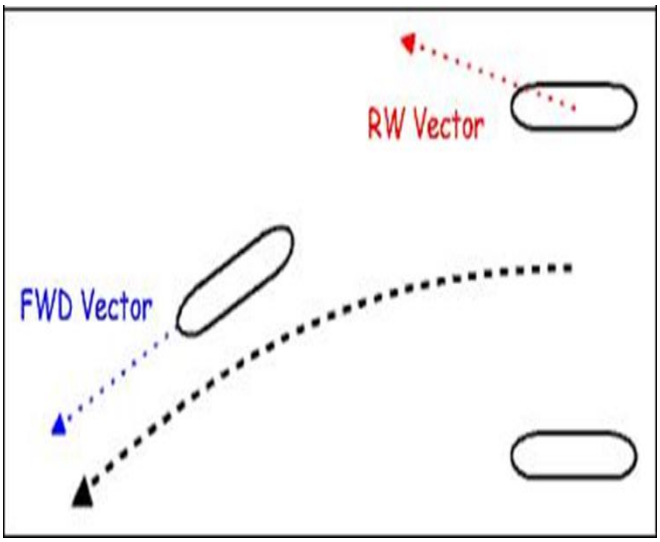

Figure 4: Forward oversteer behavior

Under the forwarding forces of stopping the change in direction behaviour may be completely takes different. It is relatively on the dynamic weight distribution, which is directly gives the result and that is reason by the location of the rider Centre of Gravity in related to the front joint adjustments, the leaning height, the force distribution of break, and the brake force applied amount.

The proposed system which is fabricated with all the considerations centre of gravity is maintained and the tricycle is electrified by the motor control with n throttle system.so that the system is achieved the comfortable riding position maintaining the COG By placing the solar panel which is arranged by mounting to trike that will assist the riding cycle, reduce fatigue, speed increase and also gives the top like shadow to rider. The only major problem is with trike is that climbing the slopes. By changing the design of a tricycle into motor based tricycle that can make run of both human effort and motor power and also the climbing slope up to the hills or roads is suitable for the rider.

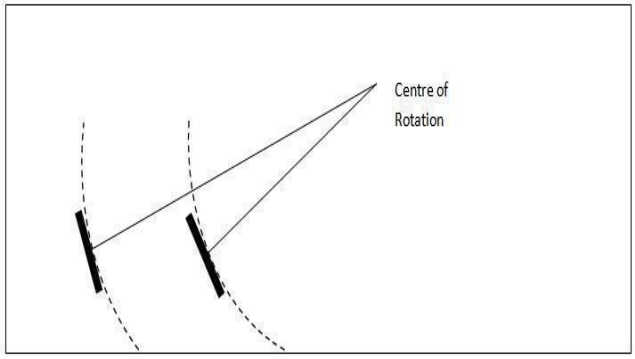

Figure 5: centre of gravity

Even this motor assist has the difficulty in charging the battery that are in rural areas. So that the battery which supplies power to the motor is charged in two modes by electric supply and solar panel so that the problem of charging the battery is solved. In these days the market there are an immeasurable of makers of recumbent tricycles. Paradoxically manufacturers fabricate recumbent tricycles for disabled riders, the current manufactures are not making that can fully satisfy the needs. When comes to our research,the hand trikes observe that there are vast type of design of recumbent trikes. These type of models offering in now a days market ranges from optimised, stylish models and strong efficient type are intended for off road ridding. The bulky framed trikes are mostly negligible to consumers. These type of trikes are focusing towards a racing and easy comfortable style.This decision is based on the off of input received by the rob Kelly design.

His mentioned that currently has ridding style are recumbent type only. The riders are requesting to team members to construct a lighter and smart type trikes. A tricycle is having the abbreviated as trike three wheeled vehicle or recumbent trike. This are also having commonly human-powered. Trikes are used by all age groups mostly younger and by making stability. In the countries like US and Canada, adult size trikes used by seniors and old also for recreation,purchasing and exercises to all age groups. In Africa and Asian countries these trikes are called Pedi cabs that are used to transport passenger's .These are also used to deliver goodsand transport freight. These type of trikes are human based and hand barked. Motorized trikes are having battery and some automatic transmission and also hand breaks.As three wheeled cycles are establish in 1655 /1680 disable German man, whose name is Stephan Farffler, he maintained the vehicle mobility. Since his job is watch-making, so that hewas ready to invent and created a vehicle that was powered by hand cranks. In 1789, pair of French creators fabricated a trike cycle, with the pedals; that is tricycle. In 1818, British inventor Denis Johnson filed a patent his advance towards to designing tricycles.In 1876, James Starley developed the Coventry Lever Tricycle, which used for paorod small wheels on the right side and a big drive wheel on the left side hand leers are supplies the power to trike. In 1877, The fabricated of the tilting system stores for steering by allowing for more tilting angle on the outer inner forward wheel during cornering.

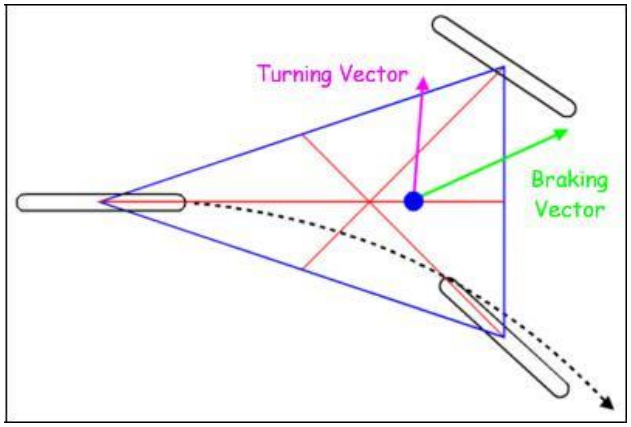

Figure:6 Trning vector, Breaking vector

The top shown schematic of the forward front cycle wheels shown in 6.4.1 explains how the body in wheel is adjusted at above angle during direction changing. Starley made vehicle that called the Coventry rotary, which is the only chain based cycle. Hence the solar power based tricycle gives a feasible replacing for short and joy trip. The advantage that is most important is by this solar trike the cost is low and pollution free ride. The Recumbent are cycles which is having different frame design geometry than the created and have shown to suit different features thereby:

- Speed that effect aerodynamic of the system.
- The body posture is sitting or leaning depending on leaning angle.
- More comfortable.
- Good comfortable seat
- Pedalling is good
- Expensive

3. CONCLUSIONS

The increasing the natural resources use like petrol, diesel it must to change our way variant the alternative resources like the electric based vehicles and electric trike and others because it is pointing to prefer alternative transportation to new way. Electric trike is a new vehicle that is modified of the existing cycles by using the three wheeled with alignment of motor with electric and solar power are provided, this can be add the energy production to vehicle. Since it is efficient based on energy, electric trike is low cost and reasonable to anyone. This can be used for the any distance by people of all ages. It can be artificial throughout the year.

The most essential feature of the electric recumbent trike is that it does not depends on fossil fuels thereby reduction crores of foreign money. Another most important feature is it is noise less operation, no pollution, and eco – friendly. For stopping and say no permanently to environmental pollution using of Electric trike is the most useful and also best solution. This trike is charged when in emergency charge with help of AC and also solar power. By using solar panel the using cost per/km is less up more. It is having the less components and it can be easily deconstruct to small components, hence we requiring less maintenance.

A latest speed control idea for a PMBLDC is the use of back emf as a starting signal has been resulted. A new torque control scheme of BLDC has been found as a promising vibration and noise. Besides, it may also be worn in the fans with PMBLDC motor drives on the traction. By using the our proposed control method the torque ripple and speed changing can be get and can made motor starting and running more efficient for long time of life duration

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