90 DEGREE STEERING MECHANISM IN WHEEL CHAIR

[1]Ms.S.S.SUBASHKA RAMESH, [2]ANUP S KUMAR, [3] N R SATHISH KUMAR, [4]ARUN DAS ,
[1]Assistant Professor, [2,3,4] UG Scholars, SRM INSTITUTE OF SCIENCE AND TECHNOLOGY,CHENNAI

***Abstract*— In this project we are fabricatinga four wheel drive with 90 degree rotation. Here we are creating the concept by the arrangements of motor, chain drive, keypad, vehicle model, battery and control unit. This concept is can be useful in reducing the parking time in many places. The most conventional and general steering arrangement is to turn the front wheels using a hand–operated steering wheel which is positioned in front of the driver. The steering column, which contain auniversal joint which is part of the collapsible steering column is designed to allow it to deviate from a straight line according to the Roadmap. In convertible four wheel steering with three mode operation three steering modes can be changed as needed which assists in parking at heavy traffic conditions, when negotiating areas where short turning radius is needed and in off road driving.This steering mechanism in wheel chair can be controlled using a android mobile through Bluetooth technology or an Bluetooth controller.**

Keywords:steering,angle,radius.

I. INTRODUCTION

This concept can be used to improve the parking assistance in many areas. The steering of a four wheeler gets an update. Rather than the conventional way of using the steering, here we can rotate the steering in 90 degree. The system can be controlled remotely too or by Bluetooth device. The basic idea is to improve the turning radius. The concept is powered by a battery. The concept hassix motors, two motors are fixed to the vehicle's two wheels of the front side, the next two motors connected the back side. The four motors are used to run the vehicle. Another two motors are connected to rotate the vehicle wheel 90 degree by the chain drive arrangements. The keypad in the control unit has six keys. the keys are used to maneuver the vehicle to forward,reverse,left,right,park right and park left. Each key is used to maneuver the vehicle in its respective direction.

Objectives

According to the census conducted by government of India 2001, 6,105,477 of the total population of 1,028,610,328 people are disabled with movement impairment which account for about 0.6% of the total. These people will need movement assisting devices for their locomotive purposes. In addition to this the growing old age population coupled with various ailments, increases the requirement for these movement assisted devices.

To achieve the long lasting, vastly better development prospects, we must empower people with disabilities and remove the barriers which prevent them in participating in their communities; getting a quality education, finding a descent work and having their voice heard. Be it trains, planes or automobiles, disabled people still face massive challenges in getting around. The main objective of this idea would be as follows

1. Better parking at home in narrow space and at multiplexes using this steering mechanism.
2. Improve the turning radius
3. Use of electrical drives to optimize power consumption.
4. Maintenance is low

II.LITERATURE SURVEY

1. Automatic Mode
   These bearings are placed between two rear pinions. The machine cannot rotate itself on a 90 degree perspective and the cost to make this machine is high and its more electrical based.[1]
2. Manually Handled Device
   It's a toothed bar that can be thought of a sector gear.It is of variable size , once the size is confirmed it can be put to good use. The main drawback of this system is its manually operated[2]
3. Shigeo Hirose
   Due to the use of large wheels the mobility is disturbed and the use of this machine is minimum[3]
4. Bluetooth controlled device
   The wheel is controlled and turned accordingly using the android mobile through Bluetooth technology[4]
5. Articulated steering mechanism
   The designed can perform yaw and pitch movement passively. The workspace of the front vehicle with respect to the rear vehicle to analyze the motion performance of the designed wheel drive.[5]

III.PROBLEM STATEMENT

Nowadays all vehicles uses two wheel steering system, but the efficiency of 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 to prove that the 4WS is better than 2WS in terms of turning radius. A vehicle with higher turning radius face difficulty in parking and low speed cornering due to its higher wheelbase and track width, but the passenger prefer the vehicle to be higher wheelbase and track width as it gives good comfort while travelling. In this scenario four wheel steering will be effective as the turning radius will be decreased for the same vehicle of higher wheelbase. In this project a benchmark vehicle is considered and four wheel steering is implemented without change in

dimension of the vehicle and reduction in turning radius is achieved. For achieving reduction a mechanism is built which turns the rear wheels opposite to the front wheels.

IV WORKING AND CONSTRUCTION.

In this project battery provides the power supply to the control unit. The equipment contains totally six motors, two motors are coupled with the vehicle's left and right wheels of the front side, the next two motors are connected to the vehicle's left and right side of the back side. The four motors are used to run the vehicle. Another two motors are connected to rotate the vehicle wheel 90 degree by the chain drive arrangements. The keypad in the control unit has six keys they are left, right, forward, reverse, park left, and park right. We press the left key in the keypad the vehicle turns left side in a required angle, we press the right key in the keypad the vehicle turns at right side in a required angle, similarly the forward and reverse motion of the vehicle are controlled by the forward and reverse key in the keypad. We want to park the vehicle in left side by press the park left key then the motor connected in the chain drive is turns the wheel left side 90 degree automatically, then the vehicle is parked in the left side, this process is same as right side. Using this we can easily park the vehicle in various areas.

This project basically focuses on counter-phase systems in which the rear wheels turns in the opposite directions as that of the front wheels in almost the same angles. This causes the system to take large radius turns smoothly and more efficiently compared to the counter-phase system. The drawback of this system is that it loses stability on attaining high speeds, i.e. attaining speeds more than 40Kmph but this speed is all it needs for a person on wheel chair and therefore is taken as the limit speed of the system. The counter phase system is obtained with the help of gear mechanisms in which racks, spur gears, bevel gears and shafts are used to link the steering with the rear wheels and the front wheels so that the steering can control both the front and the rear wheels. The figure shows the normal position of steering. When the steering wheel turns left as shown, the pinion which is connected to the steering turns counterclockwise, which in turn moves the rack linked to it towards left. The rack is linked to both the forks of the front wheels through the pinions attached to the fork, thus the wheels turn according to the rotation of the steering wheel. This is simply the basic form of rack and pinion mechanism. Each fork has 4 bevel gears attached to it. The right front gear is linked to the corresponding rear gear through a shaft having bevel gears at the ends. These bevel gears are attached to the shaft through the axis of the shaft. When the front gears rotate, it rotates the gear on the shaft which is perpendicular to each other, this rotates the bevel gear at the other end of the shaft. This gear thus rotates the bevel gear at the back wheel and that rotates the rear wheel.

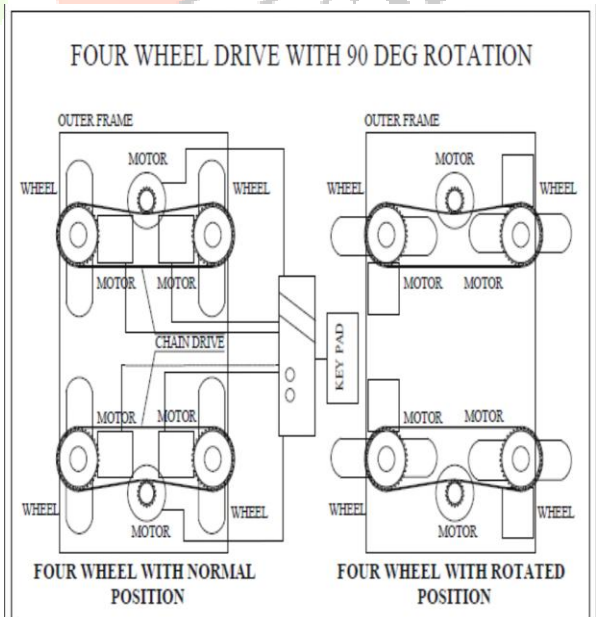
This project consists of front rack and pinion mechanism assisted by three bevel gears of which one is connected to front pinion, one is connected to steering rod in which input is given by the driver and third one will be connected to rear pinion. Rear wheel system consists of two racks with two pinions. One of the racks will be in front of the rear wheel axis (primary rack) and the other will be behind the axis (secondary rack). Also at any point in the system, one of the rack & pinion assembly will be engaged with the other being disengaged. Motion of pinion will be guided by an actuating pump connected to intermediate shaft which will receive input from speed sensors. The engaging & disengaging of the rack & pinion assembly will depend on the input received from the speed sensor. At lower speeds i.e. below 35kmph the pinion will be in contact with secondary rear rack so as to keep the wheels motion out of phase while for speeds above 35kmph pinion will be in contact with front rack of rear steering system, giving in phase motion to wheels. This position of the rear pinion on the rack is controlled by a hydraulic circuit and an actuator mechanism. The angle turned by rear wheels will not be as high as that of front wheels because the function of rear steering system is to assist the motion of front wheels and notprovide its own direction. This change of angle is obtained by changing gear ratio of rack and pinion.

Bluetooth controller

The system is combined with an android mobile platform and the wheel under control.The mobile platform requests to connect with the wheel chair and then sends the instruction to it by calling the android system Bluetooth API.

In-phase and counter-phasesteering

The 4WS system performs two distinct operations .In-phase steering, whereby the rear wheels are turned in the same direction as the front wheels, and counter phase steering, where by the rear wheels are turned in the opposite direction. The 4WS system is effective in the following situations Lane
Changes, gentle curves, junctions, narrow roads, and u turns. By minimizing the vehicles turning radius, counter-phase steering of the rear wheels enables U-turns to be performed easily on narrow roads.



Parallel parking

Zero steer can significantly ease the parking process, due to its extremely short turning footprint. This is exemplified by the parallel parking scenario, which is common in foreign countries and is pretty relevant to our cities. Here, a car has to

park it between two other cars parked on the service lane. This maneuver requires a three-way movement of the vehicle and consequently heavy steering inputs. Moreover, to successfully park the vehicle without incurring any damage, at least 1.75 times the length of the car must be available for parking for a two-wheel steered car. As can be seen clearly, the car requires just about the same length as itself to park in the spot. Also, since the 360 mode does not require steering inputs, the driver can virtually park the vehicle without even touching the steering wheel. All he has to do give throttle and brake inputs, and even they can be automated in modern cars. Hence, such a system can even lead to vehicles that can drive and park by themselves.

High speed lane changing

Another driving maneuver that frequently becomes cumbersome and even dangerous is changing lanes at fairly high speeds. Although this is less steering intensive, this does not require a lot concentration from the driver since he has to judge the space and vehicles behind him. Here is how crab mode can simplify this action.

Battery

A battery is a device that converts chemical energy to electrical energy. We generally use two types of battery, one of them is which can be used once before itgets totally discharged.
Another type of battery is rechargeable which means it can be used multiple times by recharging it externally.

DC Motor

DC motor stands for direct current motor. A machine that converts dc power into mechanical energy isknown as dc motor. Its operation is based on the principle that when a current carrying conductor is placed in a magnetic field, the conductor experiences a mechanical force.

Toggle Switch

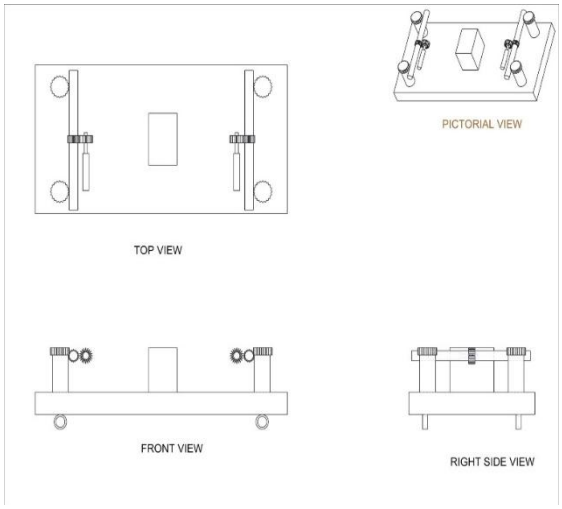
An electric switch having a projecting lever that is manipulated in a very particular way to open or close a circuit. The mechanism of a switch removes or restores the conducting path in a circuit when it is operated.

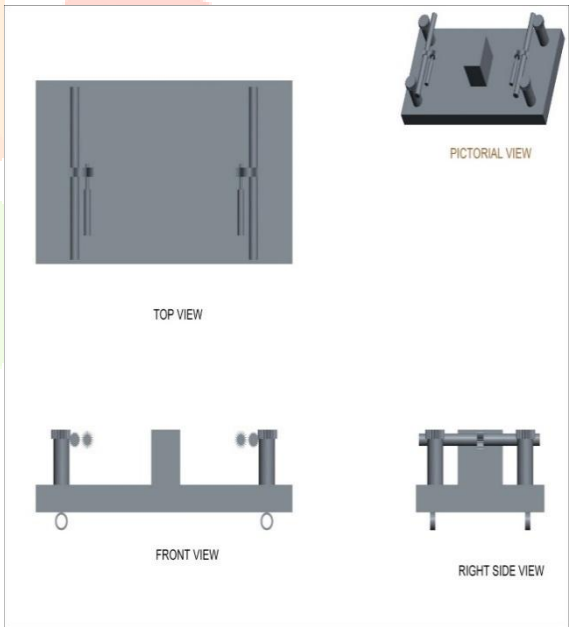
Pin Switch

A push-button or simply button is a simple switch mechanism for proper controlling some aspect of a machine.Buttons are typically made out of hard material, usually plastic or metal. Buttons are most often biased switches, though even many un-biasedbuttons.

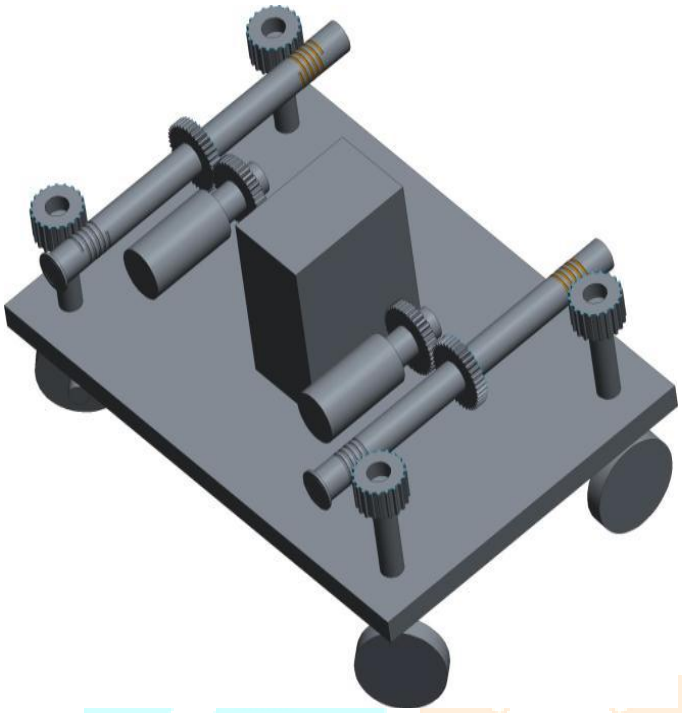
V. DIAGRAMS

2D





3D



VI.FUTURE SCOPE

Having studied how 4WS has an effect on the vehicles stability and driver maneuverability, we now look at what the future will present us with. The successful implementation of 4 Wheel Steering using mechanical linkages & single actuator will result in the development of a vehicle with maximum driver maneuverability, uncompressed static stability, front and rear tracking, vehicular stability at high speed lane changing, smaller turning radius and improved parking assistance. Furthermore, the following system does not limit itself to the benchmark used in this project, but can be implemented over a wide range of automobiles, typically from hatchbacks to trucks. This coupled with an overhead cost just shy of Rs.15,000 provides one of the most economical steering systems for improved maneuverability and drivers‟ ease of access. With concepts such as "ZERO TURN" drive as used in Tata Pixel and "360 degree Turning" used in „Jeep Hurricane", when added to this system, it will further improve maneuverability and driver's ease of access.

CONCLUSION

As per the focus of the project we have created an 4 wheel active steering mechanism which is feasible to manufacture, easy to install and highly efficient in achieving in-phase and counter-phase rear steering with respect to the front wheels using DRRC. This system assists in high speed lane changing and better cornering. It combats the problems faced in sharp turning. It reduces the turning circle radius of the car and gives better maneuverability and control while driving at high speeds, thus attaining neutral steering. Moreover components used in this system are easy to manufacture, material used is feasible, reliable and easily available in market. The system assembly is easy to install and light in weight and can be implemented in all sections of cars efficiently.

REFERENCES

[1] Hori Y. Future vehicle driven by electricity and controlresearchon four-wheel-motored ‘‘UOT electric marchII.’’ IEEE T Ind Electron

[2] Tsai M-C and Hu J-S. Pilot control of an auto-balancingtwo-wheeled cart. Adv Robot .

[3]. Sakai S, Sado H and Hori Y. Motion control in an electricvehicle with four independently driven in-wheelmotors. IEEE/ASME T Mech .

[4]Thomas P. Crash Motion control of an vehicle using the Bluetooth technology.Adv robot section.

[5]Jing H, Liu Z and Chen H. A switched control strategyfor antilock braking system with on/off valves. IEEE TVeh Technol

[6] . Minaki R and Hori Y. Driver-friendly motion controlbased on electric power steering and in-wheel motors onelectric. Int J Vehicle Auton System.

[7]20. Nam K, Oh S, Fujimoto H, et al. Estimation of sideslip and roll angles of electric vehicles using lateral tire force sensors through RLS and Kalman filter approaches