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Design and Fabrication of 360 Degree Rotating Vehicle

Dr. P. Mohammad Ali¹, A. Sarath², S. Satheesh Kumar³, P. Yuvaraj⁴

^{1, 2, 3, 4}Mechanical Engineering, Prathyusha Engineering College

Abstract: *The project is about 360-degree rotating vehicle. This vehicle moves in all directions. This makes the vehicle suitable for operation in narrow paths and sharp corners. The normal wheel vehicles face lot of problems like parking, U turn and much more which consumes more time. So, a 360-degree wheel rotating vehicle is designed to reduce and eliminate problems that occur when handling material in the industries. In this system, each of the 4 wheels has given drive with stepper motors, so it can rotate 360 degree. There are 4 Dc motors drive to move the vehicle in forward and reverse directions. 360-degree rotating wheel is controlled by RF remote. Consequently, we can utilize this 360-degree rotating vehicle for various perspectives like to transport things overwhelming bags and furthermore in vehicles, which will help in decreasing rush hour gridlock and spare time.*

Keywords: *All Directions, Material Handling, 360* Degree Rotation*

I. INTRODUCTION

As referenced over, this venture is about plan of 360 degree wheel turning vehicle. This vehicle moves every which way and this plan gives better solace and furthermore spares the season of clients, the vast majority of the general population utilizing this vehicle to convey products, understanding and so on. In any case, more often than not, they need to confront the issue like taking U turn and so forth. So need to structure a 360 degree wheel turning vehicle to lessen and dispose of issues in the business and at the railroad stage. This structure will give better solace and furthermore spares the season of clients, that is the reason it is additionally the dependable for the client. As it is likewise battery worked vehicle consequently no fuel is required. Consequently it is affordable to the earth. This will likewise diminish the expense of the vehicle. Zero degree turning span of a vehicle suggests the vehicle pivoting around a hub going through the focal point of gravity of vehicle for example the vehicle turning at a similar spot, where it is standing. No additional room is required to turn the vehicle. So vehicle is to be turned in the space equivalent to the length of the vehicle itself. In this framework, controlling is associated with sprocket and this sprocket is associated with sprocket of front wheel by chain drive. Guiding is utilized to give the course of front wheel. The DC engine is associated with sprocket jolt at above of casing. At the point when control supply from battery to DC engine then revolving movement exchange from DC engine to the wheel. The heading are give beneath sprocket which permit to wheel turn 360 degree about vertical pivot. At that point this equivalent rotating movement is exchange to the back wheels by sprockets and chain drive course of action. So accordingly this game plan of the vehicle wheels to turn 90 degrees left and 90 degree directly from unique position, however front wheels of this vehicle pivot 360 degree by controlling, sprocket and chain drive game plan. Without moving from the spot, for example the vehicle has zero turning span.

II. LITERATURE REVIEW

The idea of 360 degree wheel rotation load carry vehicle is analyzed from;

Jaishnu Moudgil, et al. [1], presented a 360 degree rotating car to overcome the problem of parking space. This car has zero degree turning radius of a vehicle implies the vehicle rotating about an axis passing through the center of gravity of vehicle i.e. the vehicle turning at the same place, where it is standing. No extra space is required to turn the vehicle. So vehicle is to be turned in the space equal to the length of the vehicle itself. In this presentation, so got idea of 360 degree wheel rotation vehicle and have plane to make 360 degree wheel rotation load carry vehicle, this vehicle is to be used in different area like industries, hospital, railway platform, etc.

Sudip kachhia [2], presented a 360 degree rotating vehicle to overcome the problem of parking space. This project is about design of 360 degree rotating car to move in all direction. This design provides better comfort and also saves the time of customers, that's why it is also the reliable for the customer. As it is also battery operated car thus no fuel is required. Hence it is economical to the environment. This also reduces the cost of the car, and also got idea to use battery to operate this vehicle. This helps in manoeuvring the vehicle in tight spaces such as parking lots and within small compounds. The various functions of the steering wheel are to

control the angular motion the wheels, direction of motion of the vehicle, to provide directional stability of the vehicle while going straight ahead, to facilitate straight ahead condition of the vehicle after completing a turn, the road irregularities must be damped to the maximum possible extent. This should coexist with the road feel for the driver so that he can feel the road condition without experiencing the effects of moving over it.

K. Lohith, et al. [3], presented a four wheel steering system for a car. In four wheel steering the rear wheels turn with the front wheels thus increasing the efficiency of the vehicle. The direction of steering the rear wheels relative to the front wheels depends on the operating conditions. At low speed wheel movement is pronounced, so that rear wheels are steered in the opposite direction to that of front wheels with the use of DC motor to turn left and right. In this presentation, the use of DC motor is to rotate the wheels 90 degree left and 90 degree right from original position.

Er. Amitesh Kumar, et al. [4], presented zero turn four wheel steering system, the various functions of the steering wheel are, to control the angular motion the wheels, direction of motion of the vehicle, to provide directional stability of the vehicle while going straight ahead, to facilitate straight ahead condition of the vehicle after completing a turn, the road irregularities must be damped to the maximum possible extent. This project the use of steering is to rotate front wheels.

Mr. Sharad P. Mali, et al. [5], presented zero turn four wheel mechanism, in this project people have used DC motor and wheel to vehicle rotate 360 degree at a same position. So in this project, the idea is to arrange of DC motor and wheel.

III.COMPONENTS

S.NO	DESCRIPTION	SPECIFICATON	QUANTITY
1	DC MOTOR	12V	5
2	CYCLE CHAIN	-	AS PER REQ
3	BATTERY	12V 7A/HR	1
4	ESP WIFI BOARD	-	1
5	SPROCKET	-	4
6	CONNECTING WIRES	-	AS PER REQ
7	STEEL FRAME	-	AS PER DIMENSION
8	WHEELS	-	4
9	RELAY BOARD	-	3
10	CLAMPS	-	4

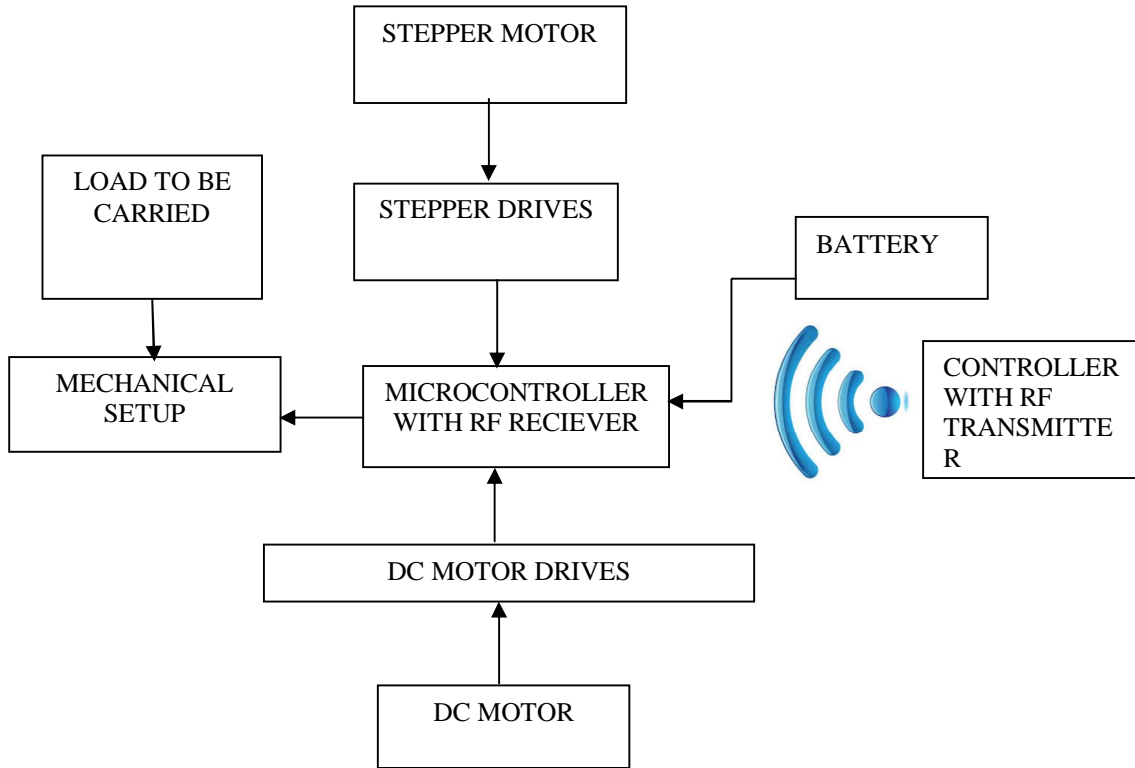
IV.WORKING

The base frame is manufactured as per the dimensions. At the corners of the frame the clamps are fixed with shafts mounted on them. Above the shaft the sprocket wheel setup is mounted. Totally four wheel sprocket are used in the setup. The wheel sprockets are connected using a cycle chain. Using the clamp the dc motor are mounted in the frame. The wheels are connected to the motor via the shaft. A 12v 7amp/hr battery is placed in the back of the frame. Using wire connections the motor is connected to the battery. ESP wifi board is mounted on the setup using a breadboard or card board. The relay boards are fixed in the same place. ESP wifi board is programmed by interfacing with the relay board. The interfaced electronic setup is then connected to the motor for controlling the motor setup. All the connections are made to connect to the battery. With this the setup is assembled. Now the power supply is given to all the circuits and motors. The wifi board transmits signal to the device that could pair with it. Usually a mobile device is used to connect the wifi board and display the web page that has the remote control functions. The load is loaded in the loading area. Using battery power supply the motor starts to operate. The motor operation is controlled by the ESP wifi board. There are two types of key sets for controlling the motor.

The first key set controls the forward and reverse operation of the device. This is achieved by varying the power supply to the motors using the relay board. Forward movement is achieved by giving positive supply and reverse motion by reversing the polarity. The second set of keys control the directions of the setup. 360* rotation of the setup is achieved by this concept. The same principle applied above is done here also. By these processes the load is carried from one location to another without much disturbance. Due to 360* rotation of wheels the movement of the setup is far more easy than the conventional systems used. Usage of remote control for controlling the movement of the device ensures that human intervention for controlling it is reduced. Because of this human error that occur carelessly or out of consciousness is greatly reduced. Other than that the cost for movement of resources is greatly

reduced and unnecessary usage of manpower is reduced. This system increases the working time of the unit. Since humans get tired after some time of hard lifting works. Due to its compact structure the device can enter all areas that are available with minimum spaces. The operation area requirement is minimal in this case.

V. ARCHITECTURE



VI. LOAD CALCULATIONS

Length=700 mm

Width=900 mm

To find reaction force on each wheel (F), torque(T)

$$r = ((a/2)^2 + (b/2)^2)^{0.5}$$

$$r = ((700/2)^2 + (900/2)^2)^{0.5}$$

$$r = 531.50 \text{ mm}$$

$$\text{Now } W = 25\text{kg} = 25 \times 9.81 = 245.25\text{N}$$

$$\begin{aligned} \text{Now Force on each wheel } F_w &= W/4 \\ &= 61.32\text{N} \end{aligned}$$

Reaction Force developed by each wheel:

$$\begin{aligned} F_w &= W/4 \\ &= 61.32\text{N} \end{aligned}$$

Now Torque on each wheel:

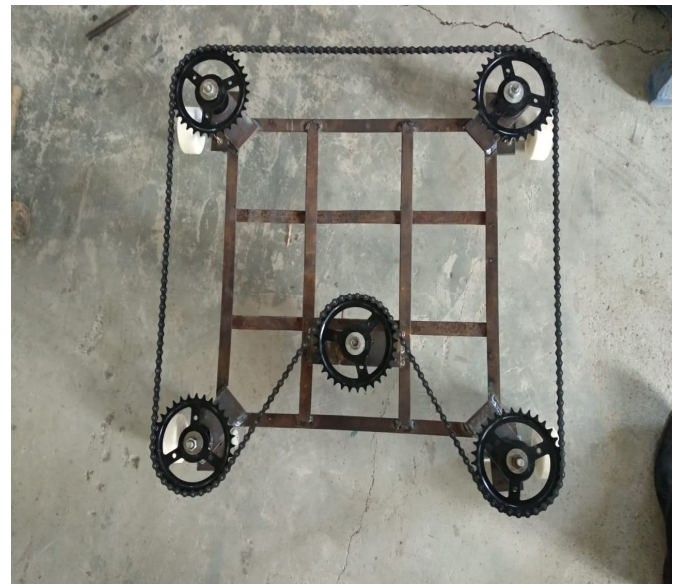
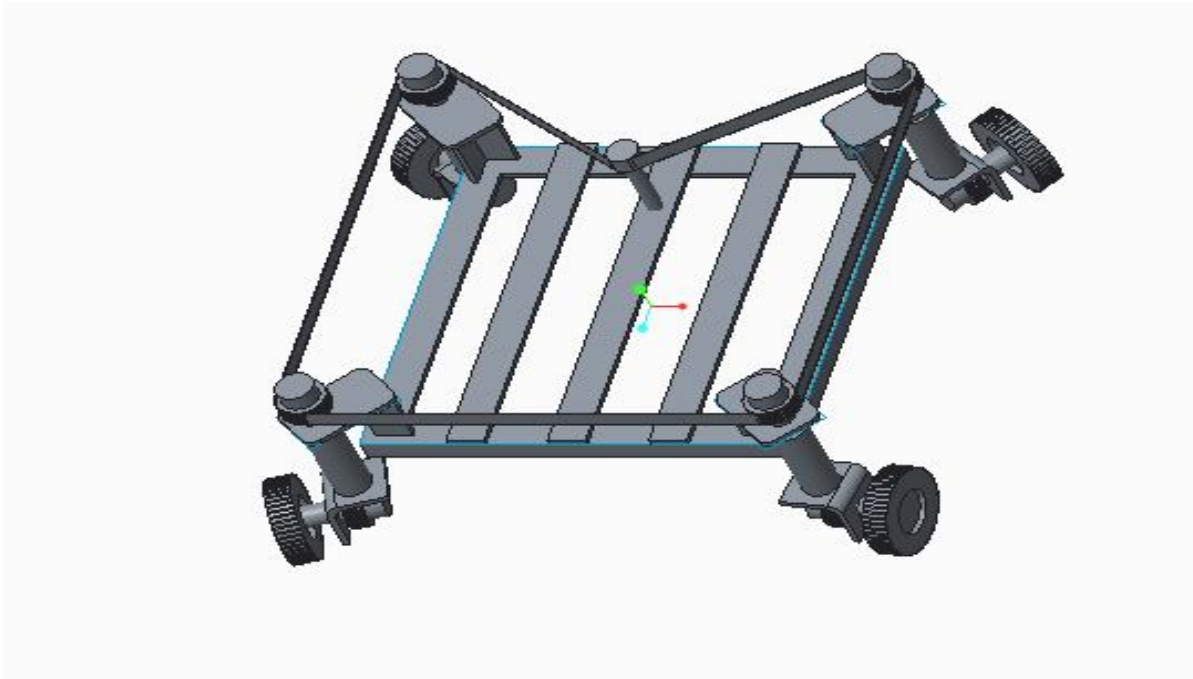
$$\begin{aligned} T &= F_w \times r \\ T &= W/4 \times r \\ &= 32591.58 \text{ N-mm} \end{aligned}$$

The equivalent required horsepower for motor

$$HP = (\text{TORQUE} \times \text{RPM}) / 5990$$

$$HP = .5 \text{ hp}$$

VII. DESIGN



VIII. ADVANTAGES

A. Semiautomatic System

Semi automatic control is the use of various control system for operating equipments such as machinery, processes in factories, boilers and heat treating ovens, switching on telephone networks, steering and stabilization of ships, aircrafts and other applications and vehicle with minimal or reduced human intervention. Some processes have been automated. The biggest benefit of semi automation is that it saves labour, however it is also used to save energy and materials and to improve quality, accuracy and precision.

B. Low in Cost

Our system is very low in cost because we are using very simple mechanism. So we can say that our mechanism will be very easy to construct and it will not incur any high labor cost and also the cost components will be very low and it will be low in cost.

C. Easy maintenance

Our machine will be very easy to maintain because it is having components which are detachable in nature and we will be able to maintain each and every components individually and also if any particular needs to be replaced so we can replace them readily and since we have said earlier that our components are very simple in nature so this makes our system more maintainable.

D. Easy Operation

Our machine as the state of art features. It embeds within itself the IOT control system for its controlling device. This technology allows the user to operate the machine from afar.

IX. APPLICATIONS

- A. It is used for moving material around the industry.
- B. It is used almost in all types of terrain.
- C. Movement in sharp and narrow areas.
- D. Project to use this in efficient way to control the movement of heavy loads in industry.

X. DISADVANTAGES

- A. Frequent charging of battery.
- B. Heavy loads could not be driven.
- C. Reduced working time due to power problems.
- D. Complicated chain arrangement.

XI. RECTIFICATION

- A. Use of solar cell to eradicate power problems.
- B. Suitable motor selection for heavy loads.
- C. Increasing the power of motor to lift all kinds of loads.

XII. FUTURE SCOPE

- A. We have built now only a prototype this can be built into a bigger model suiting to the needs and requirements of the customer.
- B. This equipment is semiautomatic in recent fabricated model using suitable technology it could be made fully automatic.
- C. ESP wifi board has an area coverage of 1km for using control system this can be boosted using wifi routers.
- D. Usage of renewable energy sources to power the device can be applied.

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