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Design and Fabrication of an Eco-Friendly Electric Go-Kart for Sustainable Transportation

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Abstract: The increasing demand for sustainable and eco-friendly transportation has accelerated the development of electric vehicles (EVs) as an alternative to conventional internal combustion engine-based systems. This paper presents the design, fabrication, and performance analysis of a single-seater electric go-kart developed for low-speed urban mobility applications. The proposed system integrates a battery-powered electric drivetrain consisting of a 24 V brushless DC motor, lithium-ion battery, and chain drive transmission system.The design process focuses on achieving a balance between lightweight construction, structural strength, cost-effectiveness, and driver ergonomics. A chassis frame made of cast iron is developed and analyzed to withstand static and dynamic loads, ensuring safety and durability. Key subsystems including steering (Ackermann geometry), braking system, transmission mechanism, and electrical components are systematically designed and implemented. Analytical calculations were carried out to evaluate parameters such as turning radius, velocity ratio, and load-carrying capacity.The fabricated go-kart achieved a maximum speed of 20–25 km/h with a load capacity of approximately 95 kg, demonstrating its suitability for short-distance transportation. The study highlights the feasibility of developing low-cost electric mobility solutions with reduced environmental impact. The results indicate that the proposed design offers a reliable, efficient, and sustainable alternative for small-scale transportation and educational research applications. Future scope includes integration of renewable energy sources and advanced lightweight materials for enhanced performance.

Keywords: Electric Go-Kart, Electric Vehicle (EV), Chassis Design, Fabrication BLDC Motor Transmission System, Ackermann Steering Mechanism Sustainable Transportation, Lightweight Vehicle

1. Introduction

Electric vehicle (EV) technology originated in the late nineteenth century and experienced significant growth until the early 1900s. However, its development declined after 1918 due to the widespread adoption of internal combustion engine (ICE) vehicles and the decreasing cost of fossil fuels. The resurgence of EV technology began in the late twentieth century, driven by environmental concerns and advancements by companies such as General Motors. Further developments in the 1990s, including hybrid vehicles like the Toyota Prius, contributed to renewed interest in alternative propulsion systems, although hybrid technology temporarily shifted focus away from fully electric vehicles [1], [2].

In recent years, the rapid depletion of fossil fuel reserves and the environmental impact of greenhouse gas emissions have accelerated the need for sustainable transportation solutions. The transportation sector is a major contributor to global carbon dioxide emissions, leading to increased research on alternative energy-based vehicles such as solar, hydrogen, biodiesel, and battery electric vehicles (BEVs) [3]. Among these, battery-powered electric vehicles have emerged as a promising solution due to their zero tailpipe emissions and high energy efficiency, despite challenges such as limited driving range and charging infrastructure [4]. The present study focuses on the design and fabrication of an eco-friendly, battery-powered electric go-kart intended for single-passenger use in short-distance applications. Go-karts are lightweight, compact, and easy-to-operate vehicles commonly used in recreational and educational environments. Traditionally powered by internal combustion engines, recent developments emphasize electric propulsion to reduce emissions while maintaining comparable performance [5]. An electric go-kart consists of key components including an electric motor, battery, controller, transmission system, steering mechanism, wheels, and chassis. Among these, the chassis serves as the primary structural element, supporting all subsystems and ensuring vehicle stability and safety. Due to the absence of suspension and low ground clearance, the chassis must be designed with sufficient strength and rigidity to withstand static and dynamic loads [6], [7]. The objective of this work is to design, analyze, and fabricate a go-kart chassis using appropriate engineering principles. Special emphasis is placed on material selection, structural integrity, safety, and cost-effectiveness. Cast iron is selected as the chassis material due to its high tensile strength and durability. The design considerations include safety, serviceability, lightweight construction, ergonomics, and performance [8]. The transmission system in an electric go-kart typically consists of a battery, electric motor, chain drive, sprockets, and axle. Proper selection of gear ratios and component positioning is essential to achieve optimal speed, torque, and maneuverability [9]. Additionally, the use of electric motors enhances efficiency and reduces environmental impact compared to conventional engines. Driver comfort and ergonomics are also considered by optimizing component placement based on human factors. A cost-effective and practical fabrication approach is adopted to ensure ease of manufacturing and maintenance. With increasing concerns over global warming and environmental degradation, the adoption of electric vehicles has become a global priority. India, being one of the largest automotive markets, is actively promoting EV technology to reduce emissions and dependence on fossil fuels. Government initiatives and technological advancements are accelerating the transition toward sustainable mobility solutions. This study demonstrates the feasibility of developing a low-cost, efficient, and eco-friendly electric go-kart, contributing to the advancement of electric mobility solutions for short-distance transportation and educational applications.

2. Literature Review

Shubham Lakpale (2018) et al. [10] A chassis of Go-Kart mainly consists of an internal framework that supports a man-made object in its construction and use. An example of a chassis is the under part of a motor vehicle, consisting of the frame (on which the body is mounted). If the running gear such as wheels and transmission, and sometimes even the driver's seat, are included then the assembly is described as a rolling chassis. The chassis of Go-Kart takes a load of the operator, engine, brake system, fuel system and steering mechanism, so chassis should have adequate strength to protect the operator in the event of an impact. The driver cabin must have the capacity to resist all the forces exerted upon it. This can be achieved either by using high strength material or better cross sections against the applied load. But the most feasible way to balance the dry mass of chassis with the optimum number of longitudinal and lateral members.

Prof. T. Z. Quazi1, (2018) et al. [11] The Go-kart is a vehicle which is compact, simple, lightweight and easy to operate. The go-kart is designed for flat track racing so, its ground clearance is very small as compare to other vehicle hence it skips the suspension. The parts of go-kart are engine, steering, axle, tires and bumpers. The engine used for go-kart is either two strokes or four stroke engines. The electric motors are also used instead of engine, known as "eco-kart". The chassis is independent of suspension to experience thrill. Go-karting is a great outlet for those interested in racing because of its simplicity, cost and safer way to race.

Kaustubh Hajare, (2016) et al. [12] The drivers in these are very professionals and accurate. They can drive it very fast. But there are also motor sports which do not need professional drivers and need not much speed. The vehicles used are also fewer amounts Such a motor sport is Go-Kart. They resemble to the formula one car but it is not as fast as F1 and also cost is very less. The drivers in go-kart are also not professionals.

Kiral Lal, (2016) et al. [13] The chassis is an extremely imported element of the kart, as it must provide, via flex, the equivalent of suspension to give good grip at the front. Karts have no suspension, and are usually no bigger than is needed to mount a seat for the driver. Go-Kart technology has been widely developed since the introduction of wheels. But it was not fully implemented in racing activity until the past three hundred years in America.

Shubham Kolhe, (2016) et al. [14] A Go Cart also spelled as Go-Kart is a four wheeled vehicle designed and meant for racing only. It is a small four-wheeler run by I.C Engine. It is a miniature of a racing car. This report documents the process and methodology to produce a low-cost go-kart. analyze that the design of chassis act as an important role and it can develop many skills in designing software like FUSION 360. From the analysis it can predict that the chassis is safe to bear stresses or not and also seeing the deformation and modification in chassis design.

Prof. Deepak Verma (2015) et al. [15] Go –kart is a small four wheeled vehicle. It came in all shapes and forms, from motor less models to high-powered racing machines, like super carts being able to beat racing cars on long circuit. There are many major components of a Go-Kart which undergo heavy loading and forces even in static condition, out of those few are critical components like chassis, knuckle and drive shaft. Chassis bears the load of the driver, Engine, Brake System, Fuel System and Steering Mechanism. Therefore, chassis should have adequate strength to protect the operator in the event of an impact.

Ammar Qamar (2015) et al. [16] A Go kart is a small four wheeled vehicle. Go-kart, by definition, has no suspension and no differential. 'Carting is commonly perceived as the stepping stone to the higher and more expensive ranks of motor sports. Kart racing is generally accepted as the most economic form of motor sport available. The first go-kart was simply a cart consisting of wheels and handles jointed together as children pushed from behind when learning to walk or a four-wheeler platform where children where children can sit on it while another push the kart around.

Prof. Alpesh V. Mehta, (2015) et al. [17] The fiber to take load in the form of a structural element, but the matrix phase only sustains small amount of applied load. In addition, beside the matrix material is ductile; it also protects the individual fibers from mechanical abrasion or chemical reaction with the environment which will cause surface damage. There are no dampers or springs and camber and caster angles are including with tires. We have performed many stresses test in our project to make a good and safe vehicle.

K. Vignesh, P. Sakthi, (2015) et al. [18] performed an experiment in the Design and fabrication of Go-Kart Vehicle which would produce a cheaper and effective result than the existing system. In this, they have fitted a dynamo in the bicycle which is in contact with the rear wheel. The motor is also connected with a rear wheel via main shaft to transmit power to the wheel and other end of dynamo is connected with the two terminals of the battery for the recharging purpose. It is working on the principle that when the wheel rotates, dynamo is functioning and from this the battery is charged by means of battery.

Kusekar S.K ,(2015) et al. [19] Has conducted an experiment in Design and development of electrical car to illustrate an implementation of electric vehicle technology on a small scale. Here we observed how to design an electric car with less cost and have studied about various components that is required to design an electric car. It shows that electrical battery-operated vehicle is more suitable than other vehicle because the cost of the electricity is low and also maintenance cost is less. The connections from the battery are given to the motor in such a way that when the motor energies through the current, the stator field coil get magnetized and induces the rotor shaft to rotate in the counter clockwise direction.

Awash Tekle (2014) et al. [20] performed an experiment on the topic Renewable Energy Use for Continuous electric vehicles Battery charging capacity in mobile. This paper presents and studies on renewable energy use, by integrating solar and wind energy for continuous electric vehicle battery charging capacity in mobility. Here, the power for electric vehicle is generated from solar cells and wind turbine and it is fed to the battery for charging the inverter. This is fed to the electric motor for rotational power development to the differential shaft. Here we mainly observed the charging and discharging rate of the battery and we came to know that it fully depends on the battery design. In this paper we studied about how to calculate the power generated by the wind turbine and the blade tip ratio for the various speeds.

Patel Vijaykumar, (2012) et al. [21] conducted an experiment on the topic Structural Analysis of Automotive Chassis frame Design Modification for Weight Reduction for the work performed towards the optimization of the automotive chassis with constraints of maximum shear stress, equivalent stress and deflection of chassis under maximum load. Here we observed that how the chassis serve as a frame work for supporting the body and different parts of the automobiles. Here we analyse how to design a chassis, its load withstanding capability and the calculations required for the chassis frame. This paper also gives idea about, how to modify the design for the required weight of vehicle.

S.M.Ferdous, (2011) et al. [22] conducted an experiment on Electric vehicle which is based on the concept of charging the batteries of an electric vehicle when it is in motion. In general, the energy storage capacity of the battery used in electric vehicle is very low compare to the conventional fuels used in modern automobiles. Hence, they have found out a method to recharge the battery using renewable resource. This can be achieved by using the wind energy which is caused by the relative motion between the vehicle and the wind surrounding it. In this paper, we have study about the use of Renewable energy i.e., wind energy to generate electricity and to charge the battery by using the developed power.

3. Working Priciple of Electric Go-Kart Vehicle

The electric go-kart operates on the fundamental principle of conversion of electrical energy into mechanical energy to produce motion. The system primarily consists of a battery, motor controller, electric motor, transmission system, and driving wheels, all mounted on a rigid chassis frame. When the vehicle is switched ON, electrical energy stored in the lithium-ion battery is supplied to the motor through a motor controller. The controller regulates the flow of current based on the driver’s input (accelerator), thereby controlling the speed and torque of the motor. In this design, a brushless DC (BLDC) motor is used due to its high efficiency, low maintenance, and compact size. Upon receiving electrical power, the motor converts electrical energy into rotational mechanical energy. This rotational motion is transmitted to the rear axle through a chain and sprocket mechanism. The transmission system ensures appropriate speed reduction and torque multiplication by selecting a suitable gear ratio, enabling smooth acceleration and efficient power delivery to the wheels. The steering system of the go-kart is based on Ackermann steering geometry, which ensures that during turning, the inner and outer wheels rotate at different angles, allowing smooth cornering without tire slipping. The braking system, typically a mechanical shoe brake, is used to decelerate or stop the vehicle by applying friction to the rotating wheels. Since the go-kart does not incorporate a suspension or differential system, the chassis is designed to provide sufficient rigidity and flexibility to withstand road shocks and loads. The entire system works in coordination to deliver a simple, efficient, and eco-friendly mode of transportation suitable for short-distance travel. Thus, the electric go-kart functions by converting stored electrical energy into controlled mechanical motion, ensuring efficient, emission-free, and cost-effective operation.

Figure 1. Real Image of Go-Kart Vehicle

4. Design of Electric Go-Kart Vehicle

Model design is a critical aspect of any engineering process, as it is influenced by visual appeal, functional performance, and economic feasibility. Prior to the design of the go-kart vehicle, a comprehensive study was conducted to ensure that the final product meets user requirements, particularly in terms of driver comfort, safety, and reliability. The design approach was focused on achieving a failure-free structure while maintaining ergonomic suitability for the driver.

One of the primary considerations during the design phase was the selection of a material that offers a balance between low weight and high strength. Minimizing the overall weight of the vehicle without compromising structural integrity plays a vital role in enhancing performance and efficiency. In chassis design, strength and lightweight characteristics are fundamental requirements. Therefore, material selection becomes a crucial step in the overall design process.

In this work, cast iron was selected as the material for the chassis due to its medium carbon content and high tensile strength. To ensure optimal material selection, a detailed comparative study of various lightweight materials was carried out. The final choice was based on key factors such as cost, availability, weight, and strength.

The design of the chassis frame was aimed at achieving maximum weldability, adequate bending stiffness, minimum weight, and maximum strength of structural members. The overall design process followed an iterative approach, incorporating both engineering design principles and reverse engineering techniques, depending on practical constraints such as material availability and cost considerations.

The primary design objectives established for the go-kart vehicle included durability, lightweight construction, and high performance. Additionally, efforts were made to avoid overdesigning, thereby optimizing material usage and reducing manufacturing costs. The design methodology involved defining performance parameters, distributing tasks among team members, and systematically developing the vehicle model to meet the desired specifications.

4.1 Chassis Frame Design

The chassis frame is designed to meet the technical requirements of the go-kart while ensuring safety, structural integrity, and efficient component integration. It serves as the primary supporting structure, accommodating all essential components including the driver, motor, battery, and transmission system.

The frame is constructed using rectangular iron sections to provide adequate strength and rigidity. It is designed to withstand dynamic loads and stresses generated during vehicle operation. All major components are rigidly mounted to the chassis to ensure stability and reliability.

A fully rigid construction is adopted, eliminating unnecessary articulations. Movable joints are permitted only in the steering mechanism, specifically at the steering knuckle, to facilitate controlled directional movement. This design approach ensures durability, simplicity, and safe operation of the go-kart.

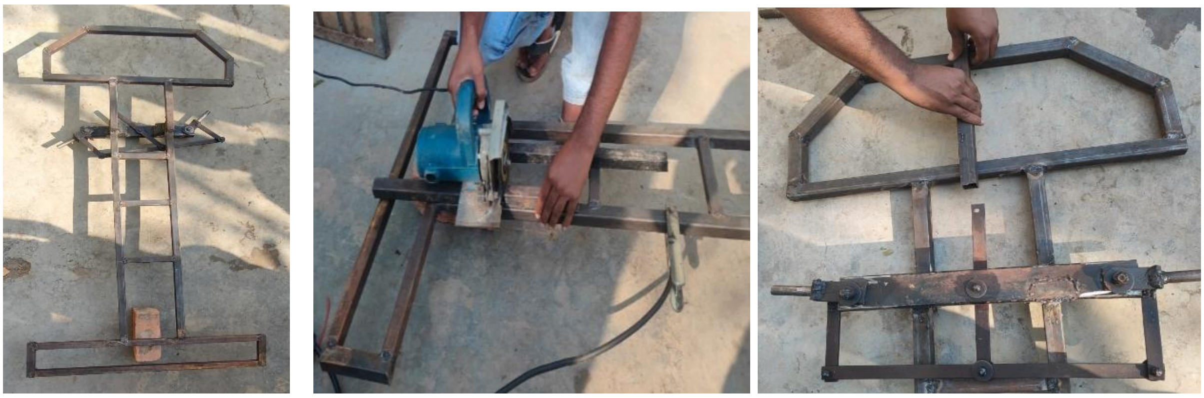

Fig 2: Real image of Chassis Frame of Go-Kart Vehicle

4.2 Steering System

The steering system is a vital mechanism responsible for smooth manoeuvrability and effective control of the vehicle. In addition to providing directional control, it must ensure good ergonomics and ease of operation for the driver. The primary objective of the steering system is to minimize steering effort while reducing steering wheel travel, thereby enhancing responsiveness and control.

In this design, an Ackermann-type steering mechanism is employed, which utilizes a four-bar linkage system to achieve accurate wheel alignment during turning and ensure efficient handling characteristics.

Fig 3: Real Image of Steering System

4.3 Transmission System

Electric vehicles typically employ a single-speed transmission system to transfer power from the motor to the driving wheels. The electric motor is powered by one or more batteries that store the electrical energy required for operation. The capacity of the battery, expressed in kW or kWh, directly influences the driving range of the vehicle. In the present design, a chain drive transmission system is utilized between the motor and the drive shaft due to its advantages such as lightweight construction, high efficiency, and low maintenance requirements. The primary objective of the transmission system is to ensure efficient and reliable power transfer from the motor to the wheels. A comparative study of commonly used power transmission systems, such as belt drives and chain drives, was conducted. Although belt drives exhibit higher efficiency in certain conditions, further analysis of different belt types identified the timing belt as a suitable alternative due to its durability, reliability, and ability to operate over a wide range of speeds and torque with minimal maintenance and re-tensioning.

The transmission system consists of a timing belt, pulleys, drive shaft, and supporting bearings. The design and selection of the timing belt are based on the required output power. A belt pitch of 5 mm was selected, and all associated design parameters were determined accordingly. To reduce dynamic weight and improve acceleration performance, aluminium alloy was chosen as the material for the timing belt pulleys.

Fig 4: Real Image of Transmission system

4.4 Electrical System

4.4.1 Motor

Brushless DC motors work on the same principle as that of a conventional DC motor. Due to its low noise and lightweight, it is being used for a vehicle. It requires low maintenance as well.

Figure 5: Real Image of Motor

4.4.2 Battery (Li-ion)

Lithium-ion batteries have a high energy density and are rechargeable. They are commonly used in consumer electronics. The life cycle and efficiency of Li-ion batteries are more as compared to the other rechargeable batteries.

Figure 6: Real image of battery

4.4.3 Circuit Diagram

A motor controller is a device used for operating an electric motor and is coordinated in some predetermined manner. A controller can have a manual or automatic system in order to start and stop the motor, for changing the direction of rotation from forward to reverse, for selection and regulation of speed and for limiting the torque. It is also used to protect the motor from overloads and faults.

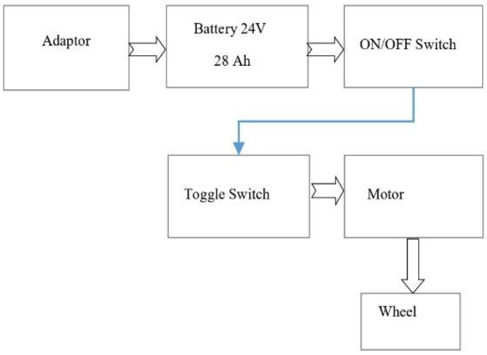

Figure 7: Real Image of Circuit Diagram

4.4.4 Adapter

- Quick charge. Applicable batteries: 24 V 14 Ah
- Input voltage: 100V-240V~5A, 50/60Hz. Output power: DC 24V.
- Fit battery: 24v
- Indication Light: green light when power indicate, red light when charging, green light when fully charged

Figure 8: Real Image of Adapter

4.4.5 Reverse Forward Switch

- Car Forward Backward Switch Suitable Switch Between Forward, Off & Reverse Directions During Vehicle Operation
- 6 pin (on-off-on) Allows driver to switch between forward, off and reverse directions during vehicle operation The colour may have different as the difference display
- Total size (each one): 2.1 cm x 1.5 cm x 2.5 cm or 0.82-inch x 0.6-inch x 1 inch (lxwxt)
- Dimensions: Mounting size - 1.8 cm x 1.3 cm x 2cm or 0.7-inch x 0.5-inch x 0.78 inch (lxwxt)
- Color: Black, package contents: Dpdt switches (2 piece)

Figure 9: Real Image of Reverse Forward Switch

4.5 Chain and sprocket

In Go kart vehicle, the power from engine is transmitted to the sprocket using chain i.e., chain drive. Usually Go karts do not have a differential, so it is eliminated. The power from the motor is transmitted to the rear two wheels using chain drive which is capable of taking shock loads .In the case of go-kart chains, it is possible to modify the overall gear ratio of the chain drive by varying the diameter (and therefore, the tooth count) of the sprockets on each side of the chain. This is the basis of derailleur gears. A multi-speed g-kart, by providing two or three different-sized driving sprockets and up to 11 (as of 2014) different-sized driven sprockets, allows up to 33 different gear ratios.

Figure 10: Real Image of chain and sprocket

4.6 Tires

The tires used on a go-kart are often determined by the track conditions. When the weather is muddy, wet tires are used, and when the weather is dry, slippery tires are used. Although some of the karts would use intermediate tires with a reasonable degree of grooves to deal with conditions that are in between rainy and dry, some would use wet/dry tires. The complete tread patterns on both the wet and intermediate tires were designed to remove water trapped between the road surface and the tires.

Figure 11: Real Image of Tire

4.7 Brake System

The purpose of the brakes is to stop the vehicle safely and effectively. In order to achieve maximum performance from the braking system the brake have been designed to lock up rear wheels, while minimizing the cost and weight. We are using shoe braking system.

Figure 12: Real Image of Breaking System

4.8 Axle

4.8.1 Design Considerations

Go karts use a variety of rear axle types. The most common are single wheel drive, but two-wheel drive karts are also popular. The simplest of these is the live axle, and the more complicated use a differential. A live axle means that the wheels are mounted directly to the axle, and the axle spins. A dead axle would be where the wheels spin freely and the axle does not turn.

4.8.2 Dead Axle

These axles stay in place and don't rotate with the wheels. Most dead front axles and differentials have housings that prevent them from coming into contact with water or dirt.

Figure 13: Real Image of Dead Axel

4.9 Pillow Block Bearing

A pillow block bearing (or Plummer block) is a pedestal used to provide support for a rotating shaft with the help of compatible bearings & various accessories. The assembly consists of a mounting block which houses a bearing. The block is mounted to a foundation and a shaft is inserted allowing the inner part of the bearing / shaft to rotate. The inside of the bearing is typically 0.001 inches (0.025 mm) larger than the shaft to ensure a tight fit. Set screws, locking collars, or set collars are commonly used to secure the shaft. Housing material

for a pillow block is typically made of cast iron.

Figure 14: Real Image of Pillow Block Bearing

4.10 Driver Seat

This kart's seat is also built to be lightweight; it's made of simple plastic and is only connected to the frame by four points. The seat's backrest angle is 13 degrees, which is a decent spot for the driver's body rest from an ergonomics standpoint, and it is almost parallel to the firewall. The seat in our go-kart has a good ride.The seat mounting must be rigid enough to withstand the dynamic conditions during the track events. The driver seat should be well cushioned and at least 3 inches away from the firewall. Alignment of the driver seat/driver sitting direction must be parallel to vehicles longitudinal axis

Figure 15: Real Image of driver seat

5. Testing and Calculations

5.1 Calculation of Turning Radius

If we consider these links as four bar link mechanism, having one link fixed, then the mean position of the tire (while going straight).

The turning radius depends on two things:

Wheelbase w, which is the distance between the front and the rear wheel and Angle α of the front wheel.

We suppose that only the front wheel is able to turn.

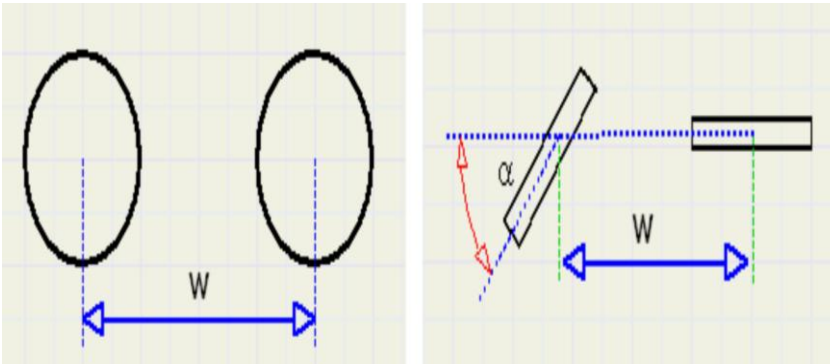

Figure 16: Calculation of Wheelbase

The front and rear wheel follow a circle with the same center. At all times, the direction is perpendicular to the radius. See figure below:

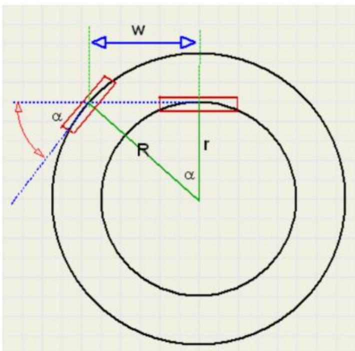

Figure 17: Calculation of turning radius

The radius of the front wheel is R, the rear wheel r.From the figure above we conclude:

$\sin \alpha = w / R$

$R = \frac{W}{\sin \alpha}$

We have wheelbase (w) = 80 cm

And α = 30 degrees

$R = \frac{80}{0.5}$

(R) = 160cm

The Turning Radius of Vehicle is 160 cm

5.2. Velocity Ratio of Chain Drives

The velocity ratio of a chain drive is given by

$V.R. = \frac{N\,1}{N\,2} = \frac{T1}{T2}$

Where,

N1 = Speed of rotation of smaller sprocket in r.p.m.,

N2 = Speed of rotation of larger sprocket in r.p.m.,

T1 = Number of teeth on the smaller sprocket, and

T2 = Number of teeth on the larger sprocket.

$V.R. = \frac{3300}{N\,2} = \frac{9}{18}$

$N2 = \frac{3300 \times 18}{9}$

= 6600

$N = \frac{N1 + N2}{2}$

$= \frac{3300+6600}{2}$

= 4950

The average velocity of the chain is given by

$v = \frac{\pi\, DN}{60}$

where

D = Pitch circle diameter of the sprocket in meters,

$v = \frac{\pi \times 0.06 \times 4950}{60}$

=15.55 m/s

5.3 Load carrying capacity Calculation

We use cast Iron material pipe for chassis

Ultimate tensile strength = 200 Mpa

Yield Strength = 130 Mpa

Area = 1.27 = $(3.81)^2$ cm

Permissible Stress= $\frac{Ultimate\ tensile\ stress}{Factor\ of\ Safety}$

Permissible Stress = $\frac{200}{6}$

Permissible Stress = 33.33 Mpa

Permissible Stress = $\frac{Load}{Area}$

Load = Permissible Stress × Area

$= 33.33\times10^{6}\times2.8\times10^{-5}$

= 933.5

$= \frac{933.5}{9.81}$

Load = 95 Kg

$\boxed{\text{The Load Carrying capacity of go- kart vehicle is 95 kg.}}$

6. Results and Discussion

The performance of the developed electric go-kart was evaluated based on key design and operational parameters, including turning radius, average velocity, and load-carrying capacity. The turning radius of the vehicle was found to be 160 cm, which indicates good maneuverability and efficient steering performance. The implementation of Ackermann steering geometry ensured smooth cornering with minimal tire slip, making the vehicle suitable for operation in confined spaces and flat track conditions. The average velocity of the go-kart was calculated as 15.55 m/s, demonstrating satisfactory performance for a low-speed electric vehicle designed for short-distance travel. This speed range ensures a balance between safety and efficiency, making the vehicle appropriate for institutional or campus-level applications. The load-carrying capacity of the kart was determined to be 95 kg, which confirms its suitability for a single passenger. The chassis design and material selection provided adequate strength to withstand the applied loads without structural failure, ensuring safe operation under normal working conditions. The integration of an electric powertrain contributed to smooth and noise-free operation, while the selected transmission system ensured efficient power delivery from the motor to the wheels. The lightweight design of the chassis, combined with proper component placement, improved overall stability and handling characteristics. Overall, the results demonstrate that the fabricated electric go-kart meets the desired design objectives in terms of performance, safety, and efficiency. The vehicle provides an eco-friendly alternative to conventional fuel-based karts and can be effectively utilized for educational, recreational, and short-distance mobility applications.

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