Design and Optimization of Foldable Electric Skateboard

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ABSTRACT
This project presents the design and optimization of a revolutionary Rechargeable foldable electric skateboard, focusing on enhanced portability, performance, and sustainability, flexibility combining innovative materials, electronics, and advanced sustainable energy solutions. The skateboard features a compact, lightweight, and durable design, allowing for effortless folding and storage and can be utilised in peak rush hours in cities. Equipped with high-torque motors, rechargeable battery this skateboard provides a thrilling riding experience while minimizing environmental impact. It also considers the environmental protection because it is highly Environmental friendly which ensures that no use of fuels and no pollution takes place.

Keywords: Rechargeable Foldable Skateboard, STM 32, Belt Driven Mechanism.

1. INTRODUCTION

There are many means of transportation available in cities; some are more time consuming but some are time taking than others. Though cars are nearly ubiquitous in America, cars, bicycles, buses, and trains remain popular alternatives. Recently, electric skateboards have filled a particular niche for some travellers. They have the advantages of decent speed and good portability but are often held back by low range, making them ideal for short rides and trips that include trains or buses cars as well. Electric skateboards and similar devices can take many forms, the market is still new, but most are recognizable as a skateboard or longboard with a motor and drive train, an enclosure for batteries and electronics materials, and speed controller which may be wired or wireless. They are very useful in traffic because of portability they can easily rush from small space through traffic. The Electric Skate Board is a modern-day innovation which is completely Rechargeable and has a battery backup of 2-4 hours in one single use this skate board is small as compared to any vehicles on the road. As the size is small and compact it solves our first problem of parking space in cities. It has a lithium-ion 7s2p battery pack which is completely rechargeable in condition. Being completely rechargeable skate it solves the problem of fuel. The size is eco-friendly, As the area occupied by E- skate board on road is very small as compared to any two- wheeler and car like bus so one can easily travel on road without causing any traffic jam in cities. In recent years, many new short-to-medium-distance transportation devices have become available such as scooters, electric scooters, bicycles, electric bicycles skateboards, electric skateboards, and hoverboards. These are all great ways to go to the neighborhood's park or to go from class to class while in school: they save time and energy, especially since some classes may be just 10 minutes apart and very far from each other. However, these devices are controlled by humans and rely on human instinct. In addition, they required an inconvenient amount of space. Imagine if all the students in a class were to ride skateboards to class: students leave their skateboards against the wall, which can make 30 to 200 skateboards a very messy process to pick up one by one. The goal was to design an electric skateboard that would provide convenience, fun. And safety for the rider. We achieved these conditions in various ways. There have been several accidents involving electric skateboards and many accounts of severe injuries. Personal protective equipment including helmet, knee guards, elbow and wrist pads are recommended for highspeed riding in roads.

Types of electric skateboards-

There are multiple variations of electric skateboards , but 5 main types stand out:

- **Mini Boards** are short, light-weight boards (usually under 12kgs) for shorter distance travel and focused on portability and compatibility. Can be fitted with an easily-detachable, sometimes under 99Wh capacity battery packs.
- **Street Boards or Flexy Boards** are relatively light-weight boards usually fitted with street wheels (under 116mm diameter) and a flexible board. Most of them are fitted with a two-piece enclosure (battery and ESC) for better flexibility and have an average speed.
- **AT (all-terrain) Boards** or 2-in-1 Boards are a mix between Flexy Boards and Off-Roaders, having bigger wheels (115mm and above), and usually a single-piece battery and ESC enclosure with either a carbon-fibre or wooden deck. These boards are destined for urban environments but can also tackle grass, gravel and light off-roading. They are usually belt-drive dual motor systems better for swapping between different sizes and types of wheels (polyurethane, rubber, pneumatic).
- **Off-Roaders** are based on mountain board decks and are bigger, heavier boards specialized for tackling rough terrain and high inclines. They have at least a dual motor configuration (sometimes even 4x4) and have a top-mounted, box-type battery enclosure for better ground clearance. They can be fitted with specialized suspension, foot bindings and mud guards. Sometimes they have a metal chassis on top of which the deck is mounted.
- **Racing Boards** are specialized, high-performance boards that usually have a very low, stiff deck, wide-patch rubber wheels and are used for racing events. Some of these boards have a 3-link truck system which offers better stability during heavy acceleration and high speed. They are fitted with top-end ESCs that can sometimes output over 15KW of peak power.
- **Other uses and styles**

Transportation-

The uses of skateboards as a form of transportation is often associated with the longboards. Depending on local laws, using skateboards as a form of transportation outside residential areas may or may not be legal in our cities. Backers cite portability, exercise, and environmental friendly as some of the benefits of skateboarding as an alternative to vehicles.

Trampboarding-

Trampboarding is a variant of skateboarding that uses a board without the trucks and the wheels on a trampoline. Using the bounce of the trampoline gives height to perform tricks, whereas in skateboarding one needs to make the height by performing an ollie. Trampboarding is seen on YouTube in numerous videos.

Swing boarding-

Swing boarding is the activity where a skateboard deck is suspended from a pivot point above the rider which allows the rider to swing about that pivot point. The board swings in an arc which is a similar movement to riding a half pipe. The incorporation of a harness and frame allows the rider to perform turns and spins all while flying through the air.

Military-

The United States Marine Corps tested the usefulness of commercial off-the-shelf skateboards during urban combat military exercises in the late 1990s in a program called Urban Warrior 99. Their special purpose was "for maneuvering inside buildings in order to detect tripwires and sniper fire in wars. The United States Marine Corps tested the usefulness of commercial off-the-shelf skateboards during urban combat military exercises in the late 1990s in a program called Urban Warrior '99. Their special purpose was "for maneuvering inside buildings in order to detect tripwires and sniper fire".

Safety-

Typical retail boards such as those from Evolve and Boosted are able to reach top speeds of around 20-25 mph on their fastest modes, while specialist and hobbyist boards can be built with very powerful motors for top speeds of 50 mph and more. Braking is typically implemented as Dynamic braking or regenerative braking from the rear wheels only and the stopping distance can vary widely between motors and wheels. There have been several fatal accidents involving electric skateboards and many accounts of severe injuries. Personal protective equipment including helmet, knee guard, elbow and wrist pads are recommended for highspeed riding.

2. LITERATURE SURVEY

Kshitiz Anurag [1] In this research paper we get to know the implementation of electric skateboard by using Arduino UNO L298 with Bluetooth Module. The skateboard has wooden frame and belt-driven wheels. It emphasizes safety features and environmental benefits of controlling pollutions and no use of fuels. A conventional skateboard with certain additional pieces with electric material combinations connected is known as an electric skateboard. However, in this prototype, used Arduino and L298 to control the speed of the motor attached to the wheels using a Bluetooth module connected to the Arduino that transmits the signal to the Smartphone, allowing us to control the motor speed using an app designed for controlling the speed Start/stop button, and even reverse movement of the wheels. The Arduino Uno specifications along with overview of L298 Bluetooth module is given. But in future scope this prototype might be built for cruise control, off- roading, and uphill driving in mountain and hill climbing. They are incredibly cost-effective and cause minimal harm to environment as there is no use of fuel so no pollution risk.

Sicheng Tan [2] This paper proposes a novel electric skateboard control architecture to hybridize the skater's manual operation and electric motor drive. It also gives system state flow of the torque-speed controller, weight estimation and compensation of friction resistance and torque. The proposed scheme does not need a handheld remote controller for steering; hence provides better man-machine coordination and enhances the safety of new skaters as safety is main action of life. The compensation level is configurable according to the skater's comfortableness and safety issues. The graphs of all acceleration and torque is given. But in this paper solution for the sloping road is yet be tested according to this paper.

Joshua Andrews [3] This paper describes the methods used to develop an electronic skateboard. The integration of LED's sensors and additional voltage controller is also provided. The implementation of certain technologies, such as brushless motors, passive infrared sensors, and the use of lithium-ion batteries with subsystems made the project. It is a foldable skateboard. The goal was to design an electric skateboard that would provide convenience, fun, and safety for the rider. For safety, the Backpack E-Skate makes use of light sensors to automatically control LEDs to increase visibility in the dark. It also uses motion sensors to provide warnings in case of pedestrians and unexpected obstacles in the roads which are at sudden intervals on roads. The E-Skate is controlled with remote with simple controls to make operation intuitive and effective. Easy operation increases safety eliminating distractions of rider. An Android application was deployed which is used for the rider's enjoyment by customizing accordingly.

Prof. Mr. Bhausaheb N. Rajole [4] This project is an alternate solution to the increasing use of non-renewable energy resources such as fossil fuels like petrol diesel which are leading to various problems such as, Traffic problems, Parking space problems, emissions of gases due to the burning fuels, air pollution, noise pollutions which occurs in cities during peak rush hours. The pollution is main cause in which it leads to harmful diseases. People tend to use their private vehicles even for the smallest distances of 2-3km around cities contributing to the traffic problems which are not only harmful to environment but also to humans which can cause harmful diseases. This innovation is having future scope in software and IOT. The block diagram and circuit diagram is also given in it.

Keerthi Kumar [5] The scientific research of the paper was to reduce weight and the cost of design and the fabrications of the materials. It shows the tensile testing impact testing hardness testing water absorbing test along with bamboo treatment is also given. The stress v/s strain, Weight v/s Time graphs also given in the paper. The Finite elemental analysis is also show which is very useful in the selection of the materials. The CATIA diagram is also given in it. It is also important to develop nature friendly and the biodegradable material for the nature to save it. The project for the making of lightweight is give and in terms of all the stress and strains.

P. Viswabharathy [6] This paper describes two fundamental components in the electric car are the electric motor and its energy storage system. The modelling by the use of software likes Creo 3.0, Ansys 14.0 is shown. The motor used in this is brushless dc (BLDC) motor type. The specifications of BLDC motors and types are also given. A controller will be used to convert the dc source into ac for BLDC motor power source. The power loss angles diagram graphs are shown. The Ackerman angles is also given for the extra knowledge. Schematic diagrams of each function and drive circuit were given in the paper, the controller was debugged in rated voltage 36V and power rating 250W brushless DC motor, experiment turned out controller has better dynamic characteristics and ran steadily with the safety. The petroleum product will get depleted by 2050 which an lead to heavy use of Electric products.

Agus Purwadi [7] This paper gives overview of the growing development of Electric vehicle industry due to more transportation needs, encouraging ITB as a research based educational institution to give their effort and participation in developing electric city car prototype, especially for car Indonesia used. The testing performance of BLDC motor and battery is given with graphical calculations. The motor used in this ITB-1electric car is brushless dc (BLDC) motor type. A controller will be used to convert the dc source into ac for BLDC power source. How far an electric car can reach their destination depends on how much energy that is stored in the anything that can make the battery's life shorter in it.

3. DESIGN OF SKATEBOARD

3.1 Skateboard-

A skateboard is a small, rectangular platform mounted on wheels, designed for recreational or competitive riding, tricks, and transportation. The below is the picture of foldable electric skateboard and the parts ae also described further.

Fig:3.1 Foldable Electric-Skateboard

3.2 Deck

The skate deck is the flat board that you stand on when skateboarding. A standard deck shape for street or park skating is called as Twin-Tip. This means that the nose and tail are virtually the same shape so that you can easily ride. When it comes to the form of skateboard decks, this so-called "Popsicle Shape" has been the standard for years in use.

Types of Deck:

1. Bamboo Deck
2. 7 Ply Mapple Wood Deck
3. Carbon Fiber Deck

We are going to use 7-Ply Mapple wood deck as it is having lots of advantage with the water resistance.

Fig. 3.2-7 Ply Mapple wood deck

DECK CALCULATIONS-

Specifications-

Material: 7-ply maple wood,

Length: 36-42 inches (91-107 cm)

Width: 9-12 inches (23-30 cm)

Thickness: 0.5-1 inch (1.3-2.5 cm)

Deck length-

Rider height: 68 inches (173 cm)

Riding style: Cruising

Deck length = 68 x 0.55(general guideline based on industry standards and skateboarding community) = 37.4 inches (95 cm)

Deck width-

Rider foot size: 10 inches (25 cm)

Riding style: Cruising

Deck width =Rider foot size +2inches(5cm)

10 + 2 = 12 inches (30 cm)

Deck Weight capacity-

Rider weight: 100 kg(max)

FOS: (1.5 - 2.5) = 1.75(assume) (to account for impact, jumps, and uneven terrain)

Deck weight capacity = 100 x 1.75(average FOS) =175 kg(max)

To ensure durability and safety, and according to calculations consider a deck with a weight capacity of 175 Kg(max).

3.3 Wheels-

The wheels allow for movement on the skateboard and helps forward motion to determine the speed while riding. There are typically four types of wheels on a skateboard that are attached to the trucks. Ranging in size from around 48mm to around 60mm, smaller wheels are lighter in weight and are used for shorter distances. In this project we are using Polyuerethne wheels.

Types of Wheels:

Rubber Wheels

Polyurethane Wheels

Bones Wheels

Fig. 3.3-Wheels for skateboard

WHEEL CALCULATIONS-

Specifications-

Rider Weight: 100kg

Skateboard Type: Cruiser/Carve

Terrain: Mixed (hills, uneven)

Desired Speed: 25km/h

Wheel Diameter (inches):

Smaller wheels (50-60mm) for tricks and tight turns

Larger wheels (60-75mm) for speed and stability

Recommended: 65mm

Wheel Width (mm):
Narrower wheels (19-22mm) for tighter turns
Wider wheels (23-26mm) for stability
Recommended: 23mm
Durometer (Hardness):
Softer wheels (78A-85A) for smooth ride, more grip
Harder wheels (86A-95A) for speed, less grip
Recommended: 83A
Wheel Formula:
Wheel Volume (cm^3) = π x (Wheel Radius cm)^2 x Wheel Width cm
Wheel Radius = 65mm/2 = 3.25cm
Wheel Width = 2.3cm
Wheel Volume ≈ 52.39 cm^3
Wheel Load Capacity:
Wheel Load Capacity (kg) = (Wheel Volume cm^3 x Durometer)/Constant
Constant ≈ 0.145 (varies depending on manufacturer)
Wheel Load Capacity ≈ (52.39 cm^3 x 83)/0.145 ≈ 303kg
For safety, consider wheels with:
Minimum Load Capacity: 175kg (1.75 x Rider Weight)
Recommended Load Capacity: 175-200kg

3.4 Motor
A motor is a device which converts supplied electrical energy into mechanical energy. Various types of motors are in commonly use. Among these, brushless DC motors (BLDC) feature high efficiency and excellent controllability, and are widely used. The BLDC motor has power-saving advantages relative to other types. In this project we are using Brushless DC Motor.
Types of motors:
Brushless DC Motor
Hub Motor

Fig. 3.4- Motor

Calculations:
Assumptions:
1. Rider weight: 100 kg(max)
2. Desired speed: 25km/h(max)
3. Gradient: 5%

4. Skating style: Cruising
5. Wheel size: 60-70mm (diameter)
6. Wheel width: 30-40mm (width)

Motor Requirements:

1. Power (P): 350-500W
2. Voltage (V): 24-36V
3. Current (I): 15-20A
4. Speed (RPM): 250-300
5. Torque (Nm): 1.5-2.5
6. Efficiency (%): 85-90%

Calculations:

1. Motor Power (P) = Rider weight (kg) x Speed (km/h) x Gradient (%) x Efficiency (%)
P = 100 kg x 25 km/h x 5% x 0.85=106.25W
2. Motor Torque (Nm) = Motor Power (W) / Speed (RPM)
Nm = (106.25 x 3) / 275 RPM = 1.159 Nm
3. Motor Current (A) = Motor Power (W) / Voltage (V)
A = 106.25+ 20(accessories)/ 24V = 5.26Ah.

3.5 Battery

The two most common battery types for electric skateboards are lithium-ion and lead-acid. Lithium-ion batteries are the most popular type of battery because of their lightweight, high power density and long life. We are also using Lithium-ion Battery for this project.

Types of battery:

a. Lithium-ion Battery
b. Lithium Titanate
c. Lithium Polymer

Fig.3.5-Lithium-ion Battery

1. Capacity (Ah)

Capacity = (Total Power Consumption x Desired Ride Time) / Voltage
Total Power Consumption (W) = Motor Power (W) + Accessories (lights, etc.)
= 420W + 20W = 440W
Desired Ride Time (hours) = 2 hours
Voltage (V) = 24V
Capacity = (440W x 2h) / 24V = 12.5Ah (round up to 13Ah for safety)

2. Watt-hours (Wh)
Watt-hours = Capacity (Ah) x Voltage (V)
= 13 Ah x 24 V = 312 Wh
3. Cell Configuration (S/P)
Series (S) cells increase voltage, Parallel (P) cells increase capacity.
Desired Voltage: 24 V
Cell Voltage: 3.7V (Li-ion)
Series cells = Desired Voltage / Cell Voltage = 24V / 3.7V = 6 S
Parallel cells = Capacity / Cell Capacity = 13Ah / 2.5Ah = 5 P
Configuration: 6S5P
4. Battery Specifications:
Type: Lithium-ion (Li-ion)
Chemistry: NMC (Nickel-Manganese-Cobalt)
Capacity: 13Ah
Voltage: 24V
Watt-hours: 312Wh
Cell Configuration: 6S5P
Weight: approx.1.6 kg
Size: approx. 30 x 15 x 7.5 cm=3375cm

3.6 Microcontroller-
A microcontroller can be considered a self-contained system with a processor, and peripherals are used as an embedded system. The majority of microcontrollers in today's use are embedded in other machinery, such as automobiles, telephones, appliances, and peripherals for computer systems.We are going to use STM-32 Microcontroller.
Types of microcontroller :
1. Arduino or STM32
2. Frequency: 16 MHz or 32 MHz

Fig.3.6- Microcontroller

3.7 Braking system
When the rider on the skateboard steps back onto the rear-deck-mounted brake pedals, two levers push the cones into drums, which are connected to the wheels. As the cones come into contact with the pads, friction results and the board slows down to low speed. A brake is a mechanical device that inhibits motion by absorbing energy from a moving system and stop the body in motion. It is used for slowing or stopping a moving vehicle, wheel, to prevent its motion, most often accomplished by means of friction. We are using drum brakes because it is cost effective.

Types of brakes:

a. Drum Brake
b. Disc Brake

Fig.3.7- Braking system

BRAKING CALCULATIONS

1. Kinetic Energy (KE) to be dissipated:

KE (J) = 0.5 x Rider Weight (kg) x Speed^2 (m/s)^2

KE (J) = 0.5 x 100kg x (6.94m/s)^2

KE (J) ≈ 2415J

2. Braking Force (F) required:

F (N) = KE (J) / Braking Distance (m)

F (N) = 2415J / 4m

F (N) ≈ 603.75N

3. Drum Brake Radius (r):

r (m) = Brake Drum Radius (typically 0.05-0.15m)

r (m) = 0.1m (selected value)

4. Brake Shoe Friction Coefficient (μ):

μ = 0.3-0.5 (typical value for drum brakes)

μ = 0.4 (selected value)

5. Brake Torque (T):

T (Nm) = F (N) x r (m) x μ

T (Nm) = 603.75N x 0.1m x 0.4

T (Nm) ≈ 24.15Nm

3.8 Bearings

Bearings are donut shaped devices that allows wheels to roll up faster and smoother by reducing friction in it. The wheels in which they fit, all bearings have the same dimensions 8mm (inner diameter), 22mm (outer diameter), and 7mm (width). These are what enable the wheels to turn in direction required. Bearings are comprised of a large outer ring and a smaller inner ring in them. Between these rings are small steel balls.

Types of Bearings:

1. Bones Reds Bearing
2. Swiss Bearing

Bearings Calculations:

Bearing Load Rating:

Static Load Rating (N): Rider Weight (kg) x Gravity (m/s²) = 100kg x 9.81m/s²= 981N

Dynamic Load Rating (N): 2-3 x Static Load Rating = 2-3 x 981N= 1962-2943N

Bearing Size:

Inner Diameter (ID): 8-10mm (typical for skateboards)

Outer Diameter (OD): 22-28mm (typical for skateboards)

Width: 7-10mm (typical for skateboards)

Recommended Bearing Size: 8x22x7mm or 10x28x8mm

1. Bearing Material:

Steel (e.g., 52100)

Ceramic (e.g., Si_3N_4)

2. Bearing ABEC Rating:

ABEC 5-7 for skateboarding applications

3.Bearing Life Calculation:

L10 Life (hours): (Dynamic Load Rating / Actual Load) ^ (p/3) = (1962N / 981N) ^ (3/3) ≈ 2000 hours

4. Final Dimensions of Skateboard:

A)Deck Dimensions:

Sr.No.	Dimension	Value
1	Length(L)	71-84 cm
2	Width(W)	18-25 cm
3	Thickness(t)	1.3-2.5 cm
4	Wheelbase	35.5-38 cm

B) Wheel Dimensions:

Sr. No.	Dimension	Value
1	Diameter (d)	50-75mm (2-3 inches
2	Width(W)	19-25mm (0.75-1 inch)
3	Durometer	78A-101A

C) Bearings Dimensions:

Sr. No	Dimension	Value
1	Outer Diameter	22-28 mm (0.87-1.1 inches)
2	Inner Diameter	8-10 mm (0.31-0.39 inches)
3	Width	7-10 mm (0.28-0.39 inches)

D) Other Dimensions:

Sr. No	Dimension	Value
1	Grip Tape Width	9-11 inches (23-28 cm)
2	Hardware Length	Length 1-2inches (2.5-5 cm)

5. Modelling & Analysis of Skateboard

It aims to develop a comprehensive model of a skateboard, integrating mechanical, electrical, and structural components. Using finite element analysis (FEA) and ANSYS we investigate the skateboard's performance, safety, and durability. The study optimizes design parameters, enhancing rider experience and overall efficiency.

Modelling of Skateboard: Skateboarding has evolved into a popular recreational activity and competitive sport, necessitating innovative designs and improved performance. A skateboard's complex interactions between components, materials, and external factors require systematic modeling and analysis.

Modeling of Skateboard parts: Modeling a skateboard in CATIA involves creating 2D sketches and extruding them into 3D parts. Key components include the deck, trucks, wheels, bearings, and axles. Assembly Design and Exploded assembly is also shown to enable precise modeling. Below are different views given.

Fig-5.1-Splitted Assembly parts of skateboard

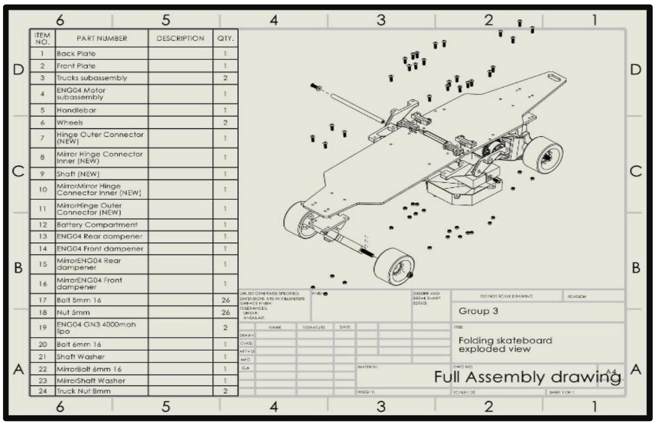

Fig-5.2-Full Assembly drawing of skateboard

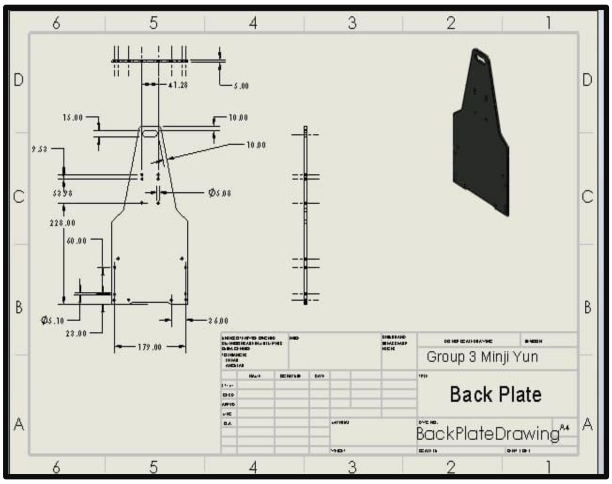

Fig-5.3-Design of Back Deck

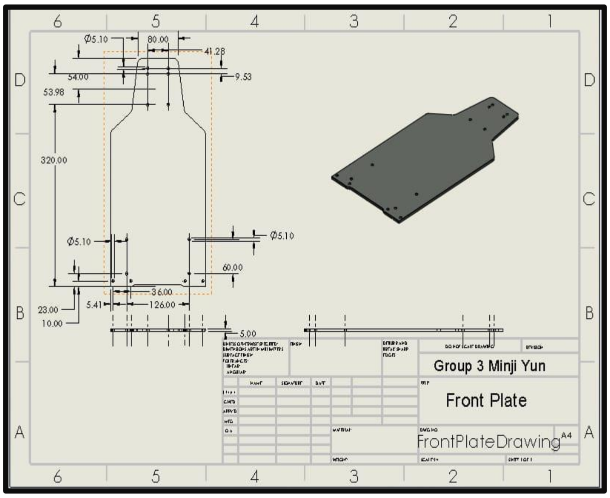

Fig-5.4-Design of Front Deck

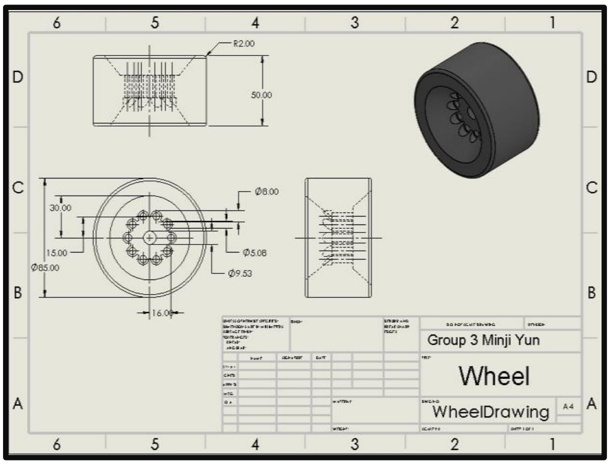

Fig-5.5-Design of wheels with views

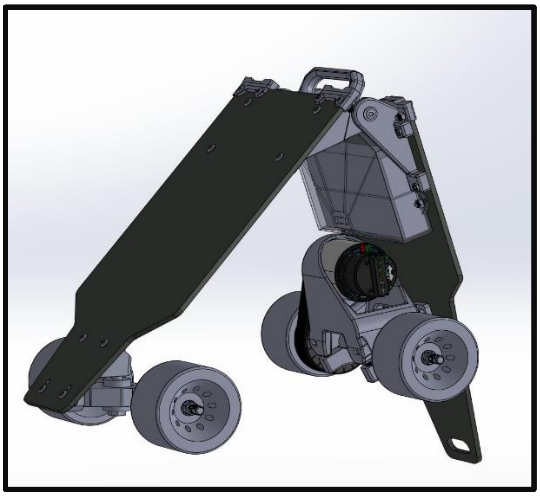

Fig-5.6-Foldable Electric Skateboard

Static Structural Analysis of frame

Static structural analysis is a method used to determine the how structures behave under different static loading conditions. It uses mathematical models, computational model tools stresses, strains, and deformations of a structure under static loads. It helps evaluate the structural integrity, stability, and safety of a design as safety is the major part of the life it is best way to determine. Here the structural analysis has been made on using ANSYS software by applying the load of 1KN which is approx. 100 kg on the frame and the deformation of the frame and stress analysis result has been given below.

By Applying the load 1 KN = 1000N which is equally 100 kg on the frame deformation of the frame maximum at the two ends and minimum in the middle portion of the frame as in the sofware. Thus the load is applied on this frame using ansys software then the result is given. Thus the maximum deformation on frame in both ends which is 3.33 x 10^{-7} m and minimum in center is zero deflection and thus the internal stress of the frame minimum in end 0.265 x 10^5 Pa and high on its center upto 1.001 x 10^5 Pa as shown in this figure according to the software.

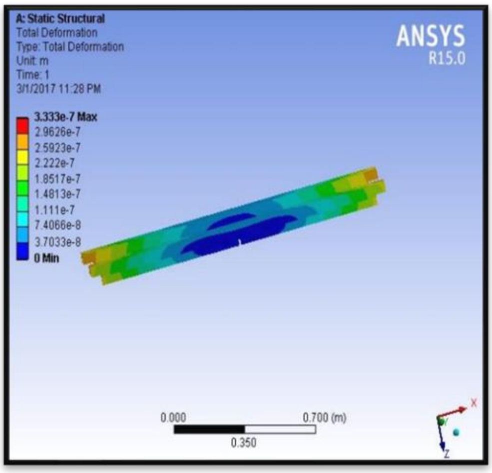

Fig.5.7. Deformation of frame

ADVANTAGES

1. **Compact design:** Easy to carry in backpacks, bags, or cases.
2. **Reduced storage space:** Ideal for small apartments, cars, or public transportation.
3. **Travel-friendly:** Meets airline and public transport size requirements.

4. **Enhanced maneuverability:** Foldable design allows for tighter turns.
5. **Improved stability:** Lower center of gravity due to foldable mechanism.
6. **Space-saving:** Store in small areas, perfect for urban dwellers.
7. **Easy transportation:** Fold and carry upstairs, in elevators, or on public transport.
8. **Reduced weight**: Lightweight materials and foldable design.

LIMITATIONS-

1. **Weather conditions:** Performance may be affected by extreme temperatures, rain, or snow.
2. **Terrain limitations:** Avoid rough, uneven, or slippery surfaces.
3. **Structural integrity:** Foldable mechanism may compromise durability.
4. **Weight capacity:** Limited to lighter riders (typically 100 kg).
5. **Skill level:** Requires basic skateboarding skills and balance.
6. **Age restrictions:** Recommended for riders 14+ years old.
7. **Health considerations:** Not suitable for riders with certain medical conditions.

Note- Keep in mind that these limitations are not exhaustive and may vary depending on the specific foldable e-skateboard model.

FUTURE SCOPE-

1. Integration of lightweight, high-strength materials (e.g., carbon fiber, graphene).
2. Advancements in battery technology for longer ranges (20-50 miles/32-80 km).
3. 3.Enhanced ride assistance, predictive maintenance, and user experience.
4. 4.Can be used for off- roading and uphill climbing in future with more ground clearance.
5. 5.Smart city Infrastructure in our country.

CONCLUSION

Design and development of a compact, portable, and environmentally friendly electric skateboard that combines innovative materials, advanced electronics, and sustainable energy solutions.

Key Features:

1. Foldable design for enhanced portability
2. Electric motor with drum braking
3. Advanced lithium-ion battery
4. 4.Ergonomic design with adjustable footpads.
5. 5.7-ply Mapple wood as it is waterproof and can be converted to any shape.

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