Electric Skateboard

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Abstract- *Taking care of terrain and energy sustentations are the main problem of moment's generation which has now increased the demand to exploration and develop new technology that can cover our terrain and also manage energy or energy conservation. People who travel daily for shorter distance faces business problem which is also a major concern for the moment's generation. These issues can be answered by the electric skateboard technology. The electric skateboard offer a zero emigration of dangerous feasts, new machine assiduity development, and profitable development, better and smart transportation vehicle. An electric skateboard is a particular transport vehicle that's analogous to that of regular skateboard, but with the use of motor to move forward. The stoner will be suitable to control the motor power according to the asked need while riding.*

I. INTRODUCTION

An electric skateboard is a personal transport vehicle that is similar to that of regular skateboard, but with the use of motor to move forward. The user will be able to control the motor power according to the desired need while riding. Cruise control is a convenient feature that exists in many cars and to make the experience of traveling on an electric skateboard even more comfortable, it's possible to implement it on the board as well as implementing regenerative braking is also possible.

II. LITERATURE SURVEY

A design in cruise was presented in the paper to tackle some of the problems like maintaining constant speed of the board while riding with the help of PWM (Pulse Width Modulation.[1]

How the charging behavior has improved in Lithium ion cell for long lasting of battery and improved efficiency.[2]

Two fundamental components in the electric vehicle are the electric motor and its energy storage system, The motor used is BLDC motor. Therefore, How the motor can be protected and converting DC to AC source affected the performance of the electric car.[3]

A design of brushless DC motor controller strategy applied to the electric bicycle control system was presented in which Protection of battery from over-current and under-voltage protection were accomplished.[4]

In a hybrid bicycle system project in power of an electric motor running a bicycle in which it has regenerative charge system and solar panels, which substantially longer distance power assist cycling by regenerating power from pedaling and charging it in the battery.[5]

III. METHODOLOGY

The electric skateboard is mainly designed for travelling short distance which are longer to walk and shorter to drive mainly 5 to 10 kilometer and can be used as a in-campus transport vehicle.

In For manufacturing of this skateboard there are several things that need to be taken care of like what kind of transmission to be used, what capacity of battery to be used or what are the sensors that are required to build this project along with keeping it environment friendly and can be handy for everyday use.

ThisImportant thing about this project is keeping the electric components safe from water and any other damage so we had to design a small compartment for housing of the components and wiring.

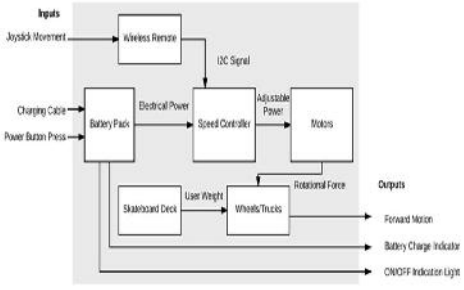

Fig 1: Block Diagram

This Design of the deck is done on CATIA and Fusion 360. Then it was tested by making different models for correct housing of the components.

Calculations for the skateboard was done according to the availability to the components and the pricing. For our project we used Flipsky BLDC Motor 140KV 2450W and battery we used 14 Cells in Series and Parallel connection. We also used 3 Arduino UNO along with different sensors for cruise control and regenerative braking with coding in Arduino IDE. We have to design the pulley for transmission after measuring the tooth on belt and making the pulley with desired dimensions on Solidworks and 3D printing it for our use.

The final CAD model was made on CADExchanger after correctly housing the components on bottom of the deck.

IV. IMPLEMENTATION

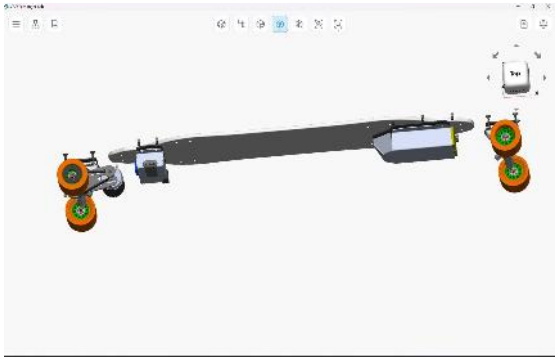

Fig 2: CAD Model

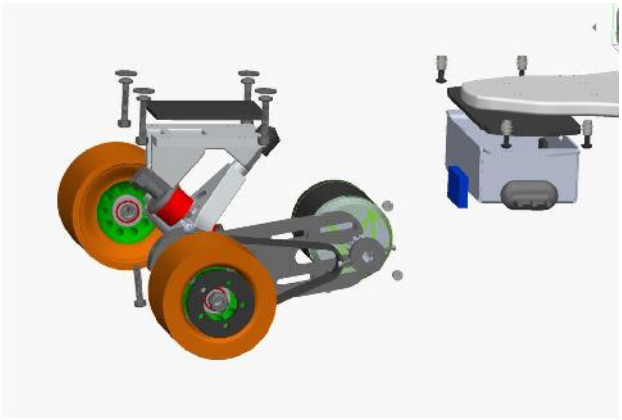

Fig 3: Motor Mount Setup

Calculations Done:

Assuming the weight of the person to be 100Kg & velocity to be 8.3m/s.

Coefficient of friction = 0.017, assuming gravity to be 10m/s & coefficient of drag = 1.22, Frontal Area = 0.54

By assuming these values we can calculate different values required for skateboard.

Rolling resistance required for the skateboard = 0.017*10*100

RR = 17N.

The aerodynamic drag force for the board = ½ * 0.54*(8.3)^2*1.22

ADF = 22.7N.

The acceleration force of the vehicle from the given conditions will be = 100*0.55

AF = 55N.

The total tractive force which is the force between direction of motion and tangential surface can be calculated using the above calculated values = RR+ADF+AF

TTF = 17+22.7+55

TTF = 94.7N.

The power required to carry out these operations can be calculated assuming the above values = TTF * Velocity

P = 94.7*8.3

P = 788W

Battery Calculation:

According to our requirements power = 788W & velocity = 8.3m/s

Rated Ampere per hour will be 77.78Ah

So we will be requiring 30 cells for functioning of our skateboard

Material Required For The Project

1. BLDC Motor: BLDC motors are commonly used in electric skateboards because they provide high torque and speed control, making them suitable for this application. The motor is typically mounted on the underside of the skateboard deck and connected to the wheels through a belt or gear system.

Fig 4: BLDC Motor

2. Controller: The controller is an essential component of an electric skateboard that enables the rider to control the pace and direction of the skateboard. The controller

typically consists of a portable remote control and an electronic speed controller (ESC) that's connected to the motor and battery.

Fig 5: Speed Controller

3. Battery:The battery is a critical component of an electric skateboard since it provides the electricity needed to operate the motor and running of the board. The battery capacity and voltage determine the range and efficiencyof the skateboard.

Fig 6: Battery

4. Gear System: The gear system on an electric skateboard typically consists of a motor pulley, a drive belt, and a wheel pulley. The motor pulley is affixed to the shaft of the motor, and the wheel pulley is attached to the wheel. The drive belt connects the two pulleys and transfers the torque from the motor to the wheel, causing it to rotate.

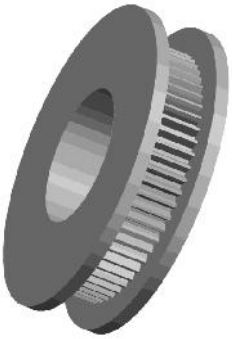

Fig 7: Pulley

5. Arduino Uno:An Arduino Uno is a microcontroller board that can be used to control various electronic systems, including an electric hoverboard. The Arduino Uno has a number of digital and analog input/output pins that can be programmed to interface with various sensors, actuators, and other components.

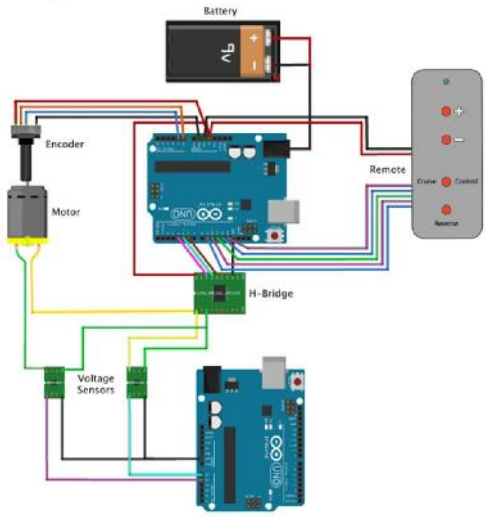

Fig 8: Circuit Design Using Fritzing

V. CONCLUSION

The electric skateboard built is capable of being used as a small transport vehicle. it's also appropriate for the implementation of a cruise control and to compare energy consumption when driving with and without the cruise control. The ability to calculate the pace of the hoverboard is necessary when implementing a cruise control. The use of cruise control is in most cases consuming more energy than without when travelling on a flat straight track. Further refining of the PID controller would likely yield a quicker and more responsive system which could result in less energy being used.

VI. FUTURE WORK

Improved battery technology: Electric skateboard manufacturers are perpetually working on enhancing battery technology to extend the range and longevity of their products. Advancements in battery technology can also contribute to faster charging times and reduced costs.

Enhanced safety features: As the prevalence of electric skateboards increases, there will be a greater demand for improved safety features. Manufacturers may integrate features such as automatic braking, improved shock absorption, and more durable construction to ensure the protection of motorcyclists.

Increased accessibility: Electric skateboards are already relatively affordable compared to other electric vehicles. However, as technology improves and production costs decrease, electric skateboards may become even more accessible to a broader spectrum of consumers.

Integration with technology: Electric skateboards may become more integrated with technology, such as incorporating GPS navigation, mobile applications, and smart sensors that modify performance based on terrain and rider preferences.

Expansion into new markets: As more people become interested in electric skateboards, the market for these products may expand to new regions and demographics. This could include both urban and rural areas, and diverse agegroups and lifestyles.

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