

A Survey of Personal transporters

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Abstract : Environmental protection and energy conservations are the main concern of 21st century which has now accelerated the pace to plan and develop electric vehicle technology. The walk car /Skateboard is one of several low-speed transportation devices (e.g., bikes, scooters, wheelchairs) that, under certain circumstances, travels on sidewalks, roadways, and other shared-use paths. The electric vehicles (EVs) offer a zero emission, new automobile industry establishment, and economic development, efficient and smart transportation system.. The dynamics of the vehicle is similar to the classical control problem of an inverted pendulum, which means that it is unstable and prone to tip over. This is prevented by electronics sensing the pitch angle and its time derivative, controlling the motors to keep the vehicle balancing. The objective of this work was to examine the primary operating characteristics of such vehicles and suggest good alternatives to build.

Keywords —Arduino Uno , Electrical skateboard , Electric vehicles , Human Transporter ,Low speed transportation, Personal transporter

I. INTRODUCTION

The Electrical skateboard /Walk Car has four tiny wheels, aluminum body. It is used for personal transportation and intended to be carried in a travel bag when not in use. The fig [1] shows such a vehicle.



Figure 1 Electric Skateboard

Steering or guiding of vehicle is achieved by shifting your weight, while acceleration and braking happen automatically when the person steps on or off. Its top speed is 10 km/h (6.2 mph) and its built-in battery takes three hours to charge via USB, providing a journey of 12 km (7.5 miles) to commute. Although it looks pretty small, the Walk Car is powerful enough to push a person in a wheelchair up an incline, and it can handle payloads weighing up to 100 kg.

II. NEED ANALYSIS

A. Requirement analysis

The literature review from many journals and conference papers and text books related to light vehicle design and Battery operated vehicle design have been carried out.

The major requirements are

- The walk car is an electric vehicle which operates on battery and finds uses in personal transportation.
- A vehicle was designed which can carry a weight up to 80-100 kg.
- The battery system will be made rechargeable to have better operational time without much additional cost.
- It should be light in weight to carry easily.
- Obstacle detection.

B. Key challenges

The major challenges in designing and fabrication are

- Self speed control during stepping on and off
- Heavy duty motor with high torque.
- Long lasting rechargeable battery with small size
- Light weight and durable frame structure
- Low weight.
- Simple electronic design.

C. Types of driving system.

The vehicles are designed for better driving pleasure and safety point of views. The modes of driving system are as follows

- Manual: The manual mode is activated by stepping in i.e. Placing both feet on the board .and step down to stop. Use body weight for direction control
- Bluetooth: The motors are controlled by Bluetooth device when vehicle is used by minor and controlled by android app by parents .

III. LITERATURE SURVEY

In [1] small skateboard is discussed with major concern on following topics

- Use of Hub motor – Hub motor itself act as a wheels .So shaft ,belt chain pulley mechanism is not required. Fig[2] shows Hub motor

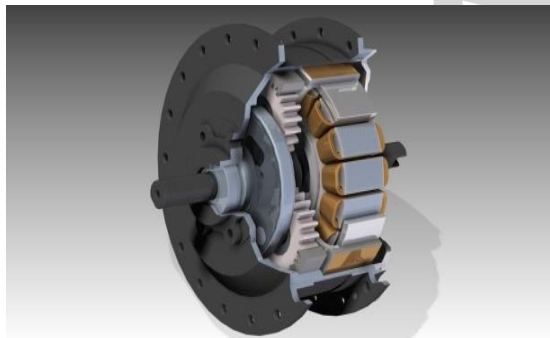


Figure 2 Hub motor.

- Remote controlled acceleration and braking.
- Use of throttle position sensor for speed control
 - Manual power mode is beneficial

The cons of the work in [1] are

- No efficient braking in case of emergency.
- Balancing is not up to marks.
- IR based controller design is not easy to modify for further improvements.

In [2] Segway- The Human Transporter is discussed with major concern on following topics

- The main objective was to build a vehicle capable of transporting a person weighing up to 70-80 kg
- It is capable of travelling to some km distance with varying speed.
- The rider controls are supposed to be natural movements; leaning forwards or backwards in combination with tilting the handlebar sideways should be the only rider input required to ride the vehicle

The cons of the work in [2] are

- No efficient braking in case of emergency.
- Balancing is depends on skill of user.
- Big size .Not easy to carry.

- Battery hungry vehicle.
- Single (manual) mode operation only.
- Not cost effective.

In [3] a Self balancing board is discussed. The main feature of this work are

- Use of PID control for linear motion control.
- A single-axis gyroscope and a 2-axis accelerometer for attitude determination.
- Use of Arduino make electronic design simple
- Easy to carry

The cons of the work in [3] are

- Not robust and durable
- Battery life is less.
- Single (manual) mode operation only.

In [4] a Mono wheel electric vehicle is designed. The main feature of this work are

- Use of PID control for linear motion control.
- Use of Arduino make electronic design simple
- IMU (inertial measurement unit) and gyroscope is used as accelerometer
- Batter level indicator is used

The cons of the work in [4] are

- The stability is poor due to mono wheel
- Speed need to be maintained low.

IV. CONCLUSION

Personal transporters need to be designed with emphasis on following points.

- Easily carry- able vehicle with use of light weight frame which should be cost effective. Aluminum and or Carbon fiber to be used
- Use of Heavy-duty motor t to carry human height in the range of 60-100. Hub motor are more suitable
- Li-ion battery are cost effective and have long life
- Effective braking can be achieved using DC planet gear motor motors.
- Use of Arduino make electronic design simple .
- Multiple mode operation is always desirable.
- Bluetooth control is cost effective for manual mode than IR control/electric mode
- App can be designed for parental control.
- Obstacle detection can be done using ultrasonic sensors

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REFERENCES

- [1] P.Viswabharathy,P.Boobalan ,M.Arun Wingston “*Design and fabrication of electrical skateboard in off road application*” Volume 5, Issue 3, March (2017)
- [2].Prof. Shakil Tadavi Rahul Sharma Mayank Sharma Kshitij Singh4 Vikrant Sinha5 “*Segway- The Human Transporter*”Citeseer journal vol 2321 pg.613 ,2015
- [3] Juang, Hau-Shiue and Lurrr, Kai-Yew “*Design and Control of a Two-Wheel Self-Balancing Robot using the Arduino Microcontroller Board*” 10th IEEE Conference on International Control and Automation (ICCA), 2013 pages634-639,2013
- [4] A.Geetha, Vishwanath Kannan, Akhil Sai Vontimitta, Indraneel Patha,” *Design and Development of a Self Balancing Mono Wheel Electric Vehicle*” International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering,ISSN (Print) :2320 – 3765 ISSN (Online): 2278 – 8875,Vol. 6, Issue 5, May 2017

