

Mechanical Segway

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Abstract— This is a mechanical Segway. In this we have not used gyroscope and sensor. But we are making it high efficient. The system is able to operate in transporter mode and robotic mode. The first goal is to maintain stabilization in pitch dynamic. This project focuses on to manufactured Segway without using any type programming & Sensors a state feedback to stabilize system on transporter mode. The system consist of forward and backward movement when the driver operating switch in transporter mode in order to stabilize body. Small wheel is used so that there is no need of gyroscope for balancing purpose.

Keywords: Mechanical Segway Sensors, Solar Plate, Two Wheels and One Small Supporting Wheel (Self-Balancing)

I. INTRODUCTION

In this project, “MECHANICAL SEGWAY” robot has been built as a part of the course applied control and mechanical and electronics fusion. The goal of this project to everyone know about the Segway how is too manufactured or fabrication and how is the working system of the Segway and another one is the how is to ride and balance of the Segway robot. The project aimed at making a two wheeled and a small wheel balancing electric vehicle Microcontroller, gyroscope and any type of sensors.

A. Necessity:

In Mechanical Segway, the aim of this project is to produce at low cost and highly efficient rate. Also, aim of this project is to prepare a Segway purely on mechanical base. In this programming parts so, that it is easy to build up and handle.

B. Objective:

The objectives of this project are:

- To prepare a Segway at low cost and high efficient.
- To prepare a Segway without using complex and electronics parts such as Microcontroller, gyroscope.
- For better performance of Segway we need batteries which are charge.

II. CRITICAL LITERATURE SURVEY:

Two-wheeled, self-balancing systems are studied in many different concepts.

They can be considered as robotic platform or as electric vehicle/ transporter. Researchers focus on various issues besides main problem stability. Segway Human Transporter (HT), which is invented by Dean Kamen, is known as the first two-wheeled, self-balancing system in the literature. Flexibility, safety and performance are important product.

III. COMPONENTS USED IN SEGWAY & ITS SPECIFICATION:

It consists of following main points:

A. Segway chassis and material properties:

Chassis is made up of aluminum section and four aluminum bars is used to make the frame. To make the chassis to balanced, four aluminum bars of equal weight are used. It is engaged firmly with the help of aluminum welding. Aluminum welding is used to connect all the bars. Wheels are attached to the middle of frame in order to withstand the load.



Fig. 1: Mechanical Segway Chassis

- 1) Atomic Weight (g/mol) - 26.98
- 2) Thermal Conductivity(0-100°C) (cal/cms.⁰C) - 0.57
- 3) Electrical Resistivity at 20°C (Ω.cms) - 2.69
- 4) Density (g/cm³) - 2.6898
- 5) Modulus of Elasticity (GPa) - 68.3

1) Details of Segway chassis:

- 1) Base Plate Thickness - 10mm
- 2) Aluminum Rod Diameter - 25mm
- 3) Rod Height - 1000
- 4) Normal Cycle Handle Bar used for balancing purpose. 5) Width* Length - (400mm*600mm)

B. Motors:

Motor is fixing with the chassis through screwed bolt and it is the main source of power with is to drive the vehicle. There are two motors, each for one wheel. Each motor is driven by a separate 12v battery.



Fig. 2: Dc Gear motor

1) *Motor Specification:*

- 1) DC gear motor (Wheel chair motor).
- 2) Voltage range- 12V-24V.
- 3) Current- 2-5 Amp.
- 4) Gear ratio- 1:50
- 5) Power- 150Watt
- 6) Motor RPM- 100-3200 RPM
- 7) Noise- 60dBA
- 8) Weight- 1.75kg
- 9) Brake- DC 24V, 0.45A & 30kgf-cm

Battery is a main power source. Two 12V DC batteries are used in Mechanical Segway. Each battery connected with each motor. Battery supplies power to each motor to run the wheels. Battery is rechargeable in both ways electric socket and solar plates.

2) *Battery Specifications:*

- 1) Voltage range- 12V-24V DC (22Ah)
- 2) Current – 2-5Amp.
- 3) Battery weights- 5.9kg
- 4) Grid alloy lead- Calcium tin Alloy



Fig. 3: Battery

C. *Momentary Push Button:*

By operating the switch the direction of vehicle can be controlled. Connecting wires are used to connect switch with motor.

1) *Push Button Specifications:*

- 1) Circuit- Momentary Push Button
- 2) Switch Function- On-off-on
- 3) Actuator type- concave (curved)
- 4) Panel cutout dimensions- 30*22.20mm
- 5) Operating temperature- -20°C ~55°C
- 6) Current rating- 15A (AC)
- 7) Voltage rating- 125V (AC)



Fig. 4: Push Button

D. *Mechanical Segway tyres:*

In mechanical Segway two tyres is used in both the sides. Scooter wheels are used in Segway reason behind that cost is less, easy to available and friction property is also less. Also higher amount of weight gaining capacity and movements is also very smooth.

1) *Tyre Specifications:*

- 1) Wheel diameter- 177.8mm
- 2) Material- Combination of rubber and leather.
- 3) Casing material – combination of fiber and plastic.
- 4) Thickness of tyre- 100mm



Fig. 5: Segway wheels

E. *Motion control potentiometer:*

Rotatory type potentiometer is used in Mechanical Segway. Purpose of potentiometer is to turn the Segway right and left by using rotary potentiometer.

1) *Rotary potentiometer specifications:*

- 1) Size- 22.225 to 76.20mm
- 2) Range of motion- 320° to 358°
- 3) Drive interface- Round solid shaft
- 4) Standard operating temperature- -55° to 125°C.

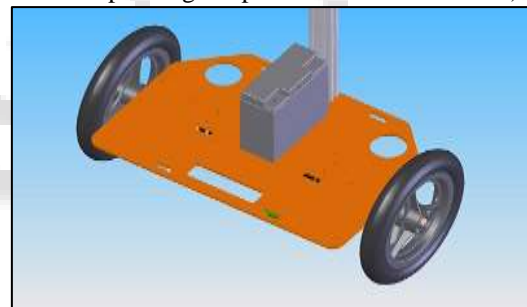


Fig. 6: Assembly

F. *Supporting Wheel:*

Supporting wheel is used on Mechanical Segway. The purpose of small supporting wheel is to balance properly; there is no need to gyroscope for the balancing purpose. Also easy to assemble and dis-assemble.

1) *Supporting small wheel Specification:*

- 1) Wheel diameter- 63.5mm
- 2) Material - Plastic hard rubber
- 3) Metal casing is used to supporting the wheels and one fixing socket is provided.



Fig. 7: Supporting Small wheel

G. Solar plate:

Mechanical Segway one advance function is used for the battery charging i.e. solar plate. The purpose solar plate to charge the battery with help of electric socket and solar plate.

1) Solar plate Specifications:

- 1) Maximum Power- 2Watt
- 2) Optimum power voltage- 16.8V
- 3) Optimum operating current-



Fig. 8: Mechanical Segway

IV. RESULT AND DISCUSSION:

Mechanical Segway presents the results of the project. First comes a short discussion on the implementation of the balancing without using any type of programming and sensors.

Control strategy with the remaining error serving as a source for speed turned out to be a success and speed control by using DPDT switch forward and backward

V. CONCLUSION:

Basically this investigation is successful achieved the objective with the acceptable outcome. The main goal of this project was a build a functional two wheels and one supporting wheels transporter and this goal has been fulfilled. The overall functionality and performance of the vehicle has been evaluated thoroughly by a number of test drives. The vehicle has been tested by a number of different weights. This project is implementing with an idea to find an effective solution to transportation problem.

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