DESIGN AND DEVELOPMENT OF MECHANICAL SEGWAY

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Abstract- In this paper, two wheeled little supporting wheel self-adjusting just as physically adjusting Mechanical Segway vehicle is readied which is otherwise called an individual transporter Segway. The framework can work in transporter mode and automated mode. The principle objective is to keep up adjustment in pitch dynamic. This task centers around to fabricated Segway without utilizing any sort programming and Sensors a state criticism to balance out framework on transporter mode. The framework comprise of forward and in reverse development when the driver working DPDT switch in transporter mode so as to balance out body. Little wheel is utilized so that there is no need of gyrator for adjusting reason. The point of this venture work is to develop requiring little to no effort, exceptionally productive rate and simple to deal with and working too. The tests are performed on mechanical Segway to affirm that Mechanical Segway working well indeed and high proficient rate.

Index Term Mechanical Segway sensors, solar plate, two wheels and one small supporting wheel (self-balancing)

I.Introduction

In this paper, “mechanical segway” robot has been constructed as a part of the route carried out manage and mechanical and electronics fusion. The purpose of this venture to all and sundry recognise about the segway how is just too manufactured or fabrication and how is the operating system of the segway and some other one is the how is to trip and stability of the segway robotic. The project geared toward making a wheeled and one small wheel balancing electric automobile. A potentiometer and electric powered vehicles inside the base of the tool hold the vehicle proper and left. [1] by way of using switch and circuit board and electric deliver pass ahead and go backward path without difficulty with the assist of ideal balancing. The vehicle has electric powered cars powered with the aid of dry batteries. It balances with the assist of small wheel there is no used of microcontroller, gyroscope and any sort of sensors. The rider hurries up or decelerates through the use of push up switch go ahead and backwards within the course she or he needs to journey. Steering is imparting by sincerely self-stability and operated vehicles with the help of switches. Guidance manage is presenting velocity indicator and additionally battery energy indicator.,

1.1 Need

In Mechanical Segway, the aim of this paper is to produce at low cost and highly efficient rate. Also, In this Segway,there is no use of complex equipment and programming parts so, that it is easy to build up and handle also.

1.2 Objectives:

The objectives of this project are:

i) To put together a segway at low cost and high efficient.

ii) To put together a segway with out the use of complicated and electronics elements along with microcontroller, gyroscope.

iii) For better overall performance of segway we want batteries which are rate by each the ways i. e. Solar plate and electric powered socket.

II. LITERATURE SURVEY:

wheeled, self-balancing structures are studied in lots of one-of-a-kind principles. They can be taken into consideration as robot platform or as electric powered automobile/transporter. Researchers focus on numerous issues besides the primary hassle balance. Segway human transporter (ht), which is invented by using dean kamen, is known as the primary two-wheeled, self-balancing system inside the literature. Flexibility, safety and overall performance are vital because of being commercial product.

Also, segway brings out two wheeled self-balancing robot platform that's known as robotics mobility platform (rmp). Moreover, human scaled robots exist. [2] a number of them are pushed with the aid of an operator at the same time as rests are pushed autonomously. As a transporter device, it's far driven semi-autonomously via the driver on it. The driver determines the speed and route of motion of the vehicle by using leaning forward and backward. Most of the transporters are blended of standing base and handlebar which make the driver experience comfy.[3-4] additionally, steering mechanism is generally established at the handlebar.

However, the automobile in [5] most effective includes a status base. Guidance is furnished via shifting middle of gravity (cog) of motive force. The have a look at [6] discusses the system each as a transporter and as a robot platform which includes items. A few studies which are inspired through segway emphasize creating lightweight and occasional-value structures. This is established in [7, 6, 3, 4, 8, and 9]. Their low-expenses lead them to low-priced and light-weight cause them to portable in anywhere. Mathematical model of the device is derived in an effort to design a controller. Many research practice lagrange equations at the same time as deriving mathematical model [10, 11, 12, 4, 13, 14, 15, and 16]. However, mathematical model is derived from newton’s law of motion in some studies including. [17] device’s states are decided as linear displacement and linear speed in

longitudinal path, perspective and angular rate associated with pitch dynamics. [17] additionally, yaw attitude and yaw angular fee are considered in some research. Mathematical version is the illustration of the actual system. Consequently, system's parameters including inertia are crucial so as to make model greater correct. Inertia of the system is determined by using calculating as in [3] or checking out as in. [18]

III. Componants utilized in segway & its specification.

It consists of following mail points:

A) Segway chassis and material properties

Chassis is made of aluminum segment and four aluminum bars is used to make the body. To make the chassis to balanced, four aluminum bars of identical weight are used. It's far engaged firmly with the help of aluminum welding. Aluminum welding is used to connect all of the bars. Wheels are connected to the center of body so as to withstand the burden ability. Manage is likewise made up of same aluminum material to which dpdt switch is fixed.

1) Atomic Weight (g/mol) - 26.98

2) Thermal Conductivity(0-1000C) (cal/cms.0 C) - 0.57

3) Electrical Resistivity at 200C (Ω.cms) - 2.69

4) Density (g/cm3) - 2.6898

5) Modulus of Elasticity (GPa) - 68.3

Details of Segway chassis:

1) Base Plate Thickness - 10mm

2) Aluminum Rod Diameter -

3) Rod Height – 1016mm

4) Normal Cycle Handle Bar used for balancing purpose.

5) Width* Length – (304.8 mm *508 mm)

Fig. 1: Mechanical Segway Chassis

B) motors:

motor is fixing with the chassis through screwed bolt and it is the primary supply of power with is to drive the automobile. There are two automobiles, every for one wheel. Each motor is pushed through a separate 12v battery.

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

Fig.2: Dc Gear Motor

C) Battery:

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.

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

5) Container cover- ABS resin

6) Electrolyte- diluted sulfuric acid

7) Size- 181*76*167mm

8) Battery type- AGM (Absorbent Glass Mat)

Fig.3: AGM type Battery

D) DPDT (Double Pole Double Throw) Switch:

Double Pole Double Throw (DPDT) switch. It is used to guide the direction of rotation of motor shaft. By operating the switch the direction of vehicle can be controlled. Connecting wires are used to connect switch with motor.

DPDT Switch Specifications:

1) Circuit- DPDT

2) Switch Function- On-off-on

3) Actuator type- concave (curved)

4) Panel cutout dimensions- 30*22.20mm

5) Operating temperature- -200C ~550C

6) Current rating- 15A (AC)

7) Voltage rating- 125V (AC)

Fig.4: DPDT Switch

E) Mechanical Segway tyres:

In mechanical segway tyres is utilized in both the edges. Scooter wheels are utilized in segway reason in the back of that fee is much less, easy to to be had and friction property is also much less. Also higher amount of weight gaining capacity and actions is likewise very easy

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

F) 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.

Rotary potentiometer specifications:

1) Size- 22.225 to 76.20mm

2) Range of motion- 3200 to 3580

3) Drive interface- Round solid shaft

4) Standard operating temperature- -550 to 1250C.

5) Extreme environment- Extended temperature.

Fig.6: Rotary Potentiometer

G) Digital Speedometer:

Digital speedometer is used on Mechanical Segway. Purpose of speedometer is to check the speed in RPM, also check the time in hours and indicated battery power.

Speedometer Specification:

1) Item width*length*height- 4.1cm *7.9cm*2.16cm.

2) Weight-280g.

Fig.7: Digital Speedometer

H) Supporting Wheel:

Assisting wheel is used on mechanical segway. The purpose of small assisting wheel is to stability well; there's no want to gyroscope for the balancing reason. Also easy to bring together and dis-collect.

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.8: Supporting Small wheel

I] 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.

Solar plate Specifications: 1) Maximum Power- 2Watt

2) Optimum power voltage- 16.8V

3) Optimum operating current- 024Amp

4) Dimensions- 220-150-20mm

5) Weight- 0.5Kg

Fig.9 solar Plate

IV. ASSEMBLY:

rotary potentiometer is equipped in backside portion of cope with bar.

- one small wheel is also fitted on again part of segway.
- a dpdt switch is fixing to handle bar.
- segway wheels are attached at the motor shaft.
- dealt with bar is fitting inside the front facet of chassis.
- speedometer & battery indicator is connected at the cope with bar.
- two vehicles are located within the opposite facet of chassis.
- battery & circuit board is placed center aspect of chassis.
- solar plate outfitted in front of segway handle bar

Fig.10: Mechanical Segway

V. RESULT AND DISCUSSION:

Mechanical segway gives the effects of the project. First comes a short discussion on the implementation of the balancing without the usage of any type of programming and sensors. This is accompanied with the aid of some initial driving outcomes and why the vehicle did now not behave in high-quality way and what changed into executed to improve overall performance without the use of programming and sensors.

Initial driving results

Whilst checking out the automobile for the first time the controller gains had been considerably decrease as a precaution. This test became mainly executed to look that the device functioned as meant, spinning the wheels inside the proper and left direction and so forth. After this changed into showed the primary driving check become conducted, and already with this controller the vehicle became drivable. The manipulate method with the final error serving as a source for velocity grew to become out to be a success and speed manipulate via the use of dpdt switch ahead and backward labored properly.

VI. CONCLUSION:

Basically this research is successful achieved the objective with the suited final results. The primary intention of this task was a construct a useful wheels and one supporting wheels transporter and this goal has been fulfilled. The overall capability and overall performance of the vehicle has been evaluated very well via some of test drives. The vehicle has been examined by means of some of different weights. This assignment is enforcing with an concept to discover an effective approach to transportation problem

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