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E-Vehicle Segway Hover board With Handle

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ABSTRACT:

Emissions from internal combustion vehicles are rising daily, and urban traffic congestion has markedly intensified over the years. Traffic congestion increases vehicular emissions and degrades air quality. A prompt resolution to this issue is unfeasible; nevertheless, an alternative possibility for conventional personnel transport is the Personal Electric Vehicle. The transition from traditional to fully electric vehicles will be incremental, yet achievable. This project is to develop a Personal Electric Vehicle tailored for short-distance transportation. The bulk of individuals employ autos for shorter journeys (i.e., 10 kilometers); this Personal Electric Vehicle will enhance travel alternatives for these distances. This will directly affect fuel scarcity, resulting in increased gasoline expenditures over the decade.

Keywords: Segway Hover Board, Personal Transporter, Emission, Personal electric vehicle, Range, Future transport system

Introduction:

The current urban transportation model negatively impacts society, leading to health problems due to air pollution, traffic accidents, climate change, congestion, and dependence on limited fuel supplies. Annually, around three million individuals worldwide die from diseases linked to pollution. Children are the principal sufferers of diseases associated with pollution. Forty percent of diseases caused by environmental factors affect children under five, who represent just 10% of the global population. In 2010, the World Health Organization indicated that 40% of global greenhouse gas emissions were linked to vehicles. Between 1950 and 1990, the worldwide quantity of motor vehicles surged ninefold, escalating from 75 million to 675 million. The Organization for Economic Co-operation and Development's most conservative projections suggest that there will be 1.62 billion autos by 2030. India has undergone substantial expansion in the past five years, resulting in an increase in pollution levels. The regional transport office indicates that 500 new non-commercial vehicles, including both two-wheelers and four-wheelers, are registered each day. The recent WHO report on pollution in India reveals that the present air quality in the city is unfavorable. The increase in vehicle numbers over the years has resulted in persistent traffic congestion on urban roadways, and more critically, the emissions from these vehicles are significantly damaging the environment. "Air pollution consists of multiple pollutants, including particulate matter." The WHO research indicates that these particles can penetrate the respiratory system, presenting a health risk by increasing mortality rates from respiratory infections, diseases, lung cancer, and specific cardiovascular disorders. Hospitals are always documenting new individuals with respiratory complications. Two-wheelers are the foremost contributors to vehicle air pollution, succeeded by four-wheelers (e.g., cars, jeeps, taxis), trucks, and buses, in decreasing order of impact.

Objectives-

1. To Prepare a Segway at low cost and highly efficient.
2. To prepare a Segway Without using complex.

Component Used In Segway and Its Information:

A DC motor (Direct Current motor) is an electric motor that runs on direct current electricity, converting electrical energy into mechanical motion. It operates on the basic principle that when an electric current flows through a conductor in a magnetic field, a force is exerted on the conductor, causing it to move. A DC motor typically consists of a rotor (armature), stator (permanent magnets or electromagnets), and a commutator to reverse the direction of current flow and ensure continuous rotation. DC motors are widely used in applications such as fans, electric vehicles, robotics, and appliances due to their ability to provide precise speed control and torque. They are simple in design, easy to control, and can run at both low and high speeds. The motor's speed can be adjusted by varying the voltage applied, making it versatile for a variety of tasks.

Specification

1) Motor Type - Brushless DC motor

2) Normal Voltage – 24 V

3) Speed – 2000-3000 RPM

4) Power – 250W-300W

5) Current – 10A-20A

A gyroscope is a device that measures the rate of rotation around an axis. It plays a vital role in applications that require precise orientation detection, such as in hoverboards and Segways. The gyroscope helps maintain balance by detecting tilts and changes in the device's orientation. It works by using a rotating mass or vibrating elements that detect rotational changes, which are then processed by the system to adjust motor speeds and stabilize the vehicle. Most modern gyroscopes used in hoverboards are MEMS (Micro-Electro-Mechanical Systems), known for their small size, low power consumption, and high precision. These sensors enable real-time balancing and smooth riding experience.

36V lithium-ion battery is a lightweight, rechargeable power source commonly used in e-bikes, scooters, and portable tools. It typically consists of 10 cells in series, offering a full charge of up to 42V. Known for high energy density and long life, it requires a proper charger and Battery Management System (BMS) for safe operation.

Specification

1) Nominal Voltage: 36 volts

2) Full Charge Voltage: About 42 volts

3) Cut-off Voltage: Around 30V

4) Configuration: 10S (10 cells in series) × Xp

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

Specification:

1. Wheel Size: 6.5 inches

2. Max Speed: Around 12-15 Km/h

3. Weight Capacity: 100-120 Kg

4. Charging Time: 2-3 hours

Literature Survey:

Sajid Iran khan1a, Muhammad Ahmad Choudhry1b, Ahsan Ali1c, Inam Ul Hasan Shaikh1d, Faisal Saleem1e Vol. 41, No. 1, 169 - 179,

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The Segway is commonly employed as a mobility method for law enforcement, urban sightseeing tours, and professionals in industrial environments, followed by a schematic representation of a two-wheeled Segway, with the main components and instructions distinctly outlined. The mathematical model of a two-wheeled Segway is based on that of an inverted pendulum. The two-wheeled Segway is a nonlinear, unstable system characterized by indeterminate characteristics, posing considerable challenges in control system design. A comprehensive design of a Two-Wheeled Mobile Robot (TWMR) is provided. The aforementioned study examines the selection of sensors and actuators, control systems, signal processing units, and modeling. A direct control approach for the Segway, employing the pole positioning methodology, has also been introduced. Executed a fundamental PID control and state-feedback control employing the pole placement method for the Segway human transporter.

Infanta Mary Priya.I 1, B.K.Vinayagam1, M.R.Stalin John2 October - December 2016

Research conducted by Shaheen and Rachel Finsen (Shaheen, 2003) demonstrates that access to transport stations is often limited, requiring a comprehensive strategy to improve connectivity, flexibility, and maybe increase transit utilization. The document outlines a Segway pilot study program that examines safety and training issues, along with transit feeder service need in several locations around the USA, aiming to address consumer acceptance, safety, land use, and market potential. The Pilot Project for Assessing Motorized Personal Transportation Devices: Segways and Electric Scooters by Pierre Lavallee, Centre for Electric Vehicle Experimentation in Quebec (Lavallee, 2014). The transportation of products and people is rising significantly, and the adverse effects of mobility—including dependence on fossil fuels, pollution, greenhouse gas emissions, and congestion—are well-documented, requiring immediate measures for sustainable solutions. A varied group of consumers found it accessible in both standard situations and difficult conditions. In terms of stability, they exceeded bicycles and mopeds.

Prof. D. S. Pawar1 Priyank Girishkumar Soni2 Labhesh Sampat Pawar3 Dhananjay Bapusaheb Thete4 Ananta Arun Shinde5 IJSRD - International Journal for Scientific Research & Development| Vol. 7, Issue 03, 2019 | ISSN (online): 2321-0613

Due to the increase in pollution and fuel costs, there is a demand for a vehicle that is both eco-friendly and cost-effective. Hoverboards are the ideal vehicles for this purpose because to their environmental sustainability and cost-effectiveness. The Segway Hoverboard is a battery-powered, self-balancing electric vehicle with two wheels, developed by Dean Kamen. It is produced by Segway Inc. in New Hampshire. The focus on the transition from personal vehicle transportation to electric vehicles was first expressed by Jack Barkenbus. All automakers are presently transitioning from oil to electricity for personal transportation to produce electric automobiles. Substantial decreases in fuel use will necessitate many years owing to the higher expenses and protracted advancement of contemporary technology. The transition to fully electric vehicles may unfold in stages, commencing with hybrid electric vehicles (HEVs), succeeded by plug-in hybrid electric vehicles (PHEVs), and ultimately resulting in totally electric vehicles. The safety, durability, and performance depend on the batteries. Improper use of a battery can significantly reduce its longevity and present safety risks..

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This study substantiates the utilization of a PID Controller in conjunction with an IMU Sensor for a two-wheeled balancing robot situated on an elevated wheeled platform. The study focuses on alleviating gravitational impacts on the platform. The PID Controller was utilized to ascertain the platform's tilt in relation to the ground level and compute control variables to mitigate fall by providing sufficient counter-torque, so maintaining the platform's parallelism with the ground. The study investigated the application of chopper drive for regulating the speed of a D.C. motor. The efficacy of the four-quadrant chopper drive is assessed, illustrating its performance in closed-loop operation. The driving and braking operations described in the study increase the likelihood of employing the Four-Quadrant Chopper drive for the full operation of the DC motor. Creation and Advancement of a Prototype Electric Bicycle Fueled by Supercapacitors: This research substantiates the preference for PMDC motors for traction applications compared to conventional BLDC motors.

Dilip I Sangotra1 , Mohan Mendhe2 , Surendra D Kshirsagar3 and Ram Tamboli4.Phys.: Conf. Ser. 1913 012102 ICRFS 2021

A self-balancing scooter, also referred to as a "hoverboard," is a self-stabilizing transportation apparatus including wheel types connected to a control system that use integrated gyroscopes and a sensor pad for rider operation. In 2019, hoverboards had a self-balancing mode, in which the motors automatically engage the gyroscope in the opposite direction. Thus, as the rider inclines forward or backward, the board persistently endeavors to maintain stability, resulting in a more seamless riding experience than its 2016 counterparts. The device advances as the rider leans forward and decelerates when the rider leans backward. Offer direction through a navigational command. The assessment of a person's balance on a hoverboard can be clarified by an advanced computational method that stabilizes the under-actuated apparatus. Since 2001, the Segway PT has been available on the market as a two-wheeled self-balancing device, recognized as a significant personal and commercial transporter. A further successful instance is the so-called hoverboard: The hoverboard represents an advancement over its predecessor, incorporating a driving mechanism and providing benefits like as lightweight construction, portability, and compact dimensions.

Methodology:

- **Hardware Selection:** The microcontroller is the brain of your hoverboard, responsible for managing sensor data, motor control, communication, and more.
- **Integration:** To ensure that all components— hardware, software, sensors, and communication systems—are integrated correctly, work together in harmony, and provide an optimal user experience.
- **Testing and Validation:** To systematically test all hardware and software components of th hoverboard to ensure they meet performance, safety, and usability standards.
- **Training and Support:** To provide users and technicians with the knowledge and resources to operate, maintain, and troubleshoot the hoverboard safely and effectively.
- **Security Implementation:** To ensure the hoverboard, its data, and the user experience are secure from unauthorized access, hacking, and potential vulnerabilities-whether it's physical security or cybersecurity. Security implementation is crucial to ensure that your Segway Hoverboard is safe from unauthorized access. Theft, and tampering, especially when integrating wireless features like remote control, real-time monitoring, and app-based interactions.
- **Define Scope:** The scope of the E-Vehicle Segway Hoverboard project outlines the objectives, features, deliverables, constraints, and boundaries of the project to ensure it meets the needs and expectations of the users and stakeholders.
- **Sensors and Actuators**: Choose the necessary sensors (, pressure, I M U , Temprature, Proximity etc.) and actuators (motors, BLDC, ESC, etc.) based on the industrial process being automated.
- **Embedded Devices**: Select embedded systems or microcontrollers (e.g., STM32, Arduino, ESP32) for processing sensor data and controlling actuators.

- **Edge Devices and Gateways**: An Edge Device is a smart device located at the "edge" of the network that collects and processes dada locally before optionally sending it to the cloud. In this hoverboard project, the Microcontroller (e.g.,ESP32) acts as the Edge device.

Results

Firstly, it is balancing the segway hoverboard with the usage of pressure type of sensors and programming. This is observed by some initial trails made and as per the initial driving results and why the vehicle was unable to get the expected result so we made a lot of advancements in terms of loads and motor capacity and shaft and bearing which helped us to get desirable results we expected for.

Fig 1. Result of E-Vehicle Segway Hoverboard

Conclusion:

E-Vehicle Segway hoverboards offer a fun, efficient, and eco-friendly way to commute or enjoy recreational riding. Combining smart technology with sleek design, they provide ease of use, portability, and a unique riding experience. Whether used for short- distance travel, campus cruising, or just for fun, they represent a modern take on personal mobility. However, users should always prioritize safety, wear protective gear, and follow local laws and guidelines when riding.

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