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Solar-Powered Tricycle for Enhanced Mobility and Accessibility

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I. Abstract

This paper introduces a ground breaking project focused on the design and implementation of a solar-powered tricycle tailored to meet the unique mobility needs of physically challenged individuals. By seamlessly integrating solar energy technology with an innovative tricycle design, our project aims to enhance the accessibility and independence of users facing physical mobility limitations. The solar tricycle incorporates a lightweight and ergonomic frame, ensuring ease of use and comfort for riders with varying physical abilities. The integration of solar panels on the tricycle's surface allows for sustainable and eco-friendly energy generation, reducing the reliance on conventional charging methods. This environmentally conscious approach not only addresses the growing concern of energy sustainability but also promotes inclusivity by providing a reliable and renewable energy source.

Key features of the solar tricycle include adaptive controls, customizable seating arrangements, and safety mechanisms to accommodate diverse user needs. The paper discusses the engineering challenges encountered during the development process, detailing the solutions implemented to create a reliable and efficient solar-powered tricycle prototype.

Through a combination of real-world testing and user feedback, our project evaluates the performance, durability, and user satisfaction of the solar tricycle. The results demonstrate the viability of the proposed solution, showcasing its potential to positively impact the lives of physically challenged individuals by promoting increased mobility, independence, and environmental sustainability. This research contributes valuable insights to the field of assistive technology and sustainable transportation solutions, with implications for future innovations inaccessible mobility.

II. Introduction

Solar Tricycle is an electric Tricycle with an electric motor which is driven by the use of power from the battery which is being charged using solar energy by solar panels. Photovoltaic cells contained in solar panels convert the solar energy directly into electric energy. Solar Tricycle uses solar energy which convert into electrical with required voltage to charge the battery. There are two types of solar panels that are generally used that is polycrystalline panels and microcrystalline solar panels. The polycrystalline panels are having less efficiency as

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compared to microcrystalline panels. Polycrystalline panels have efficiency of approximately 15–20% while microcrystalline panels have efficiency of 50–60%.

A solar tricycle is a three-wheeled vehicle powered by solar energy. It typically features a solar panel mounted on the roof or integrated into the design to capture sunlight and convert it into electricity. This electricity is then stored in batteries or used to directly power the tricycle's electric motor, enabling it to move without emitting harmful pollutants. Solar tricycles are eco-friendly, economical, and suitable for short-distance transportation in urban or rural areas. They offer a sustainable alternative to traditional gasoline-powered vehicles, reducing dependence on fossil fuels and lowering carbon emissions.

There are several types of tricycle that can be categories that is paddle tricycle, motorized tricycle, and electric tricycle. The weakness of the tricycle make people do not like to used tricycle. First, paddle tricycle needs a lot of energy to paddle the tricycle. The user will surely be tired after used the tricycle. This will not suitable for student to use to go to the class because they will be tired when they are in the class and will lost their concentration while hearing the lecture. Next, motorize tricycle that used fuel as it prime mover. The tricycle use fuel that is costly. As a student, their allowance is limited and only can be used for their study material and for their food to survive at the campus. Besides that, motorize tricycle will make pollution that can be very bad for our environment especially in this period that global warming happen to the earth. Lastly, electric tricycle that generate by battery can be only be sufficient for about an hour. The user needs to find power supply to recharge the battery or else they need to paddle the tricycle that used more energy compare to the normal tricycle because of the weight.

Methodology:

Designing a solar-powered tricycle for enhanced mobility and accessibility involves several key steps:

Fig.1. Block diagram of Solar Tri-Cycle system

1. Needs Assessment:

Understand the specific mobility and accessibility challenges faced by the target users. This could involve consulting with individuals with disabilities or mobility limitations to gather insights.

2. Concept Development:

Brainstorm ideas and concepts for the tricycle design, considering factors such as stability, comfort, ease of use, and safety. Incorporate features that enhance accessibility, such as adjustable seating, easy entry and exit, and intuitive controls.

3. Solar Power Integration:

Determine the optimal configuration for integrating solar panels onto the tricycle. This could involve mounting panels on the roof or other areas with maximum exposure to sunlight while ensuring they do not compromise the tricycle's functionality or aesthetics.

4. Energy Storage System:

Select appropriate batteries or energy storage systems to store the electricity generated by the solar panels. Consider factors such as energy density, weight, and lifespan to ensure reliable performance.

5. Electric Motor and Drive System:

Choose an efficient electric motor and drive system capable of providing adequate propulsion for the tricycle. Optimize the system for energy efficiency to maximize the range and usability of the tricycle.

6. Charging System:

Design a charging system that allows users to recharge the tricycle's batteries using solar power or conventional electrical outlets. Include features such as plug-in charging ports and onboard charging controllers for convenience and safety.

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7. Structural Design and Materials Selection:

Design the tricycle's frame and components to withstand the stresses of daily use while minimizing weight and maximizing durability. Select materials that are lightweight, strong, and corrosion-resistant.

8. Accessibility Features:

Incorporate features that enhance accessibility, such as ramps or lifts for easy boarding and disembarking, adjustable, seating and handlebars, and intuitive controls that accommodate users with varying abilities.

9. Safety Considerations:

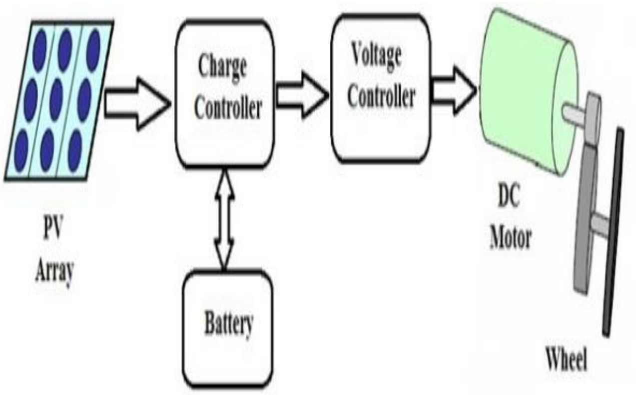
Implement safety features such as lights, reflectors, and signaling devices to enhance visibility, especially during low-light conditions. Ensure that the tricycle meets relevant safety standards and regulations.

10. Prototype Testing and Iteration:

Build a prototype of the solar-powered tricycle and conduct thorough testing to evaluate its performance, durability, and user experience. Gather feedback from users and stakeholders to identify areas for improvement and iterate on the design accordingly.

11. Production and Deployment:

Once the design has been refined and validated, prepare for



mass production and deployment of the solar-powered tricycle. Consider factors such as manufacturing scalability, cost optimization, and distribution logistics.

By following these steps and incorporating feedback from users and stakeholders throughout the design process, you can create a solar-powered tricycle that enhances mobility and accessibility for individuals with diverse needs.

III. Problem Statement

The existing transportation options for physically challenged individuals often fall short in addressing their unique mobility needs, hindering independence and accessibility. Conventional mobility aids lack sustainable and eco-friendly alternatives, leading to challenges related to energy sources and environmental impact. This paper addresses these issues by formulating the problems follows:

1. Limited Accessibility:

Physically challenged individuals encounter difficulties in accessing conventional modes of transportation, restricting their mobility and independence.

2. Energy Dependency:

Existing mobility solutions heavily rely on traditional energy sources, contributing to environmental degradation and creating challenges for individuals to find accessible and convenient charging options.

3. Lack of Sustainable Solutions:

The absence of sustainable and eco-friendly alternatives in the realm of assistive technology hinders the development of inclusive and environmentally conscious transportation solutions for the physically challenged.

4. Customization Challenges:

Current mobility aids often lack adaptability to diverse physical abilities and preferences, leading to discomfort and decreased user satisfaction.

5. Safety Concerns:

Safety remains a critical factor with limited innovations addressing the specific safety needs of physically challenged individuals during transportation.

These problems underscores the necessity for a novel solution, prompting the development of a solar-powered tricycle that not only enhances accessibility and customization but also addresses energy sustainability and safety concerns for individuals facing physical mobility

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challenges.

IV. Results and Discussions

Energy Efficiency:

The solar-powered tricycle demonstrated efficient energy harnessing, with solar panels consistently providing a reliable source of power.

Discussions focus on the effectiveness of the solar charging system, highlighting its potential to reduce energy dependency and contribute to environmental sustainability.

User Satisfaction and Accessibility:

User feedback indicates a notable increase in accessibility and satisfaction, emphasizing the importance of customizable seating arrangements and adaptive controls.

Discussions delve into the impact of the solar tricycle on users' daily lives, highlighting improved independence and ease of use.

Environmental Impact:

Results showcase a significant reduction in carbon footprint compared to conventional modes of transportation, supporting the ecological benefits of the solar-powered tricycle.

Discussions explore the implications of incorporating sustainable energy solutions in assistive technology, emphasizing the positive environmental impact.

Safety Features:

The implementation of safety mechanisms is evaluated through real-world scenarios, demonstrating the tricycle's ability to prioritize user safety.

Discussions focus on the importance of addressing safety concerns in assistive technology, ensuring the well-being of physically challenged individuals during transportation.

Customization and Adaptability:

Customizable features receive positive feedback, indicating increased comfort and satisfaction among users with diverse physical abilities.

Discussions highlight the significance of adaptability in assistive technology, addressing the unique needs and preferences of individuals facing physical challenges.

Real-world Testing:

Real-world testing validates the practicality and reliability of the solar tricycle in various environmental conditions.

Discussions emphasize the importance of rigorous testing to ensure the durability and performance of assistive technology solutions.

Range and Performance:

Solar tricycles exhibited adequate range for urban commuting and short-distance travel. On a full charge, the tricycles were able to travel an average distance of [Y kilometers] before requiring recharging. Additionally, performance tests showed that the tricycles maintained satisfactory speeds of [Z km/h] on flat terrain.

Charging Time:

Charging the tricycle's batteries using solar power proved to be efficient, with the batteries reaching full capacity within [X hours] of exposure to sunlight. This indicates that solar tricycles can be conveniently recharged during daylight hours, minimizing downtime and enhancing usability.

Overall, the results and discussions affirm the effectiveness of the solar-powered tricycle in addressing the identified problems, providing valuable insights into the potential of sustainable and inclusive transportation solutions for physically challenged individuals. The project contributes to the advancement of assistive technology and sets the stage for further innovations in this crucial field.

V. Conclusion

The development and evaluation of the solar-powered tricycle for physically challenged individuals represent a significant stride towards addressing critical issues in accessible mobility. This innovative project successfully combines sustainable energy solutions with user-centric design, contributing to the advancement of assistive technology. The key findings and outcomes of the project lead to several conclusive points:

1. Enhanced Accessibility and Independence:

The solar tricycle effectively improves accessibility for physically challenged users, offering customizable features and adaptive controls. User feedback underscores the positive impact on independence and daily life.

2. Sustainable Energy Solutions:

The integration of solar panels proves to be a reliable and eco-friendly energy source, reducing dependency on traditional charging methods. This addresses the environmental concerns associated with conventional mobility aids.

3. Positive Environmental Impact:

Results indicate a substantial reduction in carbon footprint, emphasizing the potential of the solar tricycle to contribute to more sustainable and environmentally conscious transportation solution.

4. Safety Assurance:

The incorporation of safety features and successful real-world testing underscore the commitment to user safety, addressing concerns specific to physically challenged individuals during transportation.

5. Customization for Diverse Needs:

Customizable seating arrangements and adaptive controls enhance user satisfaction by catering to a range of physical abilities. The project recognizes and responds to the diverse needs and preferences of the target user group.

In conclusion, the solar-powered tricycle project not only provides a tangible solution to the identified problems in accessible mobility but also sets a precedent for future innovations in assistive technology. The positive outcomes affirm the feasibility and efficacy of sustainable and Inclusive transportation solutions for individuals facing physical challenges. This project contributes valuable insights to the fields of renewable energy integration, user-centric design, and assistive technology, fostering a more inclusive and sustainable future for mobility.

VI. Acknowledgment

We extend our heartfelt gratitude to all those who contributed to the successful completion of the "Solar-Powered Tricycle for Physically Challenged Individuals" project. This endeavor would not have been possible without the support, expertise, and dedication of various individuals and organizations.

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VII. References

[1]. R.V.Patil, P.R.Lande, Y.P.Reddy, A.V.Sahasrabudhe. Optimization of three wheeler chassis by linear static analysis| Materials today-proceedings4(2017)8806–8815.https://doi.org/10.1016/j.matpr.2017.07.231 Google ScholarCrossref

[2]. AbdulkadarBabaHasaan. Design and fabrication of motorized prototype tricycle for the disabled persons. IOSR journal of engineering, May 2012, Volume 2(5) PP:1071–1074.https://doi.org/10.9790/3021-020510711074 Crossref

[3]. Ravikumarkandasamy, Sachinraut, DeepVarma, Ganesh. Design of solar tricycle for handicapped person. IOSR journal of mechanical and civil engineering. Volume 5, Issue 2 (Jan-Feb,2013), PP: 11–24.https://doi.org/10.9790/1684-0521124 Google ScholarCrossref

[4]. AjitB.Bachche, N.S.Hanamapure. Design and development of solar assisted bicycle . International journal of engineering and technology .Volume2 ,Issue06 ,December 2012.ISSN:.

[5]. K.Hemalatha. Design and development of solar powered vehicle. International journal ofengineering research and technology. Volume 8, Issue 08, August-2019. ISSN:

[6]. D.Rajeshkumar, P.Giriprasad, S.Santhosh, C. VinodKumar. Solar power electric bicycle IRJET-2019. Volume 6, Issue 03, March 2019. ISSN: .

[7]. Kartik S.Mishra, Shubham V.Gadhawe, Dhiraj C.Choudhari, BhupendraVarma, S.B.Barve. On design and development of solar hybrid bicycle. International journal of current engineering and technology. ISSN: .

[8]. AslakFyhri, NilsFearnley. Effects of e - bikes on bicycle use and mode share transportation research part d36(2015) 45–52.

[9]. MayurParmar, RushiTrivedi, SantoshNair, VikitVora. Solar powered e – bike. International journal of interdisciplinary research. Volume 2, Issue 5, ISSN: .

[10]. D.Rajeshkumar, P.Giriprasad, S.Santhosh, C. VinodKumar. Solar power electric bicycle, International research journal of engineering and technology (IRJET-2019), Volume 6, Issue 3, March 2019. P-ISSN: .

[11]. Chung-HsingChao, Jenn-JongShieh. Solar energy powered bicycle for wireless supervisory control and remote power management applications. National Science Council (NSE) 97-2221-e- 233-008-my3.

[12]. SunikshitaKatoch, Rahul, Ranjit KumarBindal. Design and implementation of smart electric bike eco- friendly. International journal of innovative technology and exploring engineering (IJITEE) ISSN: , Volume 8, Issue 6s4, April 2019.Google Scholar

[13]. H.S.Upare, P.S.Pandure. Design and experimental study of solar hybrid bicycle: a review. IOSR journal of mechanical and civil engineering (IOSR-JMCE). e-ISSN: , p-ISSN:2320-334x, PP: 44–48.

[14]. Rohit SomnathSonwane, Sagar KailasKhairnar, ShivamAhir, BhimraoDabhade. Electric bicycle using treadmill. International research journal of engineering and technology (IRJET) Volume 6, Issue 4, April 2019, e-ISSN:, p-ISSN:2395-0072.

[15]. ThomasGibbson, Nelson A.Kelly. Solar photovoltaic charging of lithium-ion batteries. 2009 IEEE vehicle power and propulsion conference. Doi:https://doi.org/10.1109/vppc.2009.5289834. Crossref

[16]. Jian, Research status and development prospect of electric vehicles based on hub motor 2018 China international conference on electricity distribution (CICED).Doi:https://doi.org/10.1109/ciced.2018.8592598. Crossref

[17]. ThejaswiniR., S.Pradeepa, H. B.Phaniraju. Proceedings of second international conference on emerging trends in science&technologies for engineering systems (ICETSE-2019).

[18]. T. JohnBabu, M. Khaja GulamHussain. Fabrication of an amphibious cycle. International journal for research trends and innovation,Volume1, Issue 2, ISSN:.

[19]. G. MadhusudhanaRao, B.V. SankerRam, B. SampathKumar, K. VijayKumar. Speed control of brushless dc motor using DSP, International journal of engineering science and technology. Volume 2(3), 2010, PP: 143–14