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Literature Review on Fabrication of Quad Cycle for Handicapped Person

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Abstract: ***In our daily life, we have seen various types of tri-cycles and tri-wheeled vehicles used by the disabled peoples for their locomotion from one place to another. There are several newly developed tri-wheeled vehicles for physically challenged people, which will be operated by manual, electrical and motorized modes. The most commonly used handicapped wheelchair are driven by the manual mode of operation by the use of pedal, but this vehicle provides discomfort to the handicapped persons through weakness in their body and due to their lack of physical fitness in all period of time. Hence, in order to reduce those difficulties various types of moped and modified scooter like vehicles are introduced, which are in the form of semi or fully automated mode of construction and working for their better increase in the comfort for their transportation. This paper overviews the implementation of new conceptual ideas and technologies on handicapped vehicles for the betterment in the preexisting vehicle models for differently abled people and we hope this will be helpful for the further manipulation in developments and provide the guide line for the new innovations in automotive for the physically challenged people.***
Keywords: Wheelchair, comfort, physically challenged, Transportation,

I. INTRODUCTION

In human life transportation is playing very important role from ancient time, due to transportation and communication facilities we say that, world is coming closer and closer. Day by day new vehicles with variety of models are coming into market. Normal person i.e. person without any disability can avail his vehicles easily. But in our society the number of disabled persons is also considerable, some of them born with disability, some get disabled due to accidents (road,workplace, natural calamities, etc.), large number of persons get disabled due to war activities and due to many other factors. Depending upon the severity of disability, the disabled persons can use the transportation facilities; persons with lesser disability can use the facilities as it is for normal persons, some persons are able to use the vehicles with little bit modifications like retrofitted bikes and cars There are some utilities like wheelchairs, pedal operated wheels chair which are used by the disabled persons. In some cases the disability is so severe that person can't move from one place to other place without help. The persons with hand and leg disability are able to travel but they are unable to use the Vehicles for normal persons as it is. So the vehicles are modified (customized vehicles) to make them accessible to the disabled persons. Nowadays more research work is going on for increasing mobility of disabled persons. Depending upon disabled part of body, different provisions are available like crutches, wheelchairs, customized vehicles (retrofitted bikes, cars etc.). Crutches are most commonly used for walking for shorter distances and then manual wheelchairs [1] and hand-cranked tricycles [2] are useful for the persons with leg disability and automatic wheelchairs are designed such that persons with hands & legs disability can be benefited. In automatic wheelchairs many approaches are taken into consideration and depending upon that the control system of wheelchairs is designed, for example smart wheelchair with control through deictic approach [3], intelligent robotic wheelchair [4], path following, stair climbing wheelchairs [5] etc. Another option of powered tricycles i.e. battery powered or solar powered tricycles [6], [7] is available for persons with leg disability. Currently many disabled persons are using modified vehicles like retrofitted bikes and customized cars which are having all the controls in hand [9]. In this way, there are various solutions available for travelling of the disabled persons like wheelchairs (manual, automatic), tricycles (manual, powered), modified bikes and cars but in case of severe leg disabilities, the disabled person needs to use the wheelchair and many times he/she unable to use above available options due to the reasons mentioned in further lines. The wheel chairs (both manual and automatic) are useful only for short distance travel and the manual wheelchairs need physical work from user or care taker. Then tricycles can be used for some more distance than wheelchairs but are not useful for long distance travel and also gives more physical strain to user. The retrofitted bikes can be used for longer distance travel. But to use these bikes, the wheelchair user should be capable to come out and in from the wheelchair to take the position on bike and it is difficult in most of the cases.

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So the bike is not useful for most of the wheelchair users. In case of modified cars also, the user needs to come out from the wheelchair.

But nowadays the ramp provision is there for some of the cars, so by climbing the ramp the wheelchair user can drive his wheelchair inside the car and take the position of driver. Also buses with ramp provision are available, but the option of cars and bus is not economical for most of the population.

So there is need of solutions to the problem faced by disabled persons discussed above this Quad cycle project gives the solution, which will be less costly. We have tried to design and manufacture the Quad cycle structure. First we have prepared rough sketch of project models and discussed about the challenges faced by disable persons. Then start to preparing the Quad Cycle Model.

II. LITERATURE SURVEY

In this project we have refered twelve number of research papers and their explanation is given as follows

1) Aleksandar Milenkovi et.al.[1]:- He designed a retrofitted tricycle by modifying the existing scooter. He also design special platform arrangement so a wheelchair occupant can easily hold or leave the tricycle. This trike can be use for a long distance making it suitable for long journey.
2) M. Abdulghani, Kasim M. Al-Aubidy Mohammed M. Ali and Qadri J. Hamarsheh et.al.[2]:- This paper focuses on tricycles suitable for rural and city areas. Tricycles are cost-effective for short-distance transportation. However, many disabled individuals lack the physical strength or coordination to propel themselves using hand-powered tricycles. The research explores various technologies related to tricycles and compares their features. The goal is to find energy-saving solutions that cater to the needs of handicapped persons.
3) Zhuqing Jiaoa,*, Kai Mab, Yiling Rongc, Peng Wangd, Hongkai Zhange,*, Shuihua Wang et.al.[3]:- Developed solar operated tricycle for physically handicapped person and he made it especially for an NGO started by Baba Amate. Main components of tricycle was Solar panel and frame to support panel, PMDC motor, Battery and charger controlling unit.
4) Odile Horn et.al.[4]:- Design and Fabrication of Wheelchair cum Tricycle. This paper discusses the development of a traditional manual-operated wheelchair cum tricycle. The rear-wheel drive mechanism replaces the chain drive with a single slider drive mechanism. The design aims to provide better efficiency and ease of use. The modified tricycle combines the advantages of a wheelchair for short distances or indoor use with those of a tricycle for longer distances. It can be a suitable replacement for tricycles with chain drive mechanisms.
5) Deepak Kumara, Reetu Malhotrab, S. R. Sharma et. al [5]:- In this paper the author focuses on simple, high performance, an easy maintained motorized tricycle for the disabled person which can be proved as a better replacement for the indigenous models used by the handicapped keeping in mind the factors such as safety, cost & performance The objectives of the design and fabrication of a motorized tricycle using available local materials was successful to a great extent and it was discovered that the tricycle will lessen the burden of the disabled people due to its affordability.
6) Rashmi Urdhware she, et. al [6] discussed that National Human Rights Commission has focused on the need to provide equal opportunity to physically challenged persons. While providing personalized mobility solutions to the physically challenged person, safety of the driver and also other road users is needed to be sure. Modifications in existing vehicle design involves specific adaptations of foot and hand controls to suit operations by persons having partial or full disability of limbs. In absence of network in country, the entire subject needed detail examination and sensitive treatment. Subject came before Central Motor Vehicles Rules Technical Standing Committee (CMVR-TSC) and it was agreed that Automotive Research Association of India (ARAI) will take the lead in resolving the matter and establishing approval procedure and notifying the requirement under CMVR which restricted the individuals from altering their existing vehicles in general.

III. METHODOLOGY

A. *Initial Research*

1) Start by examining existing mobility aids in the market. Look at products like wheelchairs, walkers, and mobility scooters.
2) Identify the strengths and weaknesses of these products. What are users satisfied with? What are the common complaints or areas for improvement?
3) Talk to potential users, caregivers, and healthcare professionals to understand their needs.

B. Concept Development

1) Brainstorm multiple design concepts that address the identified gaps and user needs. Focus on improving stability, ergonomics, and usability.
2) Sketch out your ideas on paper or digitally. Explore different configurations, materials, and features.
3) Narrow down your concepts to a few promising ideas that you can further develop and refine.

C. Detailed Design

1) Utilize CAD (Computer-Aided Design) software to translate your selected concepts into detailed models. Pay attention to dimensions, tolerances, and material specifications.
2) Iterate on your designs, making adjustments based on feedback from stakeholders and usability testing.
3) Use the CAD software to generate photorealistic renderings of your designs for presentation and evaluation.

D. Prototyping and Fabrication

1) Once you've finalized the design, it's time to create a physical prototype.
2) Choose appropriate materials and manufacturing processes for prototyping. Depending on your budget and resources, you may use 3D printing, CNC machining, or traditional fabrication methods.
3) Assemble the prototype and test it rigorously under various conditions. Gather feedback from users and iterate on the design as necessary.

Throughout each stage of the design process, it's essential to maintain open communication with stakeholders and be willing to adapt your approach based on feedback and new insights. Remember to prioritize user needs and strive for a balance between innovation and practicality in your designs.

IV. OBJECTIVES

The main objective of a quad cycle for handicapped individuals is to provide them with a means of independent mobility and physical exercise. These specially designed cycles aim to :-

1) *Enhance Mobility:* Offer a practical and safe mode of transportation for those with physical disabilities, enabling greater independence.
2) *Promote Physical Health:* Encourage physical activity, which can improve overall health and well-being.
3) *Boost Confidence and Inclusivity:* Empower users by increasing their participation in social and recreational activities, fostering a sense of inclusion and confidence.
4) *Improve Accessibility:* Provide a viable option for those who may find traditional bicycles or other forms of transportation inaccessible or challenging to use.
5) *Raise Awareness:* Promote awareness about the mobility challenges faced by handicapped individuals and the solutions that can improve their quality of life.

Overall, these quad cycles are designed to improve the quality of life for handicapped individuals by making mobility more accessible and enjoyable and providing them with greater freedom and opportunity.

V. FUTURE SCOPE

Quad Cycle will be an important necessity in future and provide great opportunity for handicapped persons. Development of these things can reduce the cost factor to a great extent as compare to other models.

These Quad cycle are designed to offer mobility solutions to individuals with disabilities and their future developments. We can use solar energy by installing roofs of solar panel to charge battery and we can use shock absorber for comfort working on reviews and feedbacks can help to improve the current issues for quad cycle for handicapped and also new ideas can be imagined on that project.

VI. CONCLUSION

There are several issues faced by the manufacturers and researchers which needs to be addressed so that, Quad cycle becomes a commercial success and be widely used. One common main issue is cost versus accuracy. Inexpensive and advanced sensors can help to overcome this problem. Quad cycle which can be used generally used for all types of disability are still not available. Quad Cycle should also contain the ability to monitor the patient conditions and react accordingly. Currently available Quad cycle can be easily used in indoor conditions but, for outdoor environment it requires supervision by a companion for safety. Also, Quad cycle for independent use by mentally challenged people should be researched. Quad cycle have great scope in future and technological advancement in the field of robotics and sensors will lead to commercial success as well.

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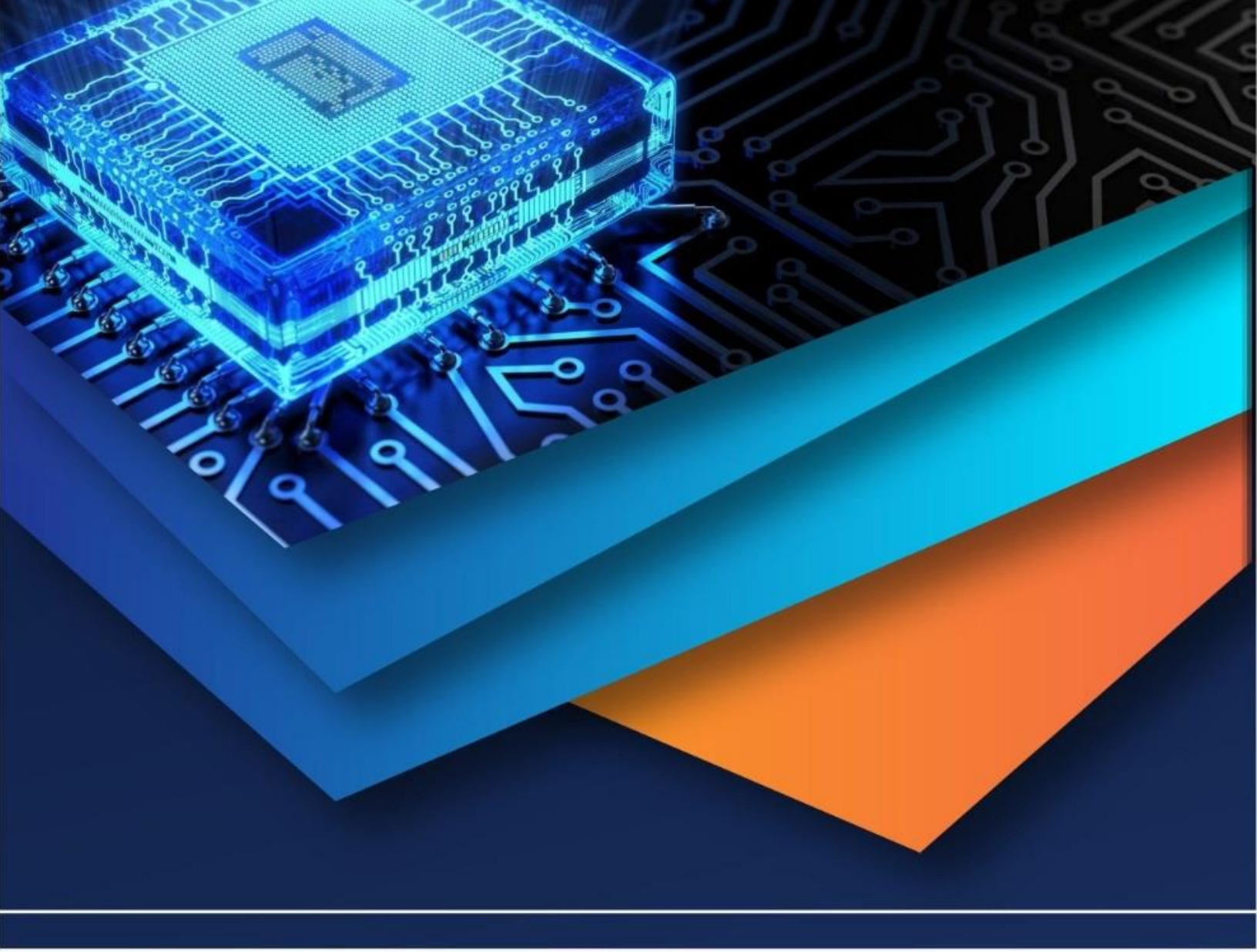
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