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Design and Fabrication of Indoor and Outdoor Attachment for Handicap Wheel Chair

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Abstract: *The project "Design and Fabrication of Indoor and Outdoor Attachment for Handicap Wheelchair" focuses on developing a multifunctional accessory system that enhances mobility, safety, and comfort for wheelchair users across diverse environments. Conventional wheelchairs often face limitations when transitioning between smooth indoor surfaces and uneven outdoor terrains.*
To overcome these challenges, this project introduces an innovative attachment that can be easily fixed to a standard manual wheelchair, providing adaptability for both indoor maneuverability and outdoor stability. The attachment integrates features such as tion on ray detachable front-drive mechanism, shock-absorbing wheels, adjustable support frames, and an ergonomic locking system. These components collectively reduce physical strain on the user, improve trough surfaces, and ensure seamless movement through narrow indoor spaces.
The design emphasizes lightweight materials, cost-effectiveness, and user-friendly operation, making it suitable for daily use. This project aims to empower differently-abled individuals with increased independence, extended mobility, and improved quality of life by offering a practical solution that bridges the performance gap between indoor and outdoor wheelchair use.

Keywords*:* Fabrication

I. INTRODUCTION

The system we designed is a Portable Electric Power drive kit for a wheelchair. The project has a number of benefits as considered in hospitals as well as handicap homes. The external benefits can be commercial to an individual as well. Despite the environmental friendliness of the project or the projected benefits of more physically able people relying on manual operated wheelchairs, the main reason we selected the project was with the intention of doing something very useful for the society. Designing a drive requires consideration of mechanical objectives, electrical objectives, safety criteria, comfort, user friendliness as well as an array of other objectives which may conflict under various circumstances. We hoped that through navigating our way through this vast set of criteria the satisfaction of completing the project would be much greater than other projects we could have selected.
Namely, we chose this project for the challenge of designing a mechanical system and implementing electronic control to dictate the response and performance of the system. The other challenge was to make it as portable and affordable as possible with the main feature of the kit being attachable and removable without haste. Since, we have never had to design a complete electro-mechanical system of this magnitude; the project presented an interesting challenge. What made it even more challenging was the challenge of adapting an existing system to a set of criteria we determined.

II. LITERATURE SURVEY

- Census 2001 has revealed that over 21 million people in India as suffering from one or the other kind of disability. This is equivalent to 2.1% of the population.
- Among the total disabled in the country, 12.6 million are males and 9.3 million are females. Although the number of disabled is more in rural and urban areas. Such proportion of the disabled by sex in rural and urban areas.
- Such proportion has been reported between 57-58 percent for males and 42-43 percent females.

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- The disability rate (number of disabled per 100,000 populations) for the country as whole works out to 2130. This is 2,369in the case of males and 1,874 in the case of females.
- Among the five types of disabilities on which data has been collected, disability In seeing at 48.5% emerges as the top category.
- Others in sequence are: In movement (27.9%), Mental (10.3%), In speech (7.5%), and In hearing (5.8%). The disabled by sex follow a similar pattern except for that the proportion of disabled females is higher in the category in seeing and In hearing.

Various studies have been conducted to improve wheelchair mobility through powered wheelchairs, modified wheel designs, and suspension systems. However, most powered wheelchairs are expensive, heavy, and require regular maintenance. Research indicates that add-on attachments provide a practical alternative by enhancing functionality without replacing the existing wheelchair.

Previous designs include front-wheel attachments, lever-driven mechanisms, and suspension-based wheels. While effective, many of these systems lack adaptability for indoor usage. This project builds upon existing concepts by integrating both indoor maneuverability and outdoor stability into a single detachable system.

Objectives

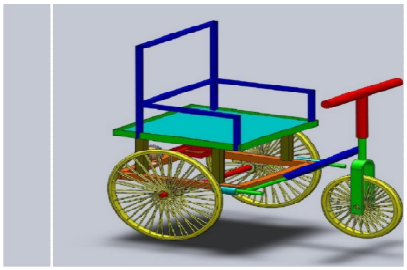
- To design an attachment suitable for both indoor and outdoor wheelchair use
- To improve stability and safety on uneven terrains
- To reduce physical strain on the wheelchair user
- To ensure easy installation and removal of the attachment
- To use lightweight and cost-effective materials
- To improve overall comfort and mobility

III. METHODOLOGY

- Study of existing wheelchair designs and user challenges
- Conceptual design of the attachment system
- Selection of suitable materials and components
- Design using basic mechanical principles
- Fabrication of the attachment
- Assembly and testing under indoor and outdoor conditions

Design Considerations

- Lightweight construction to avoid additional load
- Strength and durability for outdoor usage
- Ergonomic design for user comfort
- Simple locking and unlocking mechanism
- Compatibility with standard manual wheelchairs



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Materials Used

- Mild steel / aluminum for the frame
- Rubber wheels with shock-absorbing suspension
- Fasteners such as nuts, bolts, and clamps
- Bearings for smooth wheel rotation

Working Principle

The attachment is fixed to the front portion of the wheelchair using a locking clamp system. During outdoor use, the front-drive wheel and shock absorbers help distribute load evenly and absorb vibrations from uneven surfaces. This improves stability and reduces discomfort.

For indoor use, the attachment can be detached easily, allowing the wheelchair to function normally and maneuver through narrow spaces.

Working Model

Advantages

- Enhanced mobility on uneven outdoor surfaces
- Reduced physical strain on the user
- Improved safety and comfort
- Cost-effective solution
- Easy installation and removal
- Lightweight and durable design

Applications

- Daily indoor and outdoor mobility for wheelchair users
- Hospitals and rehabilitation centers
- Elderly care facilities
- Public places and campuses

IV. CONCLUSION

The design and fabrication of the indoor and outdoor attachment for a handicap wheelchair provide a practical and economical solution to improve mobility for physically challenged individuals. The developed attachment successfully enhances stability, comfort, and usability without altering the original wheelchair structure.

This project demonstrates that simple mechanical innovations can significantly improve the quality of life for wheelchair users by enabling independent movement across diverse environments.

The goals of the project were to design and integrate an additional power transmission drive to a manual operated wheelchair with the feature of portability, which can be attached and detached with minimum effort by the physically

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able operator. We projected that we would be able to control the systems synchronously through electronic control interfaces. Our project focus was primarily to design a system capable of forward drive with the kit being portable.

Future Scope

- Future improvements may include:
- Integration of motorized assistance
- Use of advanced lightweight composite materials
- Improved suspension mechanisms
- Smart braking and safety features

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