

# Design of a Standing Wheelchair

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## **Introduction:**

A person with leg disability may have to use a wheelchair for his/her entire life. In a conventional wheelchair, the user spends most of the time seated in one position. Providing the ability to stand can help alleviate physical issues such as sore body, building of pressure points, and lowered blood circulation due to lack of movements. In addition, it can improve the quality of life for the wheelchair user by enabling eye-level interaction with other people and access to objects at elevated heights. In this work, a mechanical wheelchair with an adjustable frame that can elevate the user to a standing position has been designed for household use.

## **Methodology:**

This development of the wheelchair was carried out in a sequential manner starting from understanding the user's needs, synthesizing kinematic mechanisms, evaluating various design options and selecting a design for further analysis and prototyping. Kinematic synthesis was carried out to determine suitable link lengths for the mechanism. The design was modeled using CAD and Finite Element Analysis was carried out to determine suitable cross-sections for the links for the material chosen.

A wooden prototype was initially made to evaluate the proof-of-concept. Springs are used in the wheelchair to balance the weight of the person and reduce the effort of the user in getting to the standing position. Based on the experience with the wooden prototype, a metal prototype made of Aluminum has been built.

## **Results:**

Able-bodied users weighing about 65 kg have tried the prototype with good success. By operating the hand levers, the user is able to lift himself up to a standing position and come back down to the seated position. The design exhibits good stability for the user in both the seated and standing positions. Improvements are being made to the design to incorporate additional safety features in the next prototype before having actual wheelchair users test the design. The design has been demonstrated at national level competitions and has won several awards. A patent application has been filed and commercialization of the design is being explored.

## **Conclusion:**

A mechanical user-operable standing wheelchair has been designed in this work. The goals of a cost-effective, simple, easy-to-operate design have been met.