

Design of an Assistive Device for the Elderly to Get Out of a Chair

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Type: Design Problem
Student Time: Three Weeks
Location: Take home

Summary

This project is to design an assistive device for the elderly or disabled to get out of a chair easier. The project is intended for the first class, and can be done individually or in a group.

The students will decide whether to design the device to be portable or permanently attached to a chair which the user uses most often. The student must also decide whether the device will be active or passive, a simple hinged configuration or a mechanism based device, etc. However, they will have to address issues such as stability of the device, cost, material, manufacturing, and other pertinent issues. A video camera may be used and frames analyzed to determine the kinesiology of movements involved. This information can be used in synthesis of the possible mechanisms.

At the end of the project, the student will hand in project specifications, alternative solutions, the final concept, and a diagram or sketch of the device. You may also want to include an oral presentation of the results at the end of the project.

ABET Descriptors

Engr Sci Content: First Year Engineering
Type: System design
Elements: Establish objectives, synthesis, testing, evaluation
Features: Design methodology, creativity, design alternatives, open ended, feasibility
Constraints: Limited space, cost, time, human factors, kinesiology, weight, safety, stability, aesthetics (Must appeal to users and by-standers)
Effort: Individual or team

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You are to design an assistive device for the elderly or people with certain disabilities who need help in getting out of a chair. You are to accurately define the scope of the project and design specifications to the best of your ability. You will have to decide whether this is a portable device or it will be permanently attached to a chair which the user uses most often. You will have to decide whether it will be passive or active, etc. You may use the information developed from the analysis of the motion involved in getting out of a chair, and recorded on camera, to design the device.

You will also have to consider other factors such as human factors, aesthetics of the product, its cost, weight, ease of use, etc. You should describe how the unit may be tested if built.

You will hand in a report outlining your activities and results. It must include a complete design definition and specification as well as a drawing with enough detail showing your product solution.

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Engineering Notes:

Objectives/Comments

A video camera may be used to determine the motions involved in getting out of a chair. To do this, the motions of a person whose ankle, knee, hip, and shoulders are marked with a bright dot, may be recorded while getting out of a chair. Subsequently, each frame on the monitor can be traced on an overhead sheet at the dots until the motion is recorded. This may be done individually or once by the whole class for everyone to use, depending on the availability of the cameras.

Students may want to visit a nursing home or interview an elderly person for more information.

A model of a four bar mechanism may be taken to class, or empirical techniques in its synthesis may be discussed in class for clarification.

Certain other constraints may be added to the project. For example, if the unit is to be portable, the seat must also be easily assembled/disassembled. It should also be foldable.

Expected Outcome

The student is expected to visualize the situation and synthesize a solution for it. This exercise in design forces the student to follow the design process discussed in class in defining the scope of the project, design specifications, idea generation and selection, and final implementation. The report should document each activity, including a sketch of the product in sufficient detail showing how it works.

It is expected that students will be exposed to the design process before this project. As a result, they should be able to determine the design steps from the given information and form the process accordingly.

Discussion/Follow-up

The project may be continued in future classes. Static force analysis, stress analysis, materials selection, fatigue, machine component design, economics, manufacturing issues, human factors are but a few possibilities. Liability and safety issues may also be discussed in other design courses.