CR Wheelchair

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Figure 10. Prototype of CR Wheelchair

INTRODUCTION
A special wheelchair was designed to reduce the operational effort of manual wheelchairs. Very few commercial wheelchairs are available for the same purpose, and the available products often aim at an increase in speed rather than a decrease in user’s effort. To address this problem, a four-bar linkage and sprocket-chain system was used to provide the user with comfort and reduce the effort.

SUMMARY OF IMPACT
The proposed design of wheelchair provides the user with an increased comfort by allowing the arms to function in a more natural position, and reduces the user effort greatly through the use of a sprocket-chain system and four-bar linkage. This design can easily be expanded to include multiple sprockets and other customizable features to accommodate more needs and provide a more flexible system that could more easily deal with various terrains and user needs.

TECHNICAL DESCRIPTION
A standard hospital-style folding wheelchair was customized to accomplish the proposed functionality, with a consideration of the design and fabrication effort.

To accommodate the linkage and sprocket-chain system, the wheelchair frame was modified and fitted with threaded inserts for shoulder screws to carry the driving handles
and sleeves added to the frame to house the shaft and bearing assembly for the crank of the linkage. Furthermore the rear wheels were modified to carry a plate that mounted a large sprocket that would be driven by the linkage.

The linkage was designed to create a natural comfortable arcing motion for the user to move the handles through and furthermore to transfer the motion easily to the sprocket-chain assembly. A Grashof crank-rocker four-bar linkage was selected and designed because of its simplicity and its easiness in customization. The sprocket-chain system allows for the wheel and driver sprockets to be freely placed and connected through the chain, and furthermore provides significant mechanical advantage to the user through the transmission ratio of the two sprockets.

The system is simply driven by rhythmically pumping the two handles simultaneously, which turns the crank and drives the sprocket-chain system. Turning is achieved by pumping one handle while allowing the other to idle, in much the same manner that one would turn a standard manual wheelchair.

The cost of the parts and supplies for this project was $600.