MPOWRD 2.0
The Next Step in Wheeled Mobility

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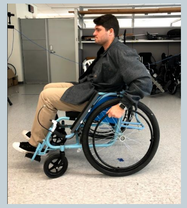
Background

Stroke can affect the muscular and motor function of patients asymmetrically. Traditional self-propelled wheelchairs require the use of both arms with equal strength, and are either impossible or painful for stroke patients to use.

Electric and lever powered wheelchairs exist, but are expensive and often unavailable for patients in lower-resource countries.

MPOWRD 1.0 designed a lever powered wheelchair that could be used by stroke patients, but there were areas of needed improvement.

Traditional Wheelchair Motion



MPOWRD Motion

The Bigger Impact of MPOWRD 2.0

The independence of mobility has a massive impact on the quality of life for patients. Electric wheelchairs are often unattainable for patients in lower resource countries.

Creating MPOWRD as a kit to modify existing Free Wheelchair Mission chairs will make it available for patients who would benefit from it the most. MPOWRD 2.0 makes MPOWRD capable of daily use.

Goal and Objectives

MPOWRD 2.0 improves on MPOWRD by making it more patient-friendly, based on feedback from the first year. Focuses for improvement include:

- Redesign armrest to be usable by patients of differing heights without shoulder hiking (which can set back physical therapy)
- Faster Braking with less hand strength
- Wheelchair can be controlled with only one hand

Timeline

Fall - Goals List, Concepts, Research Needs

Winter- Subsystem finalization, parts list, first prototype complete

Spring - Human testing, prototype refinement, Wheelchair complete

Budget:

$600 + parts donated by FWM

Team Members

Co-Lead/Document Manager: Nick Talebi	talebin@uci.edu
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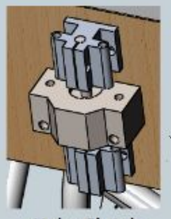
Innovation

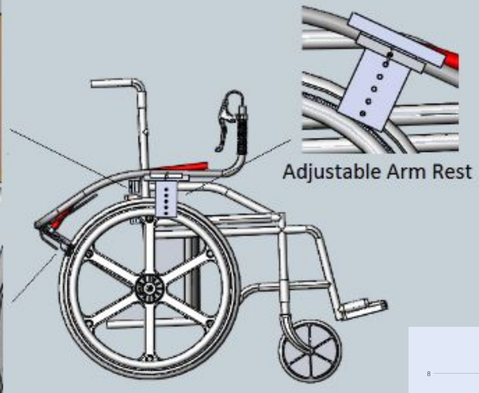
The Yoke Clutch allows one-handed control of both wheels using a linear bearing system. Thus patients with asymmetric strength can control the chair



Yoke Clutch

Swapping stock bike brake pads for trick pads made of 'grippier' materials gives patients better control for starts, stops, and turns

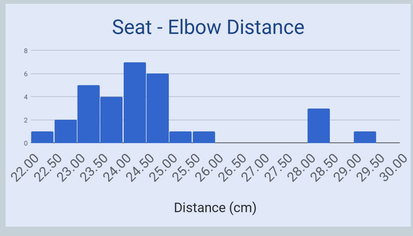
Brakes



Adjustable Arm Rest

An adjustable arm rest will allow patients of a range of heights to use the wheelchair without hiking their shoulder.

30 people were polled on ring road to find a range of seat-elbow heights, which had an average of 24.5 cm



Requirements and Current Status of Subsystems

Subsystem	Marginal	Ideal	Status
Arm Rest	Attached to lever to fit height of average user (24.5 cm from seat)	Arm rest is adjustable to specific patients' needs	Data of arm height recorded, CAD altered and 3D printing commenced.
Braking	Brake can slow chair from 1 m/s to stopped within 1 m	Brake can slow chair from 1 m/s to stopped within 0.5 m	Brake pad chosen, ready for installation
Yoke Clutch	Pulling the bike brake on one side will engage clutch on both wheels	Yoke clutching can be engaged or disengaged by the patient	Parts arrived Week 8, assembly in progress

Next Steps

With all parts in, the next step will be testing the wheelchair's performance and fine tuning it to best meet patient needs.

The Yoke Clutch system is the largest innovation from MPOWRD, and will require debugging and testing to make its use as smooth as the original two-handed control system.

Durability testing will be needed for all subsystems, as replacement parts will not be readily available in the locations MPOWRD 2.0 is targeting. These kits will need to be easy to install, endure a variety of environments, and above all else be intuitive for patients to use on a daily basis.