Robotic Parallel Bars Walking Device

Overview
Our problem was to design and manufacture a robotic walker to assist lower limp prosthetic patients rehabilitate. Patients typically begin rehab using traditional parallel bars, and then graduate to using the hand railing in the hallway in lieu of any alternative. Our walker is designed to assist these patients in the final stages of their rehabilitation; it has a U-shaped chassis which encloses the front and sides of the patient, wheelchair accessibility, and height adjustable handles which stabilize the patient. The rear wheels of the walker are motorized and are controlled with speed adjustment and on/off switches.

Objectives
Our objective was to design a walker to be used by patients in the rehabilitation of their lower body due to amputation, trauma, or stroke. The walker needed to be safe and durable, while open enough that therapists could easily access the patient’s lower body.

Approach
- Gathered initial customer needs and design objectives from our sponsor Dr. Moore
- Gathered additional information from Dr. Hills and his staff of therapists at The Hershey Medical Center during our visit there, and from Dr. Piazza at the Biomechanics Lab in Recreation Hall
- Reviewed current designs and patents to determine what worked and what needed improvement to come up with our top 3 design concepts
- Determined that safety, adjustability, and accessibility were the main customer needs and used concept generation and selection to choose our final design from our top 3 choices
- Created a SolidWorks model of our final design and made adjustments to it according to critique from our sponsor and the therapists from Hershey
- Built two “alpha” prototypes to test various design components before starting our final design
- Constructed our final prototype from 1 ½ square steel tubing and aluminium handles with motorized wheels and electronics to include: C-Rio, motor amplifiers, batteries, and controller
- Tested our prototype in Dr. Piazza’s lab to determine its affect on normal gait cycle; the data showed our walker did not inhibit the patient’s forward or lateral motion and allowed them to move freely

Outcomes
- The sponsor will have a walker to be used in a research setting and after FDA testing and approval a clinical setting
- The material cost for the walker was 932 dollars
- The walker presents a new approach to lower limb therapy and has the potential to reduce recovery time for patients
- The walker fills a current void in therapeutic recovery—currently filled by a traditional (non-robotic) walker or even hallway railing which inhibit the normal gait cycle
- From testing in the biomechanics lab, it was determined the walker does not inhibit a patient’s normal gait cycle