Evolving Connections: Community-Driven Learning Ecosystems in the Library

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Learning & Teaching Goals

- **Grand Challenges & Wicked Hard Problems**
  Engage with campus learning priorities, applying our expertise in traditional and emerging modes, partnering effectively, offering possibilities and creating solutions.

- **Pathways for Immersive & Interactive Learning**
  Explore, define, create, and make visible engagement with learning as an interactive, intentional and transformative experience.

- **Literacy & Learning Competencies**
  Integrate information literacy with core campus missions and initiatives to further promote a literate campus.
Established Service Models
Imagine Again

- Why
- Expertise
- Changing Workflows
- Campus Initiatives
- Digital Literacy
Habits of thought
Creativity
Problem solving
Community/citizens
Intercultural competence
Self-reflection
Life-long learning
Connected Scholarship

- Community-driven learning environments
- Consultation and access to expertise
- Collaboration with partners
Connecting Communities

Design Lab 1
Duderstadt Center
Makerspace with an emphasis on aesthetics for collaboration and exploration of new tools, technologies, and processes

Design Lab 3
Duderstadt Center
Ideation space with modular furniture, whiteboards, sketchpads, and workstations with data visualization and modeling software
Connecting Communities

Shapiro Design Lab
Shapiro
Focus on creating engaged learning opportunities and experiences across research, artistic, and teaching projects

ScholarSpace
Hatcher
Collaboration and consultation around exploration, application, and extension of learning technologies. Redesign in progress!
DETROIT: A COLLECTION OF STUDENT PHOTO ESSAYS

LLOYD HALL SCHOLAR’S PROGRAM (LHSP) 125:
Aluminum Prototype of Right Arm Exoskeleton
Strength Augmenting Robotic Exoskeletons
(STARX)

INTRODUCTION
Currently there are few exoskeletons that are outside of research and military applications. STARX works toward building practical strength augmenting exoskeletons that can be used in an everyday setting. Over the course of the Fall 2015 and Winter 2016 semester, we designed, manufactured, and instrumented our first aluminum arm prototype. The goal for our arm exoskeleton was to lift 10-15 lbs more than a person is capable of. With the intention of making this technology mainstream, we have made our progress open source.

DESIGN PROCESS
For our design process, we first brainstormed factors that we considered most important to our design. Those factors included safety, weight, adjustability, ease of movement, practicality, and longevity. After deciding on the main considerations and reviewing existing exoskeleton designs, we were able to generate sketches (Fig.1,2). Once sketches were complete, we were able to proceed with creating our mechanical design.

B. SHOULDER DESIGN
For the shoulder, the biggest factor was that the exoskeleton should move naturally with the user’s arm. The shoulder has three degrees of freedom and we attempted to achieve that by using a pivoting hinge system.

C. ELBOW DESIGN
The key features that we wanted for the elbow was adjustability, comfort, and safety. To investigate designs that would fit this criteria, we looked at elbow braces, specifically the Bledsoe elbow brace (Fig 3). This brace was adjustable in length and had malleable cuffs with padding, which targeted a wide range of people. Below, you can compare our design (Fig. 4) to the Bledsoe. The main safety concern we had was the risk of hyperextending the elbow if there was a misread of control signals. To resolve this, a small stop was put to prevent the elbow from extending more than 90°.

ELECTRICAL DESIGN
For the electrical design, we had to focus on three areas: sensors, control algorithm, and motor control. For sensors, our system relies on two surface electrode EMG sensors, two pressure sensors, and an angle sensor. These allow for direct control of the exoskeleton based on arm movements alone.

A. CONTROL ALGORITHM
The control algorithm ideally consists of two control loops, one for free movement without EMG signals and one for movement under load. Free movement uses a PI controller with the force sensors, while the load controller relies on EMG signals from the user’s bicep and tricep.

B. MOTOR CONTROL
For our motor, we chose to use a Milwaukee Brushless power drill. The reason behind this choice is the many convenient functions of the drill that suited our application. The drill has the proper torque and speed with its gearbox, a slip cluch to prevent stalling, and all associated electronics for controlling it. To control it, we wrote a program to control the speed and direction using signal inputs from the microcontroller while keeping the internal workings as a black box.

http://hdl.handle.net/2027.42/122853
New Possibilities
ScholarSpace
Changing Impact:
Shapiro Design Lab Residents

3D Printing for letterpress
Future of learning @ Michigan
Hashtag activism and identity
Public scholarship & creative re-use of course materials
Sustainability in the library
Student news literacy
Prison design & mental health
Changing Impact:
Shapiro Design Lab Residents

School of Information
Comparative Literature
Social Work
Engineering
Anthropology
Public Health
Education
LibLearnEx investigations are mixed-method studies to inform innovation in Learning & Teaching programs and services.
Connected Scholarship

effectiveness

emergence & connection

Discovery & Creation