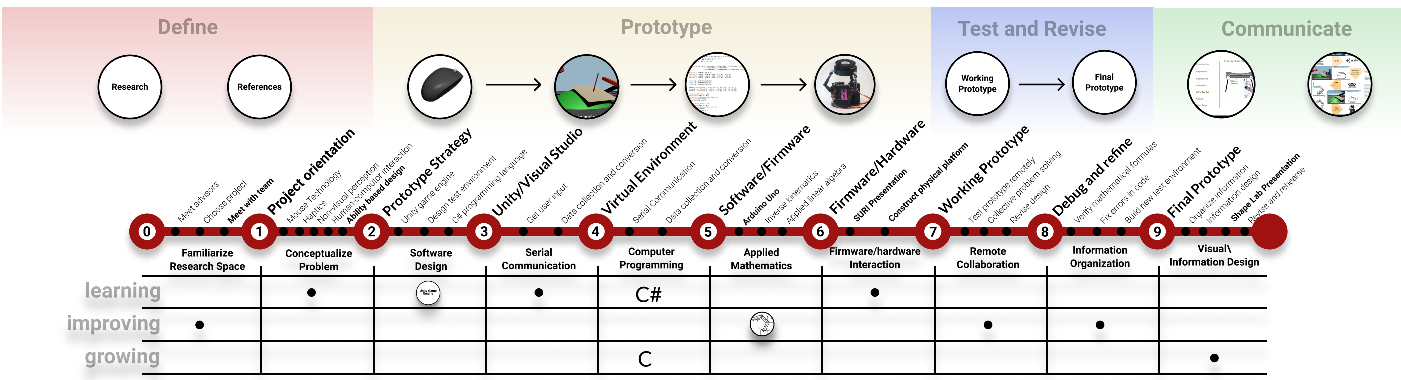
Haptic Shape Display for Exploring Virtual Interfaces

for Blind and Low Vision Users

with **Stanford Undergraduate Research Institute** and **Shape Lab**

with **Abena Boadi-Agyemang**
lab advisor **Alexa Sui**
and faculty advisor **Sean Follmer**



Research Timeline

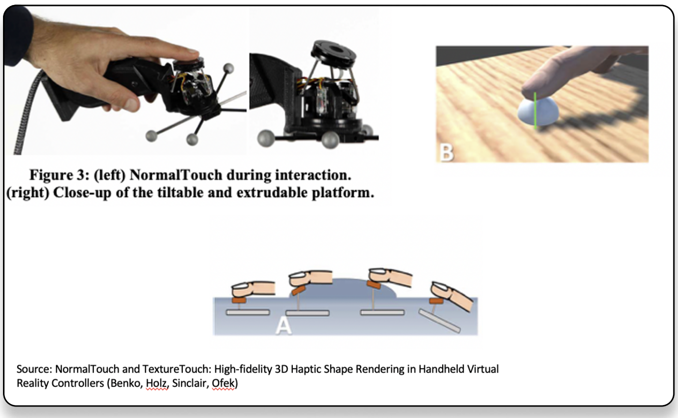
Overview

For this project Abena and I developed a prototype of a **haptic mouse** designed to assist blind and low vision users (BLV) in navigating digital interfaces. The prototype is a two-handed kinesthetic device controlled by a standard computer mouse and provides kinesthetic feedback to the users via a 3DOF Stewart platform.

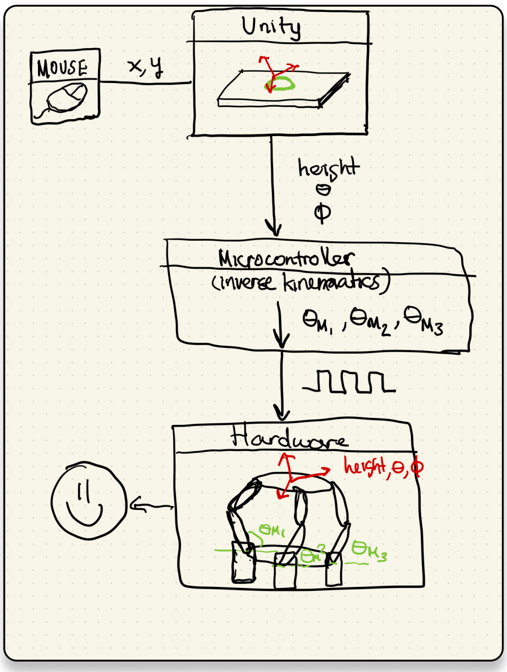
Stewart Platform (3DOF)
Designed, implemented, and photographed by **Abena**

Design goals

Our goal was to develop a two handed device to be used with an off the shelf mouse for maximum incusivity. The design was inpsired my Microsoft's NormalTouch, a device used to provide haptic feedback in VR environments.



Inspired by
Microsoft **NormalTouch**



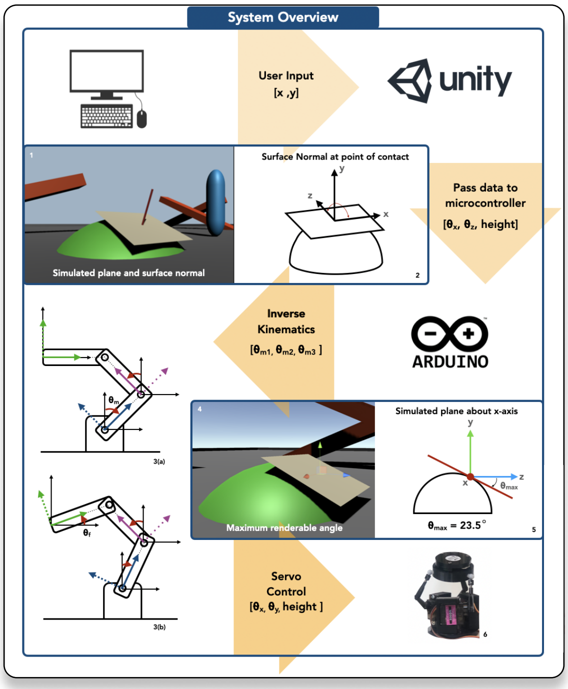
Early sketch

Strategy

Our strategy was to attack the problem from both ends. Abena's role was to work out the inverse kinematic equations and to design and construct the platform. My role was to develop the user-interface, firmware, and implement the inverse kinematics, all of which I learned as we went along.

Implementation

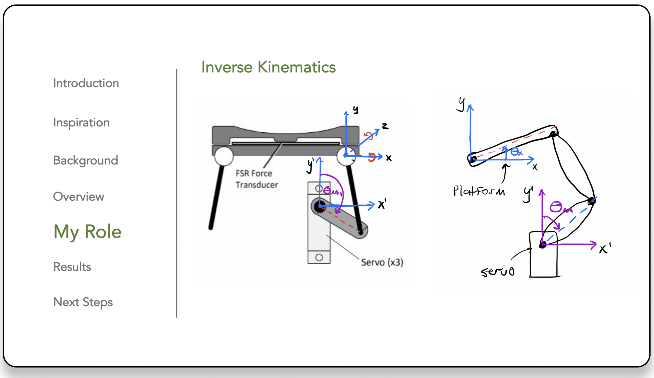
Using Unity game engine, I created an environment meant to simulate a finger passing over a surface. The 2D mouse inputs are converted into 3D values representing plane angles and height, which are passed along to the Arduino, where are then converted to output angles using inverse kinematics.

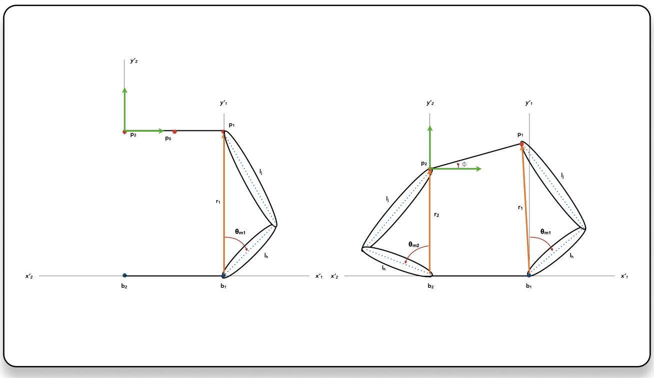


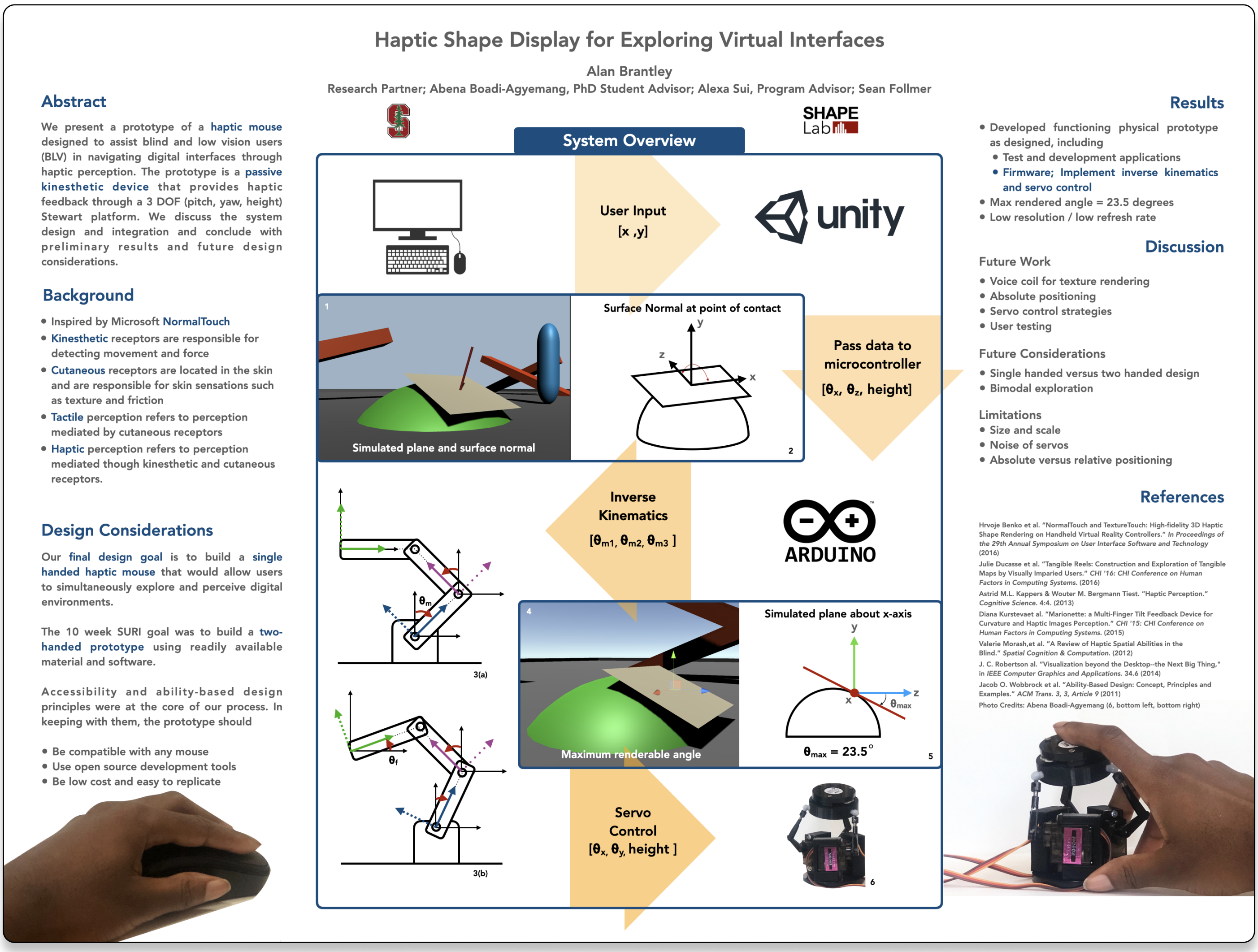
I/O Pipeline

Communication

A key responsibility as a SURI researcher involved communicating results regularly, both to the larger SURI community, and the Shape Lab design group. My personal goal for the summer was to advance my develop in **science communication** and **visual design**. I gave special thought and effort into *how* I presented my findings to the community.







Poster Presentation