

Final Report

Team D0

Accessibility Pi-0

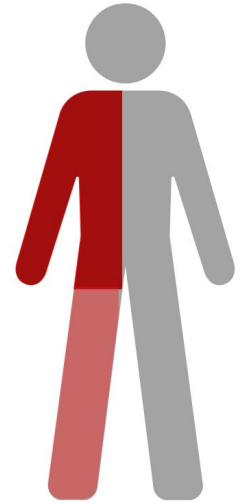
Ji Chang
Jorge Tamayo
Carlos Armendariz





Use Case

- Keyboard & mouse accessibility
- Disabilities, such as cerebral palsy
 - Most common form is spastic hemiplegia
 - Can use one arm and one leg
- Solutions are expensive and not open source
 - Or cheaper and very generic
- Limited keyboard/mouse combination options
- Designing solution covers software and circuitry



Hemiplegia

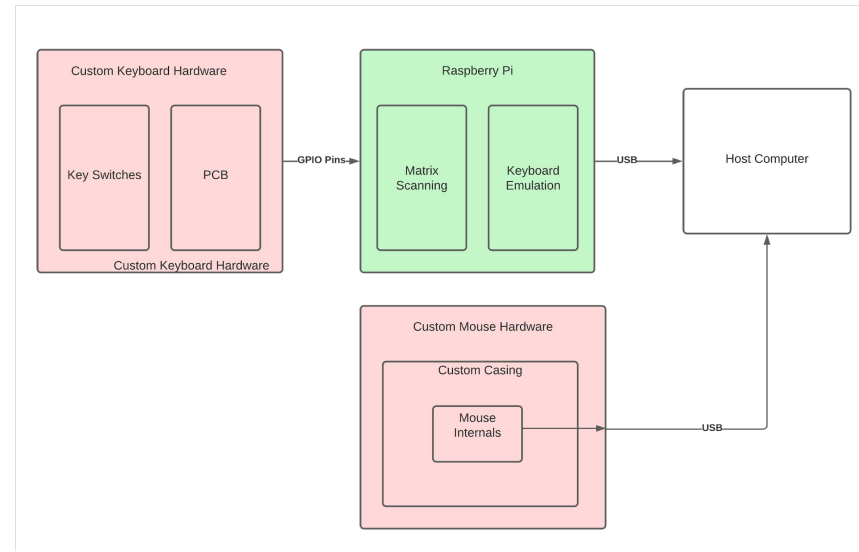
More

Less



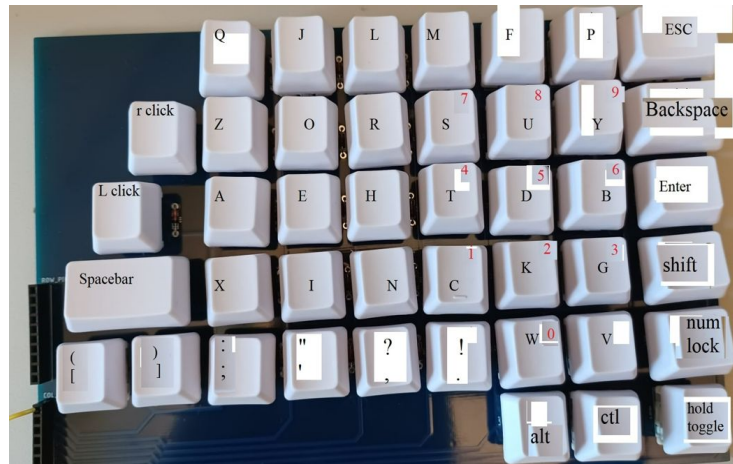
Solution Approach

- One-handed keyboard, one-footed mouse
- Linear key switches, easiest to press
- Toggle keys rather than hold press keys
- Hold toggle key
- Had to ditch keycap sizes, instead use key guard
- Right-handed Dvorak



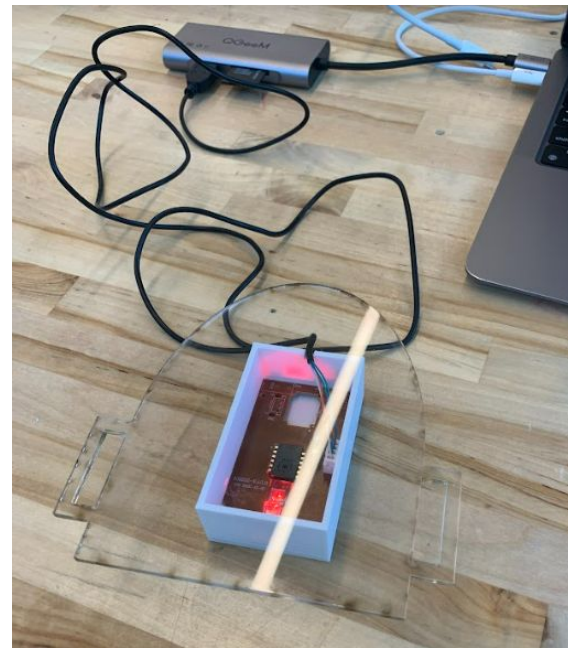
Complete Solution

- Fully-functional keyboard with every letter and some punctuation
 - All the 'shift' keys; shift, num lock, alt, ctl, hold toggle, etc.
- Mouse, right foot
- Can't touch-type yet
- Random sentence from Simple English Wikipedia
 - Look at WPM, errors
- Could not find someone to perform verification testing, so validation only



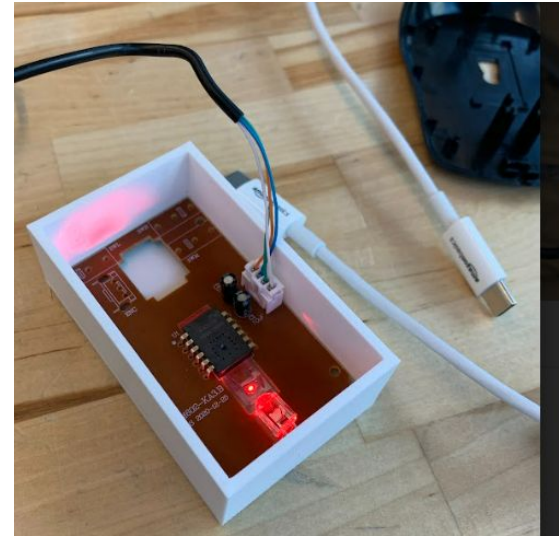
Test

- Our goal is to create a keyboard and mouse setup that can be operated with one arm and one leg rather than two arms
- So for validation, we will each type a randomly selected sentence from Simple English Wikipedia
- We cannot do verification
 - We tried emailing Community Living & Support Services (CLASS), but they never responded
 - This also means that we can't see how hold press toggle helps
- Tested basic functionality
 - Mouse works
 - Keys generally work, just require mapping



Trade-offs

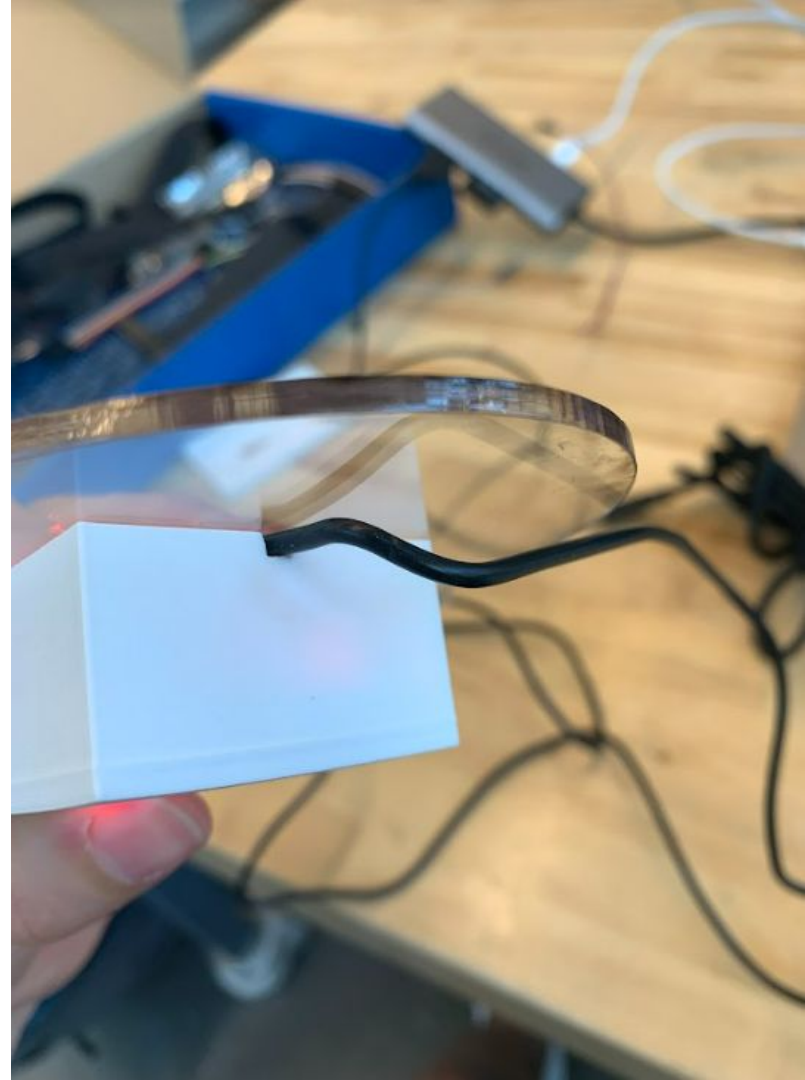
- Bought keycaps rather than printed; faster, easier, and cheaper than 3D printing
 - Concerned about key sizes
 - So we added an optional keyguard
- Used Raspberry Pi instead of micro-controller for matrix scanning
 - Easier to program
 - Uses more power, takes up space
- Original Mouse Design
 - easier to implement
 - more fine motor control





Features

- Detoggling keys through software and special key on our keyboard
 - Makes it easier to use with keyguard
 - Single press, like phone keyboard, rather than hold press
- One handed design and key layout
 - layout based on one handed keyboard research
- Foot mouse used for cursor tracking
 - Allows use with one side of the body for all keyboard/mouse uses





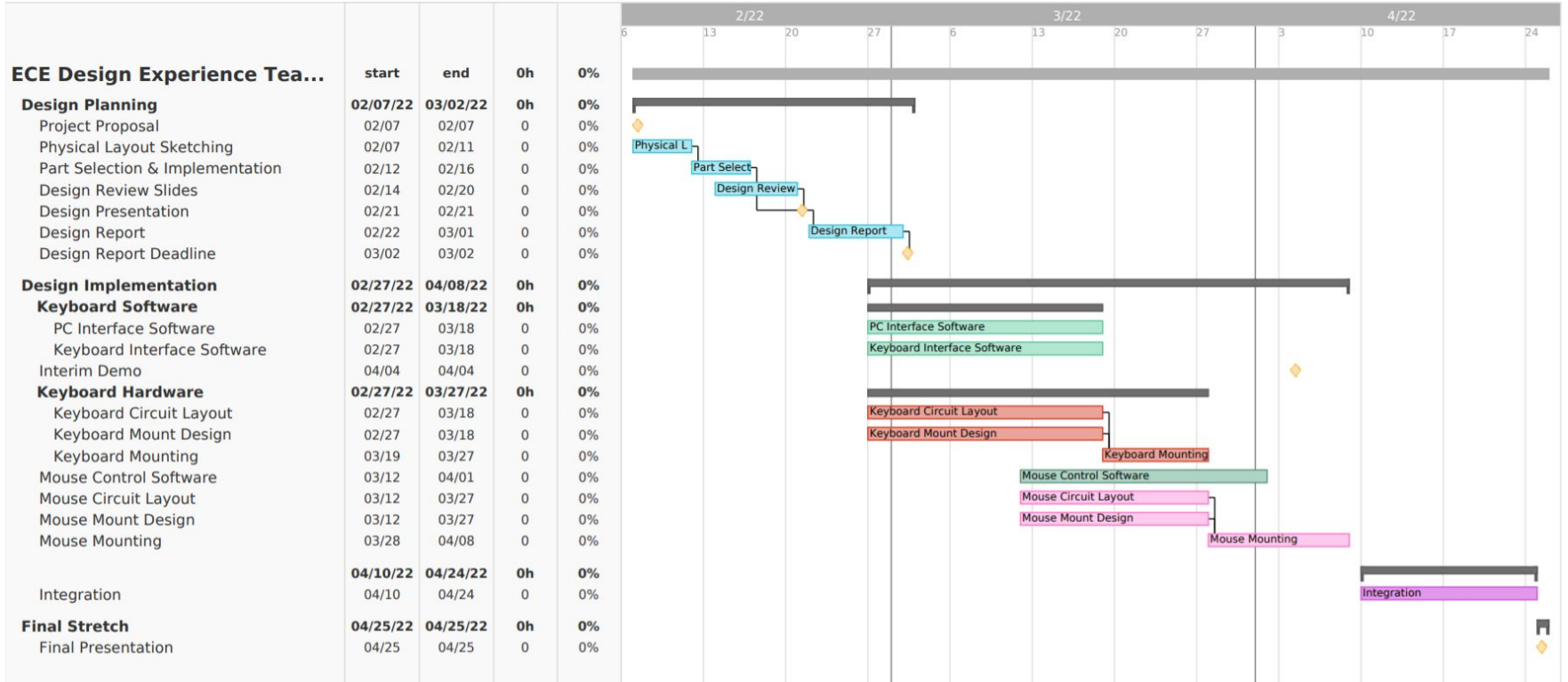
Demo Plans

- Showcase functionality with typical applications and games
 - Minecraft
 - Text to speech
 - Emailing and Document writing
 - Internet Browsing and Day to Day use
- Showcase the ability to do typical day to day tasks with ease
- Hopefully comfortable and easy to use





Original Schedule





Delays & Work to be finished

- Software issues taking longer than expected
 - delaying progress on gant chart
 - No reach out from CLASS regarding test persons
 - Week lost due to sick team
 - Manufacturing time for housing and shipping delays
 - Push back for integration time
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- Fix small issues with software
 - Fully map the keys
 - Test everything thoroughly for demo
 - Do more thorough error correction testing