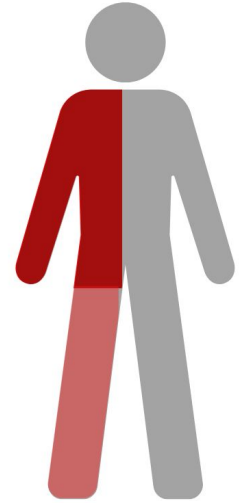


Accessibility Pi/O Design Review

Carlos Armendariz, Ji Chang, Jorge Tamayo

Use Case/Application

- 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

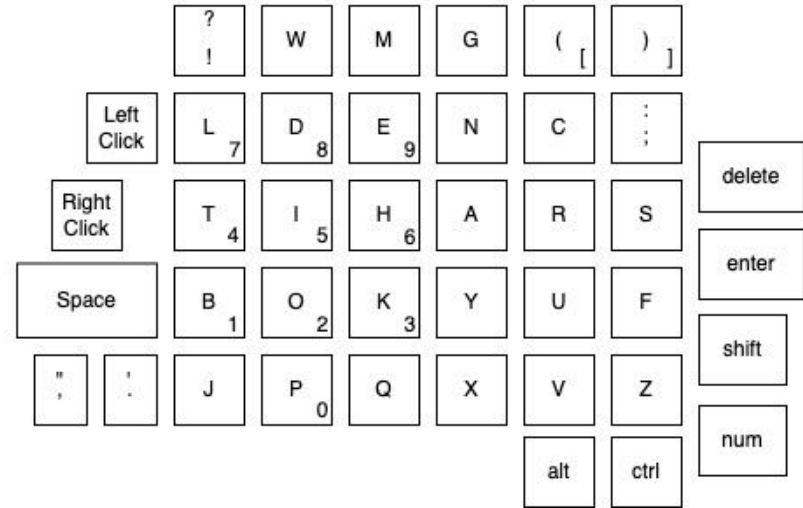
Quantitative Use-Case Requirements

- 30 WPM
- 74 characters supported
 - 26 letters (upper and lowercase), 10 digits, space, enter, punctuation at minimum
 - desired punctuation: (:.,!?"-'
- Reduce Rate of Common Errors
- Below \$200 to reproduce
- Comfort metrics based on Survey

Solution Approach:

- Software & Hardware solutions to common errors
 - Toggle Switches for key combinations
 - Software recognizing miss-inputs
- Ergonomics
 - Design reasonable size
 - Custom key layout for use of one hand

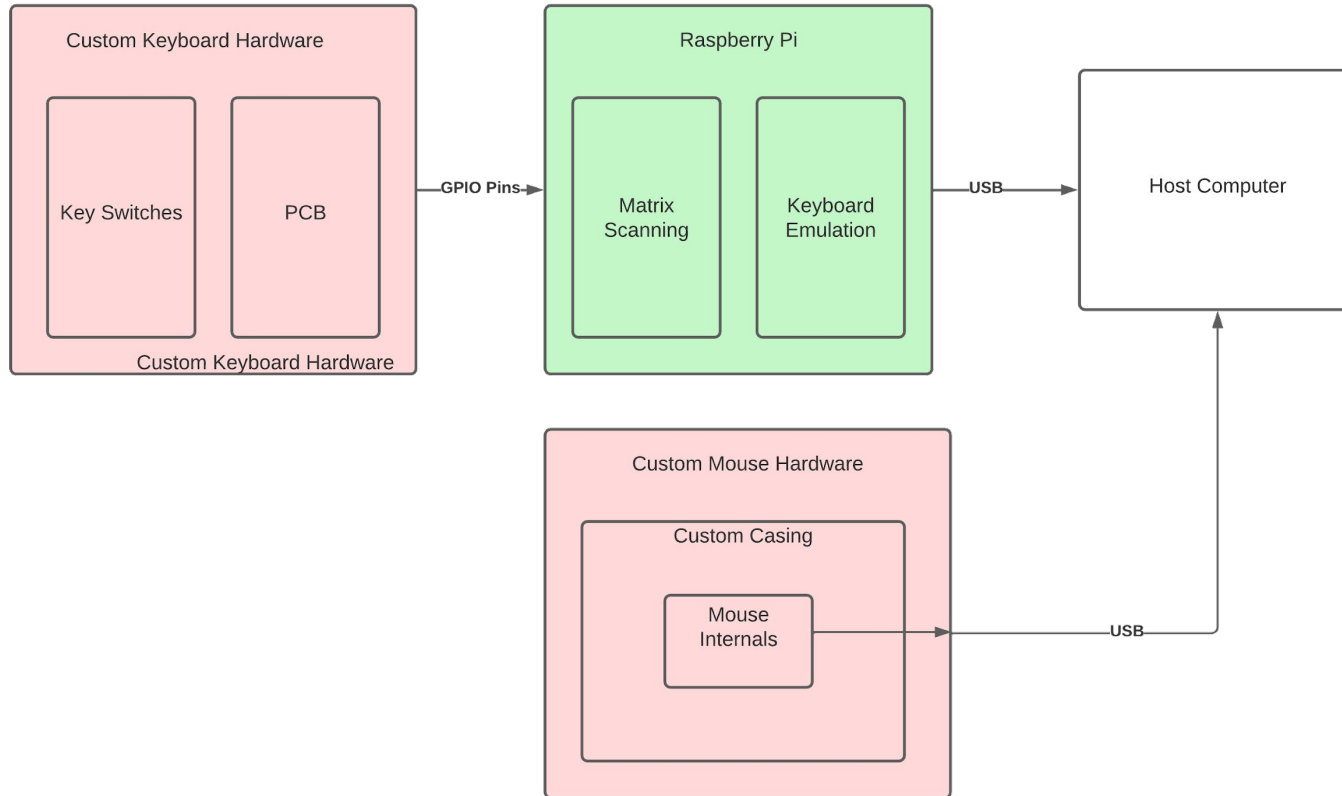
Preliminary Layout



System Specification / Block Diagram

- Linear Key Switches
 - easiest and most comfortable to press
- Custom Matrix Scanning keyboard
 - allows us to make the most use out of limited input
- ~20mm keycaps, about 30% bigger than usual
 - more comfortable with one hand while not being unwieldy
- Mouse foot control
 - allows simultaneous input
 - Straps to foot like a sandal, probably velcro
- Self-Deactivating Toggle Switches

Block Diagram



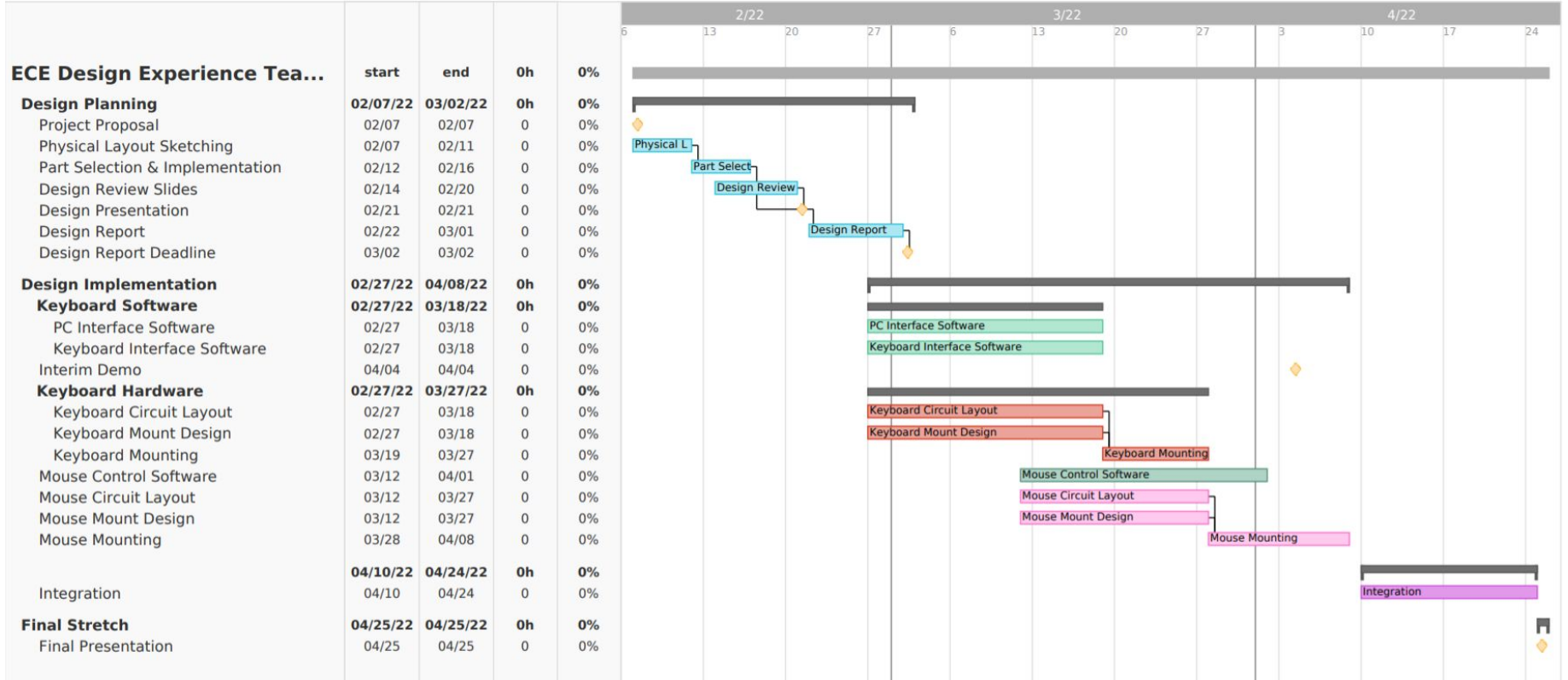
Implementation Plan

- Bought items
 - Raspberry pi
 - Linear key switches
- Designing and developing
 - Keyboard PCB
 - Keycaps and housing
 - Mouse Housing
- Libraries Used
 - gpiozero
- Assembling
 - Foot Controlled Mouse

Test, Verification and Validation

- Comfort & Use Survey
 - testing WPM
 - On one simple text and one complicated text
 - Gauge whether certain key presses are difficult to perform
 - 7 or higher average positive responses out of 10
 - WPM minimum of 30
 - No or few typing errors
- Rate of Common Errors
 - Long key press error as priority
 - Additional Key errors
 - Missing key errors

Schedule



Project Management

- Software - JT, CA
 - Receiving key signals from I/O and sending to external computer via USB
- Designing hardware
 - Keyboard circuit design - JC, JT
 - Mount for Keyboard - CA
 - Mouse circuit design -JC, JT
 - Mount for Mouse - CA
- Build and Integration - Everyone

Final Thoughts

- Progress is on pace
 - Important to work ahead on the early stages
 - May need redesigns in the future
- Next Steps
 - Meet with HCI Professor
 - Emulate Keyboard on Pi
 - Breadboard prototype for testing
 - Preliminary Layout PCB for keyboard
- Obstacles
 - need flexibility in case design changes