# Final Report Team DO Accessibility Pi-O

Ji Chang Jorge Tamayo Carlos Armendariz

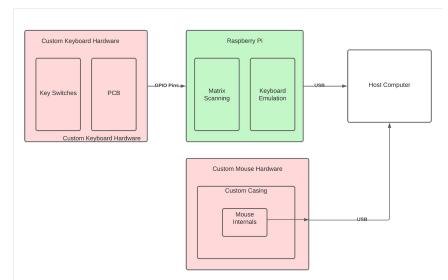
# Use Case

- 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



# **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

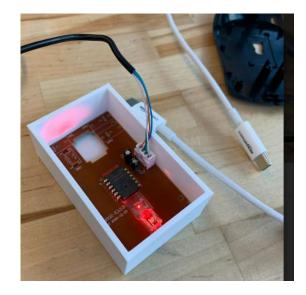
- Our goal is to create a keyboard and mouse setup that can be operated with one arm and one leg rather than two arms
- So for validation, we will each type a randomly selected sentence from Simple English Wikipedia
- We cannot do verification
  - We tried emailing Community Living & Support Services (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**

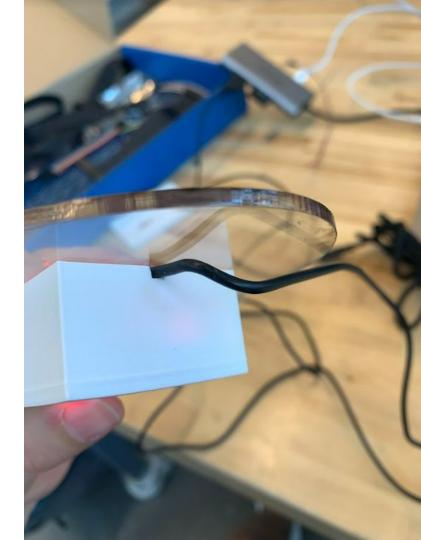
- Bought keycaps rather than printed; faster, easier, and cheaper than 3D printing
  - Concerned about key sizes
  - So we added an optional keyguard
- Used Raspberry Pi instead of micro-controller for matrix scanning
  - Easier to program
  - Uses more power, takes up space
- Original Mouse Design
  - 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
- $\circ \qquad {\sf Text \ to \ speech}$
- 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**

					2/22								
					6 13 20	27	6 13	20	27	3	10	17	24
CE Design Experience Tea	start	end	0h	0%									+
Design Planning	02/07/22	03/02/22	0h	0%									
Project Proposal	02/07	02/07	0	0%	•	2,54							
Physical Layout Sketching	02/07	02/11	0	0%	Physical L								
Part Selection & Implementation	02/12	02/16	0	0%	Part Select								
Design Review Slides	02/14	02/20	0	0%	Design Review								
Design Presentation	02/21	02/21	0	0%	L – – – – – – – – – – – – – – – – – – –								
Design Report	02/22	03/01	0	0%	l l	Design Report							
Design Report Deadline	03/02	03/02	0	0%									
Design Implementation	02/27/22	04/08/22	0h	0%				_					
Keyboard Software	02/27/22	03/18/22	Oh	0%									
PC Interface Software	02/27	03/18	0	0%		PC Interface S	Software						
Keyboard Interface Software	02/27	03/18	0	0%		Keyboard Inte	erface Software						
Interim Demo	04/04	04/04	0	0%									
Keyboard Hardware	02/27/22	03/27/22	Oh	0%									
Keyboard Circuit Layout	02/27	03/18	0	0%		Keyboard Circ	uit Layout	Ъ					
Keyboard Mount Design	02/27	03/18	0	0%		Keyboard Mou	unt Design						
Keyboard Mounting	03/19	03/27	0	0%				Keyboard M	ounting				
Mouse Control Software	03/12	04/01	0	0%			Mouse C	ontrol Software					
Mouse Circuit Layout	03/12	03/27	0	0%			Mouse C	rcuit Layout	1				
Mouse Mount Design	03/12	03/27	0	0%			Mouse M	ount Design	-				
Mouse Mounting	03/28	04/08	0	0%					Mouse M	lounting			
	04/10/22	04/24/22	Oh	0%								_	-
Integration	04/10	04/24	0	0%							Integration		-
Final Stretch	04/25/22	04/25/22	0h	0%									
Final Presentation	04/25	04/25	0	0%									

# **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

- Fix small issues with software
- Fully map the keys
- Test everything thoroughly for demo
- Do more thorough error correction testing