

Accessibility Pi/O

D0: Carlos Armendariz, Jorge Tamayo, Ji Chang
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Electrical and Computer Engineering Department
Carnegie Mellon University

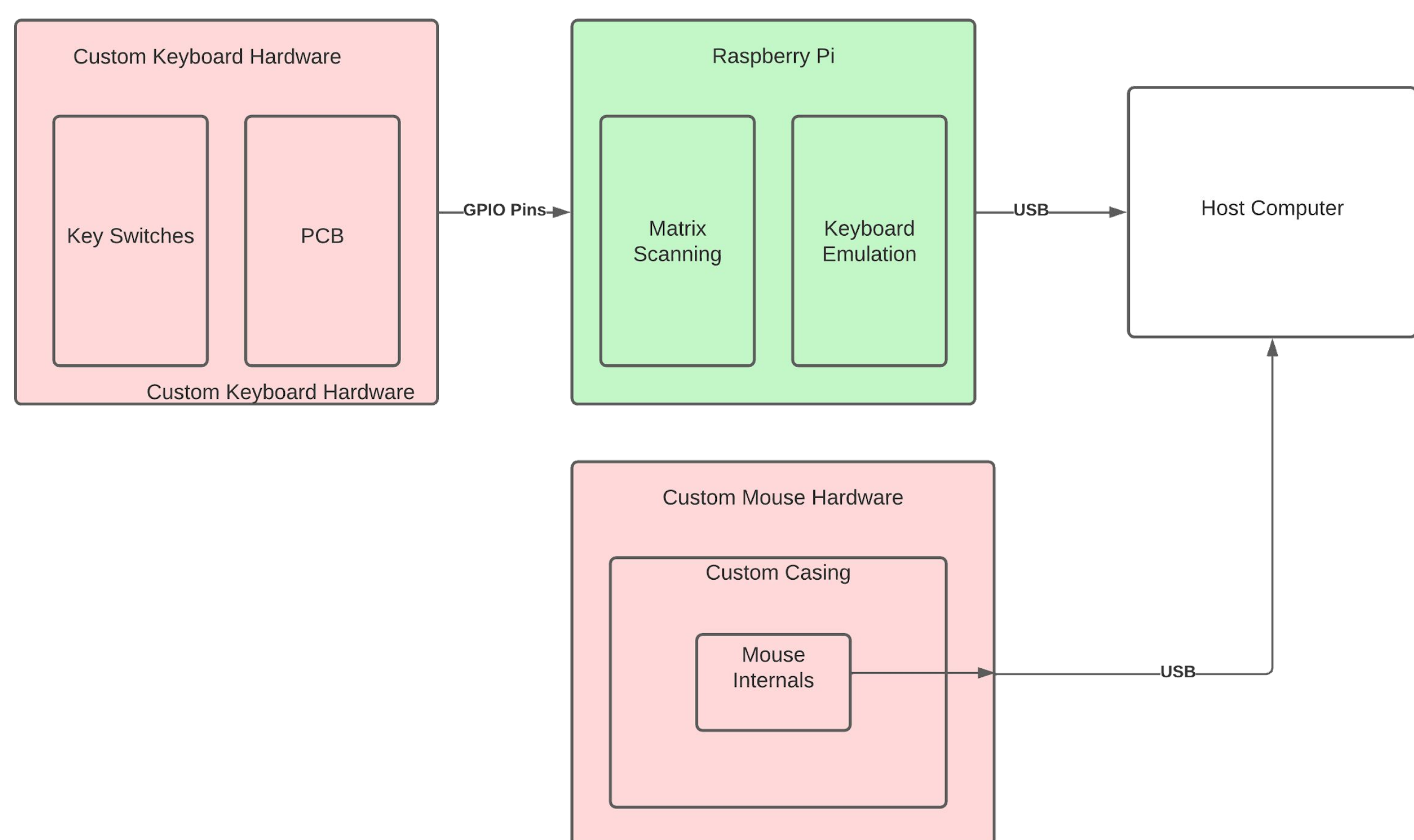
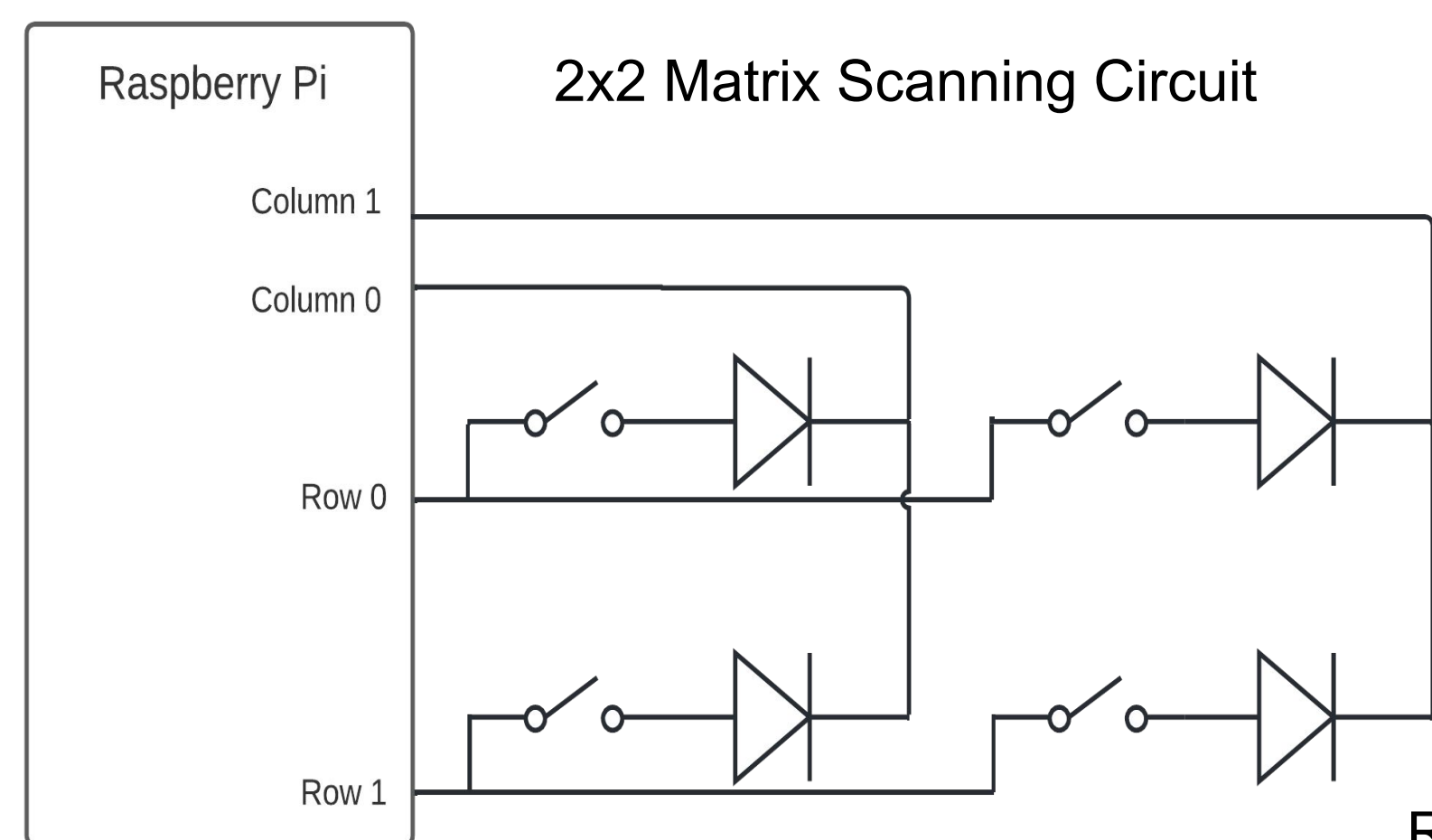
A Keyboard & Mouse for One-Handed Use

Standard computer I/O technology today, such as keyboards or mice, are designed for the able-bodied. This can create challenges for people with disabilities that impact fine motor skills. **Our goal is to make a keyboard and mouse set designed for people with Cerebral Palsy**, specifically Spastic Hemiplegia, which impairs either the right or left half of the body.

Our design allows the user to operate a computer with one arm and one leg rather than two arms. In other words, **our advantage over preexisting solutions is that the user can operate the mouse and keyboard simultaneously**. The keyboard can be operated with the right hand and the mouse can be used with the right foot.

System Architecture

Our keyboard uses a technique called matrix scanning to determine when a key is pressed. This works by using a set of row and column pins. All column pins are set to high, then one by one set to low. When a single column is set low, each row pin is checked. If the row pin is set high, then a key at that row and the currently low column is pressed. The keyboard is processed through a Raspberry Pi, which in turn connects to a computer. The mouse is connected directly to the computer.



Conclusions



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Our design met its primary goal of allowing a person to use both a mouse and keyboard simultaneously using only one side of their body. However, since we could not find any volunteers, we could not test our design's real-world use. More testing is needed to determine if our project will improve the lives of people with Cerebral Palsy.

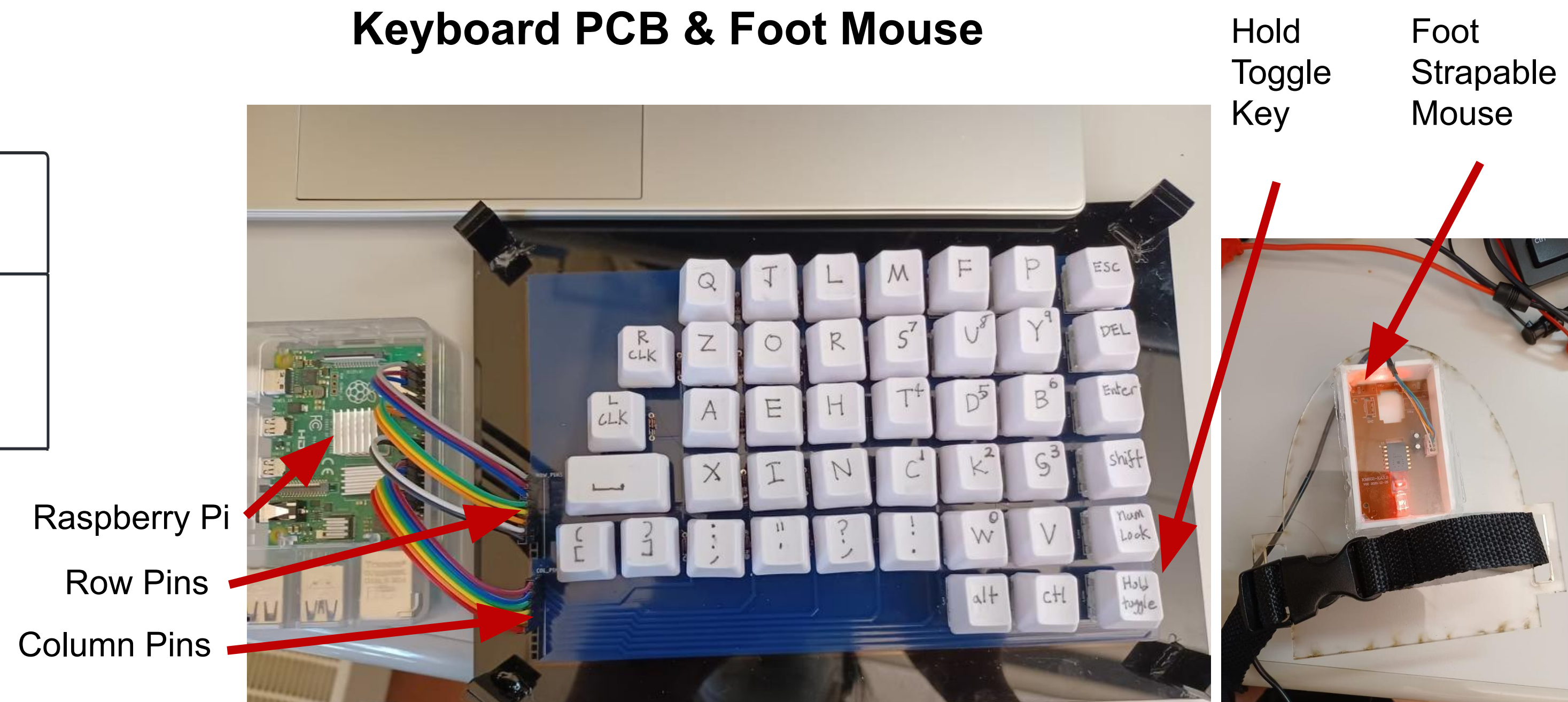
System Description

Key presses are detected and relayed to the computer using software run on the Raspberry Pi. The software also contains features that alter the functionality of other keys, such as Shift and our Hold Toggle key. The most common typo for persons with Cerebral Palsy is the hold press error, which is when the user presses a key longer than intended. By default, our keyboard reads a held press as a single press. The Hold Toggle key allows the user to turn this on or off.

The keyboard is made up of an array of switches and diodes connected on a PCB. The Pi rapidly cycles through columns in the array; when a key is pressed, it is detected on the row. The Pi then uses both row and column to determine the key.

Our foot mouse and one-handed keyboard provides the full functionality of a standard keyboard and mouse to those who can only use side of their body.

Keyboard PCB & Foot Mouse



System Evaluation

Our system is meant to emulate the standard keyboard and mouse as closely as possible, so we tested to see how easily we could perform simple and common computer tasks.

Our tests include:

- Selecting a random article on Simple English Wikipedia and then typing a random sentence
 - WPM and error rate (with allowances for unfamiliarity)
- Performing basic actions on Minecraft
- General web browsing
- Text-to-speech programs

We were unable to test our design with someone from the target demographic. We tried to reach out to the organization Community Living & Support Services (CLASS) for volunteers with Cerebral Palsy, but they never responded. So we could only do verification testing.