Project Identity

Freely Adjustable and Accessible Keyboard and Arrow Pad for Client with Cerebral Palsy

Work Completed

Last Wednesday we met with client contact, Miriam Kurland, and the rest of the staff that assist Sam. The client’s team decided on several changes that would best fit Sam’s condition and accommodate his new electric wheelchair. The sliding tray idea of the keyboard will not be used, therefore the 80/20 industrial erectors will not be necessary in this project. The team would like the keyboard to tilt to a possible 45 degree angle. In addition, the client’s current setup of a barbell suctioned to the desk next to the keyboard must be modified. Figure 1 displays the current condition.

![Image of keyboard and barbell]

Figure 1: Keyboard and Barbell

The barbell functions as a support for the client in his seat. His left hand holds on to the barbell as he types or navigates the computer. The problem with this, despite its tacky nature, is the suction and barbell combination is not stable. The devices slides around slows down his communication process. Despite the setback of having to further alter the design, there were some advantages to this change. Since 80/20 will not be necessary, time and money should be saved on our project. The keyboard will no longer have to be mounted or required to slide out.

After the meeting time in the lab was spent creating a final design for the keyboard layout. We have determined how to incorporate mouse-like buttons onto the keyboard which the staff thought would be very beneficial to the client since his condition hinders his use of the standard computer mouse. Certain buttons on the keyboard will allow the mouse to left click, right click, double click, and navigate up, down, left or right. The navigation buttons can also be set to a specific sensitivity, from a fine level of 1 to a course increment of 127. For the purposes of our design we will most likely tend towards a more fine increment in the navigation buttons. This will enable the client to be more precise and accurate. Also, the necessary keys were determined and arranged in the most
accommodating display for the client. Figure 2 below is the new keyboard design layout with dimensions.

There are 5 rows and 12 columns each containing keys that are 0.7 inches in diameter. The spaces between the keys to minimize inaccuracy, will be 0.3 inches. The total keyboard will be 11.7" x 4.7" or 54.99 inches squared. This design will be sent to the client contact for approval and other suggestions.

When the dimensions of the keyboard were finalized, we were able to determine the size of PCB needed and the cost of the PCB. Due to its dimensions 54.99 inches squared, two sheets of 20-29 inches squared on PCB express would cost approximately $105. Furthermore, I was able to begin the PCB design for the mounting of the key switches. A picture below is the first step in designing our PCB. So far it only includes the key switch mounting holes and connections. It still needs to accommodate for the diodes and control board and possibly the LED circuit.
To replace the barbell suction design currently employed by the client, Stephen and I searched online for better suction or clamp devices. However, the device that seemed to best fit the intentions of our keyboard are the Panavice suction grips found in the lab. If the upper portion (vice section) of the object were cut off, it would leave a very powerful vacuum suction piece which can be controlled with a simple lever. Two of these devices can be mounted on a sheet of the PVC purchased and subsequently mounted onto the keyboard. At $34 each, this would be an effective method towards keeping the keyboard in place. Then an adjustable handle can be placed on the side of the keyboard to eliminate the inefficient barbell suction combination. A diagram of this setup with dimensions can be seen in Fig. 4.
Figure 4: The top diagram is a side view of the setup incorporating the vacuum stand with the keyboard. The bottom picture is a front view of the setup.

Our intentions with this design is to then use two hinges in the front and attach the keyboard. This will allow the keyboard to rotate to a specified angle while still being mounted to the desk. A locking mechanism will prevent the keyboard from rotating when in place.

**Future Work**

After the setup is verified by the client contact, purchasing of the vacuum stands can be completed. The PCB express board will be designed within the next week. After that the design will be checked by Bill and ordered. From this step Stephen and I can mount the keys and begin the electrical setup of the keyboard. After the electrical setup is complete, testing and programming can begin. These next few weeks will be devoted to that since it’s the most important and difficult part of the design.

**Project Review**

Though the people who assist the client required some changes, the alterations may be simpler than our original plans. As soon as the PCB is completed and ordered, our project will be off to a good start. The female header receptacle and new cherry mx switches have not been received yet.

**Hours Worked:**

~10