Designing and building a braille keyboard

During the summer before my junior year, I decided to learn braille. I thought it would help me distinguish books I was reading for pleasure from those I was assigned in English class, which were not in braille. In addition, I was certain I could learn braille quickly for I had previously learned morse code to communicate with friends in class with appropriate blinks of the eye.

Most of my braille studies happened at lunchtime while I was attending a summer biomedical engineering class. I learned that there are three grades of braille: grade 1 which consists of the alphabet and basic symbols, grade 2 which adds some contractions to grade 1 and is the standard for books and signage, and grade 3 which includes more contractions and removes some vowels. Since school was starting up, I resigned myself to not learning contractions. But I still wanted to maintain the level of braille I had learned so I wondered if I could purchase a keyboard in braille.

With some searching, I learned that keyboards in braille ranged from relatively inexpensive to very expensive. For example, a keyboard with the QWERTY layout, and braille letters extruding from the keyboard, cost under $20. Meanwhile, more specialized keyboards could cost thousands of dollars. I realized the first type of keyboard would likely not help me learn braille as I already had that keyboard layout memorized while the second type of keyboard was too expensive for a hobby.

As luck would have it, I learned how to CAD and 3D print a prosthetic hand for my personal project in biomedical engineering. With this knowledge I realized I might be able to build an inexpensive braille keyboard and a more ergonomic one at that.

Since braille letters are formed by different arrangements of dots, I determined that all letters could be formed using only six keys each with one dot. My original plan was to create a 2x3 keyboard and then add an extra “submit” button. However, I quickly ran into a problem: the smallest motherboard I could find was for a 3x3 key layout. Thus, in addition to the “submit” key I could add 2 more keys The first key I added was the “delete” key. While having all of the dots in each cell extruded would indicate a cross out in a book, I realized that since humans have 5 fingers, it would be more ergonomic to add a “delete” key rather than press all 6 keys in the 2x3 part of the keyboard. The final key I decided to add was a “return” key.

To help visualize how this would work, here is how you write the word “den” using my keyboard where the bolded “x”’s indicate which keys you would press for each letter.

For D			For E			For N		
x	x	Delete	**x**	x	Delete	**x**	**x**	Delete
x	**x**	Submit	x	**x**	Submit	x	**x**	Submit
x	**x**	Return	x	x	Return	**x**	x	Return

Note that after pressing each letter you would hit “submit”. Pretty simple!

My project accomplished several things. First, designing and making a keyboard with only 9 keys would reduce travel time from one key to the next. Second, it was a simpler design than larger keyboards and thus easier to use for someone who is visually impaired. Finally, the overall project helped me increase my familiarity with braille as well as practice soldering and programming in C.

My next step is to take a trip to Perkins School for the Blind and get some feedback and suggested improvements. While the market for the keyboard I designed, programmed and built is relatively small, I believe it is more compact, less expensive, and even faster to type with than the inexpensive versions on the market.