



# One-Handed Chorded Keyboard

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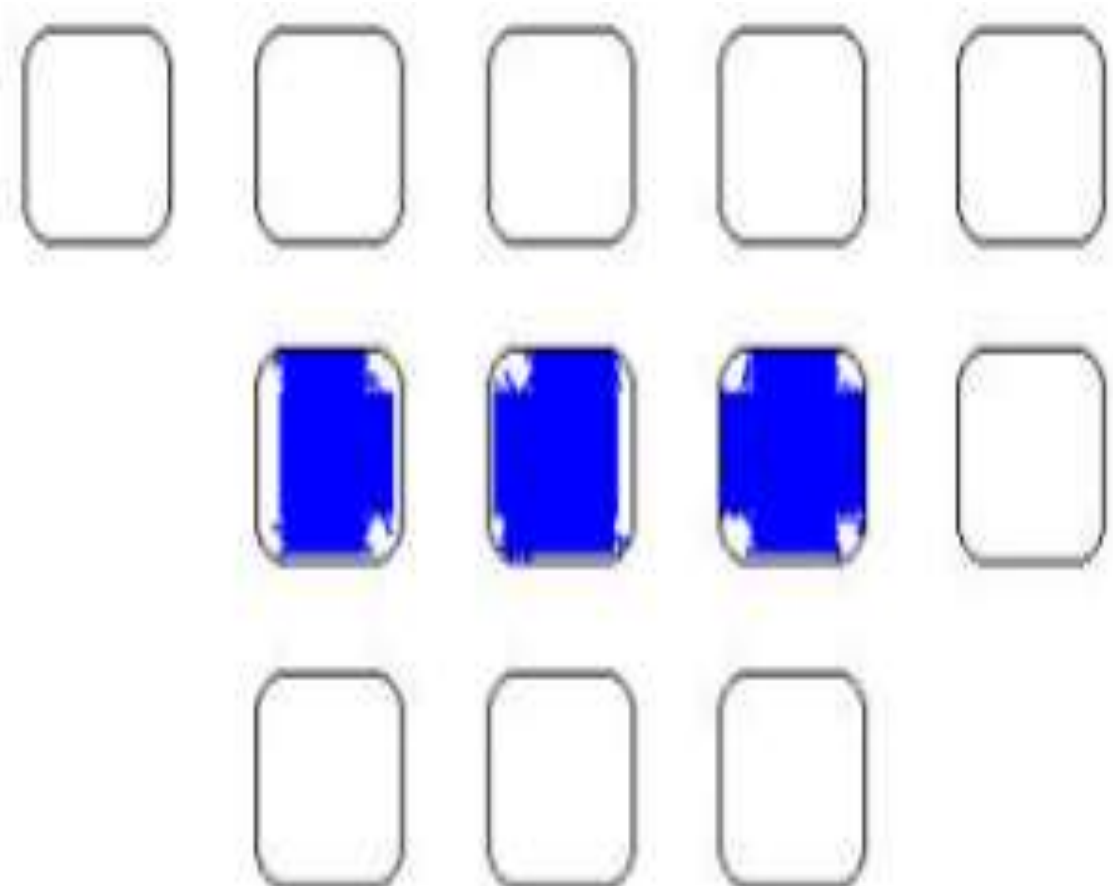


## Abstract

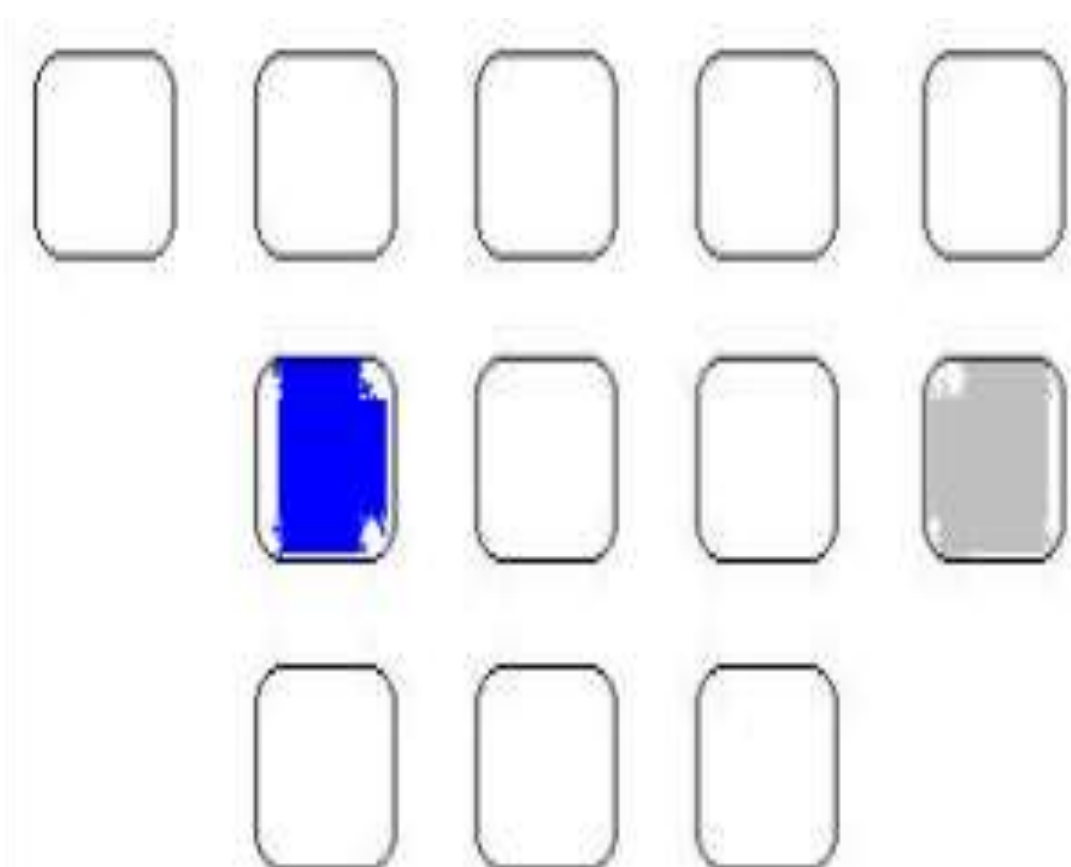
The objective of this project was to create an operational one-handed chorded keyboard design. The design of the keyboard was to be geared towards individuals with only one hand or those that could only use one hand to type because of some disability or illness. The overall goal evolved into creating a design that could maximize typing efficiency and be ergonomically suitable for the user as to provide as much comfort as possible. The keyboard was created with the use of three key elements: 3D rapid prototyping technology, microprocessor technology, and circuit fundamentals. The physical casing of the keyboard was developed in an AutoCAD program and then created with the use of a plastic 3D printer. The microprocessor used enabled the keyboard to perform all of the necessary tasks to allow the user type on to a computer. The circuitry of the keyboard consisted of a printed circuit board (PCB) and customized switches for the keys. The test results of this keyboard that were successful were the word processor compatibility, weight, microcontroller test, switch test, and the USB power supply test. The ease of use test, typing speed test, and the all inputs test was not completed due to programming issues that have yet to be resolved.

## Background

- Goals to be accomplished
  - Affordable
  - Ergonomically suitable to 95% of population
  - Compatible with most word processing programs
  - Able to type the most common inputs for everyday typing
  - Easily carried to be used at the user's discretion
- Chorded keyboard - requires multiple key presses to make one character
- Keyboard layout – based on Dvorak layout
- Keyboard design **does not** include function keys and non-essential symbols
- Extended Chorded Keyboard Design
  - 12 keys
  - Hand Angle  $\approx 45^\circ$
  - Right Handed



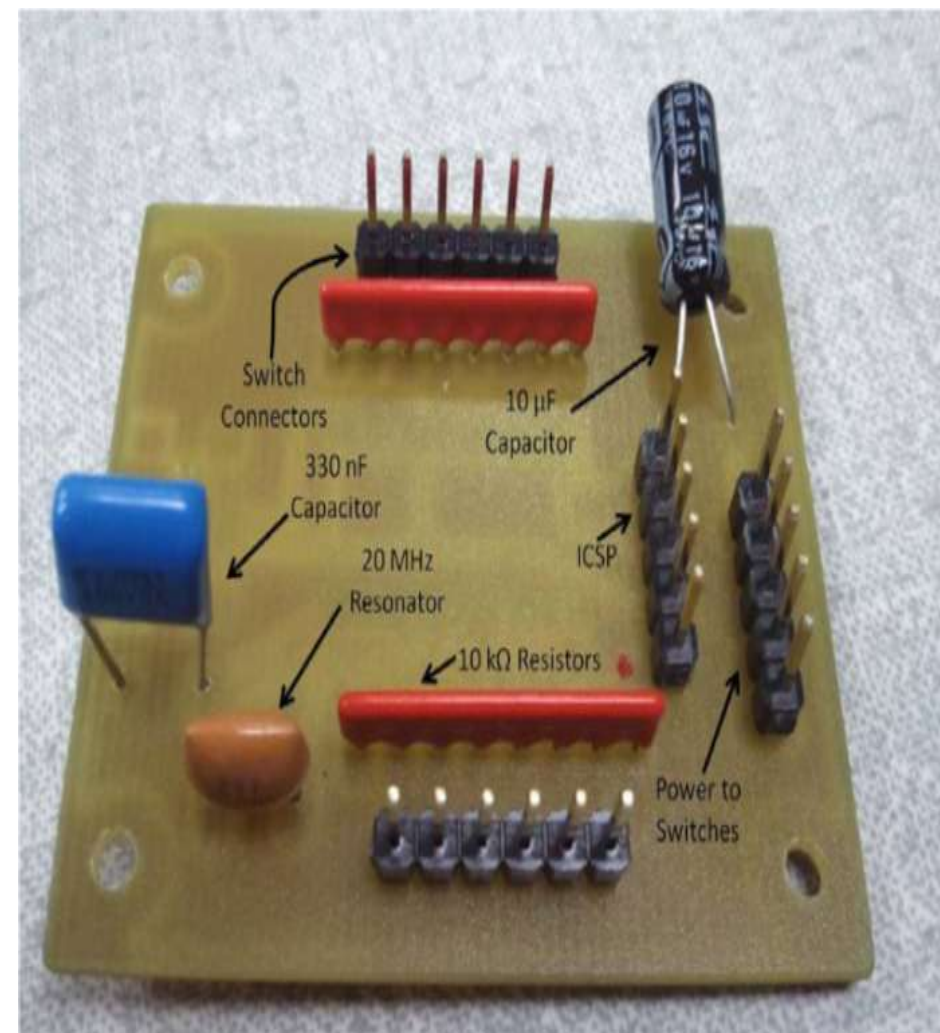
**Enter function**



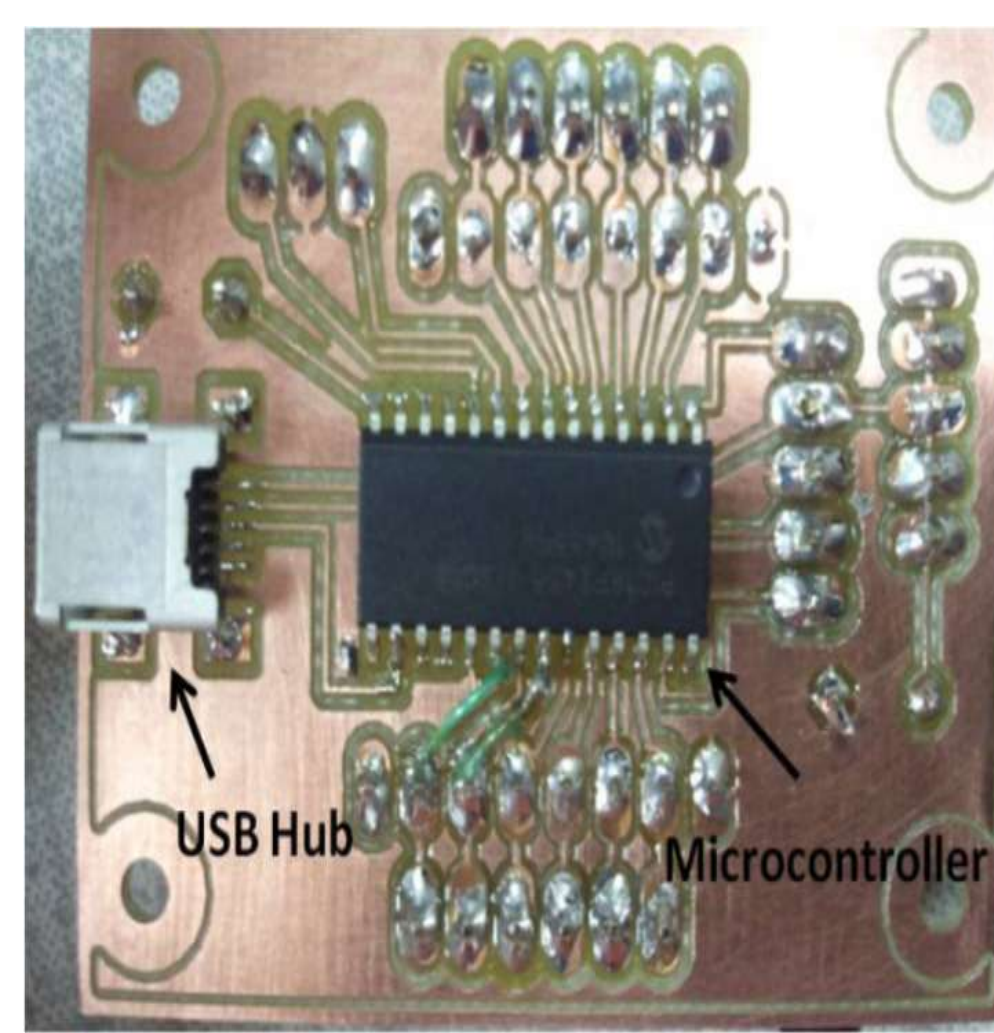
**Period (.) symbol**

## Construction

- Circuit Key Elements
  - Microcontroller
  - USB Hub
  - In-Circuit Serial Programmer (ICSP)
  - 20 MHz Resonator
- Final circuit design was created on a printed circuit board (PCB)

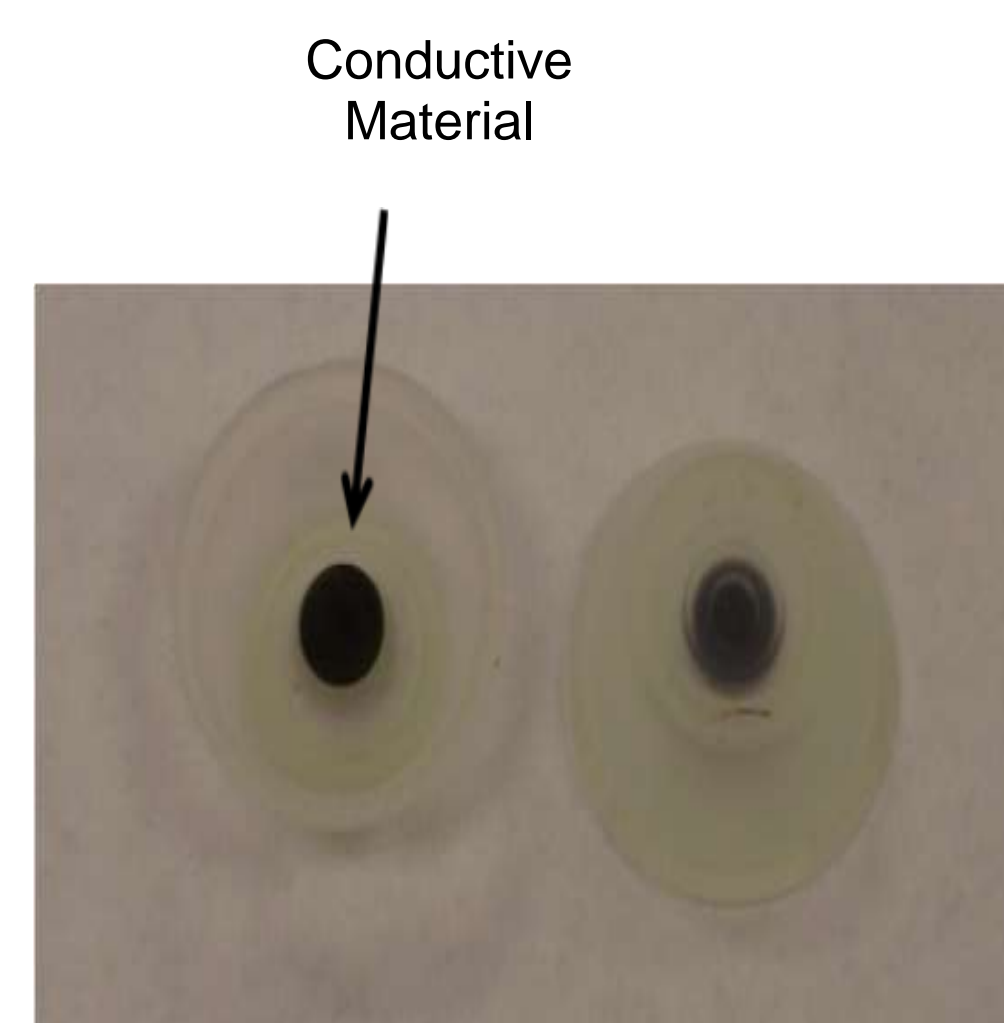


PCB Top



PCB Bottom

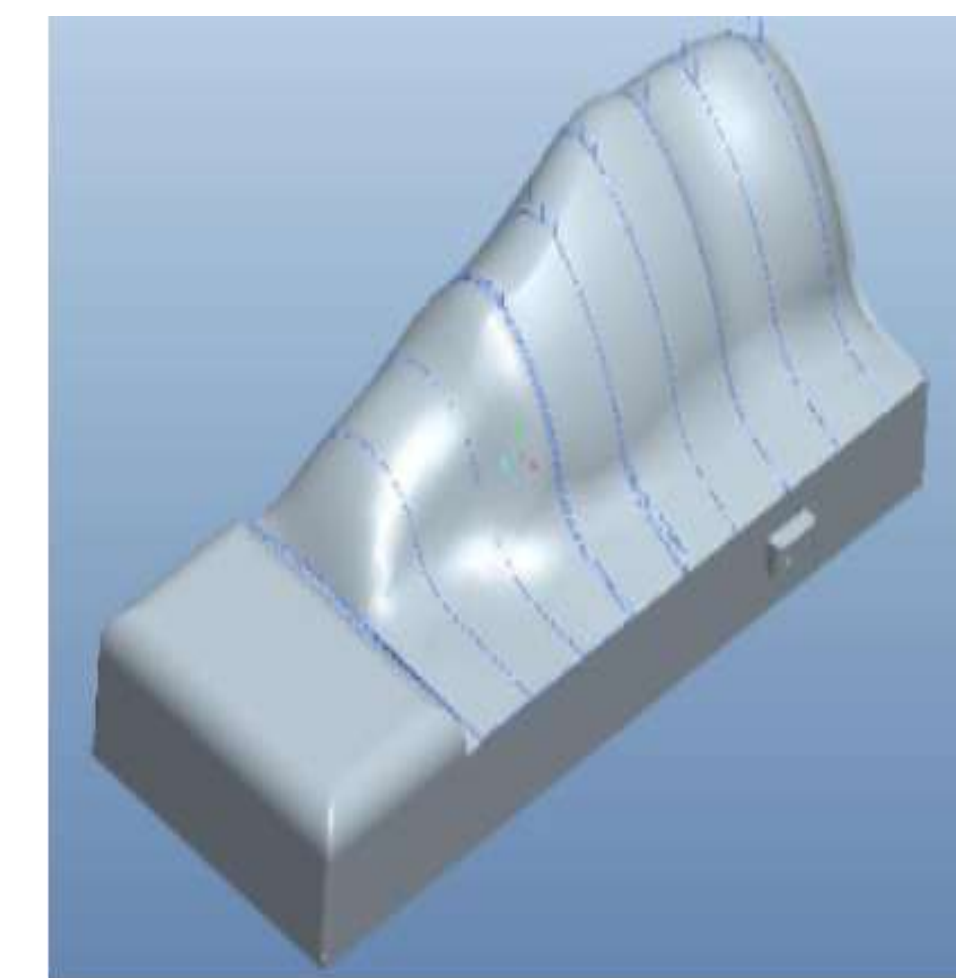
- Switch Key Elements
  - Plastic domes from older keyboard design
  - Reused housing for the plastic domes
  - Circuit switches from an old electronic translator
- Conductive material of dome completes circuit of the switches



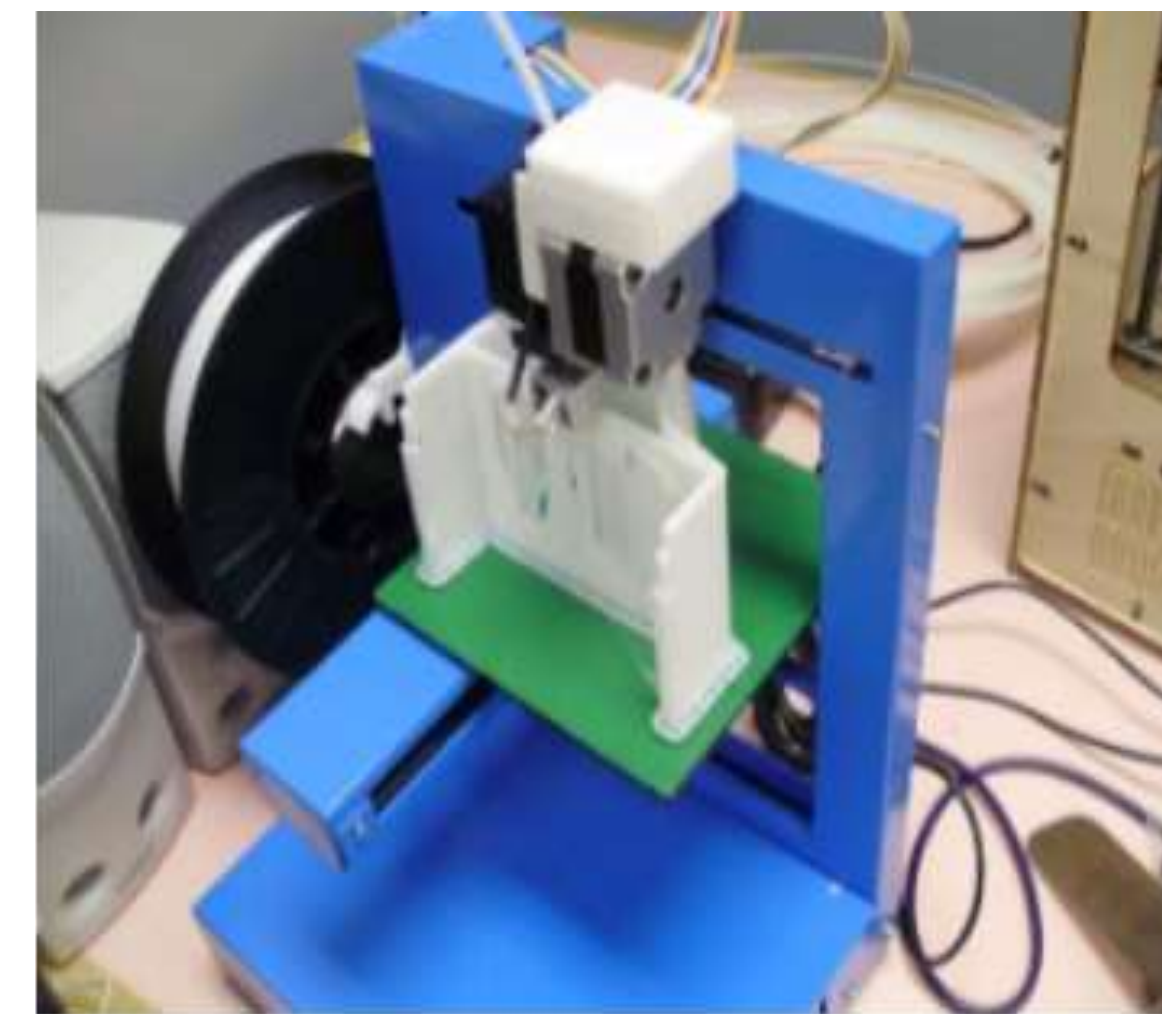
- Programming Key Elements
  - 18F2455 Microcontroller
  - PIC C Compiler
  - PICKit 2 Programmer (ICSP)
- Polling scheme used to detect key presses
- PICKit 2 writes compiled hex code to microcontroller



- Casing Key Elements
  - ABS 3D Printer
  - Pro/ENGINEER 3D modeling software
- Casing created in 7 parts
- Assembled using rotary cutting tools and hot glue



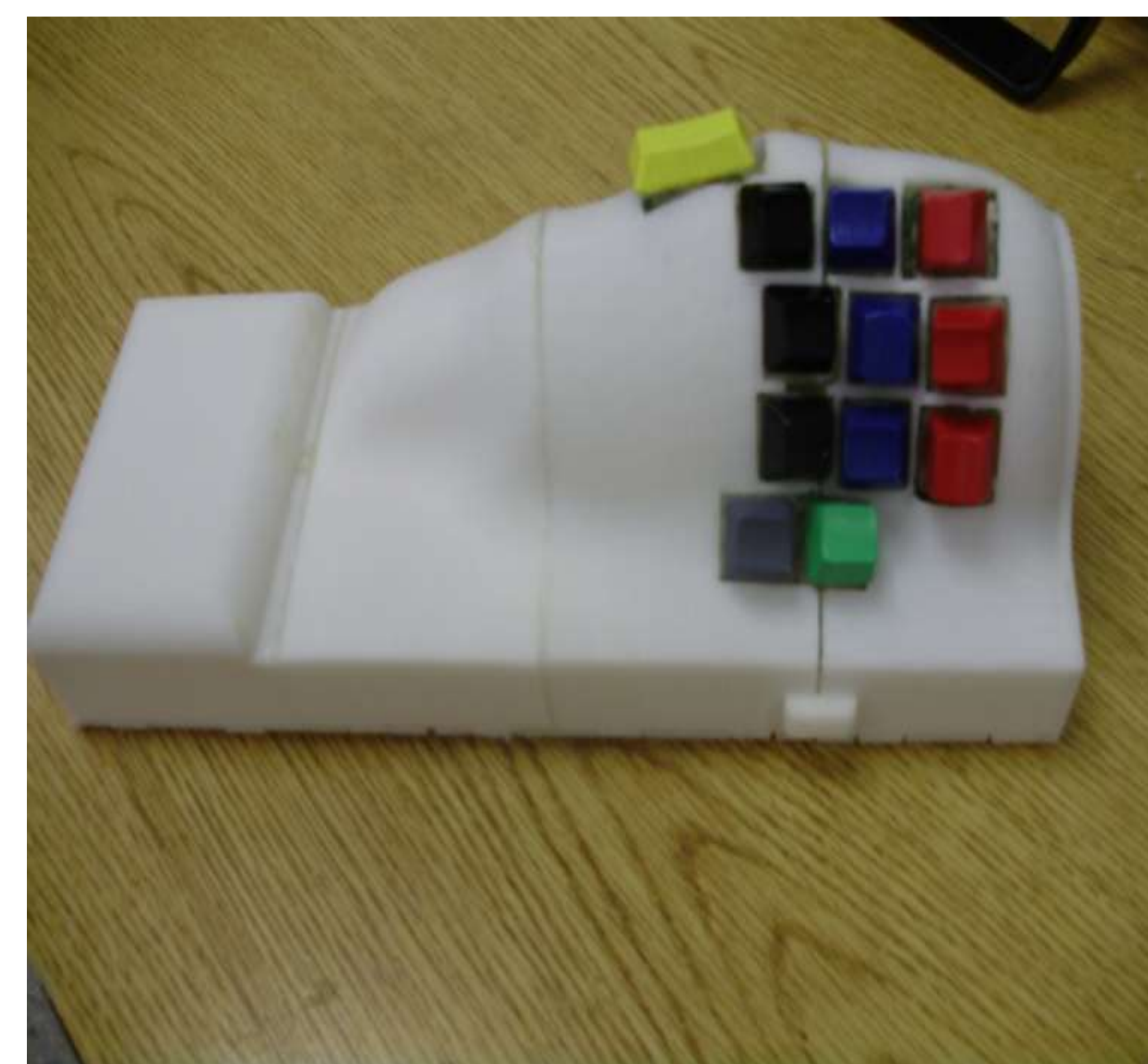
AutoCAD Drawing



ABS 3D Printer

## Results

- Finished Design
  - Colored keys for ease of learning
  - Wrist support
  - Hand contour
  - Different key shapes
  - Attachments on side for easy access to electrical components
- Tests
  - Word Processor Compatibility (✓)
  - Weight (✓) (0.89 lb)
  - Microcontroller Operation (✓)
  - Switch Operation (✓)
  - USB Power Supply (✓) (0.5 W)
  - Ease of use (X)
  - Typing Speed (X)
  - All inputs (X)



## Conclusion

- Continue troubleshooting program and PCB
- Finish testing after issues are resolved
- Design alterations (pre-production)
  - LEDs for shift and mode keys
  - Carrying case for keyboard
  - Redesign construction phase

## Acknowledgements

Dr. O'Brien, Dr. Moody, Dr. Barnett, Dr. Jenkins, & Eric Daine