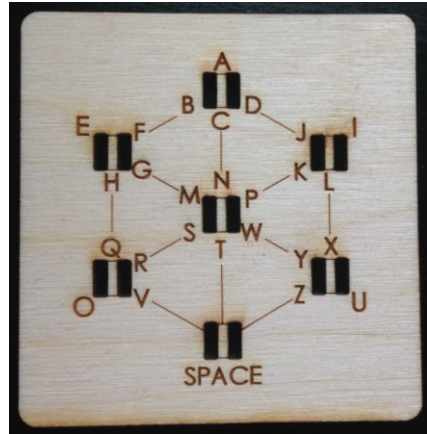


Text entry technique: Hexagonal MessagEase

MessagEase was chosen as it can allow the user to easily access many characters. It is usually used with the 12-key input for phones. In this hexagonal arrangement, 7 buttons can allow access up to 31 inputs. Since the redbear Duo has 7 serial pins, this also makes wiring and programming relatively straightforward.



The MessagEase method requires 2 key strokes to enter most characters. When a button is pressed for the first time, the user gains access to the characters localized to that particular button. The second button press then finalizes the character to be input. For example, to input letter M, the middle button is first pressed, followed by a subsequent pressing of the E-F-G-H button.

Character recognition

Basic idea:

First and second button press are stored as integers, which are then used to access the characters stored in each row/column of a pre-initialized 2D array.

Detecting HIGH state:

In the main void loop, all 7 pins (internal pull ups) are scanned to check if any pin is HIGH. If any pin is HIGH, the code then enters a secondary loop. Else, the code continues to loop scan all 7 pins.

Debouncing:

If any pin is HIGH, a timer is started and runs as the pin stays HIGH. The HIGH signal is interpreted as an actual button press when it remains HIGH for a preset time of 10ms. Otherwise timer is reset and code returns to main void loop.

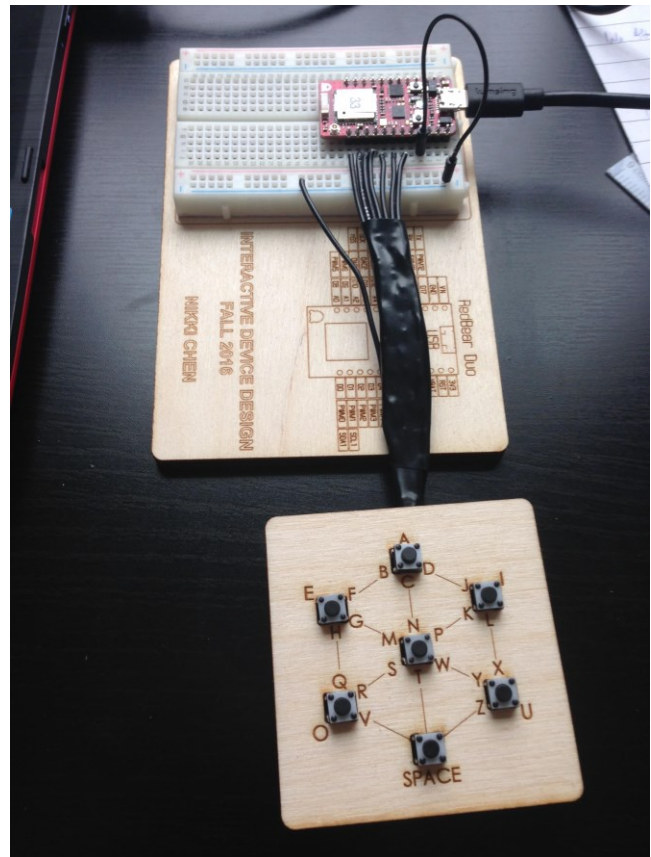
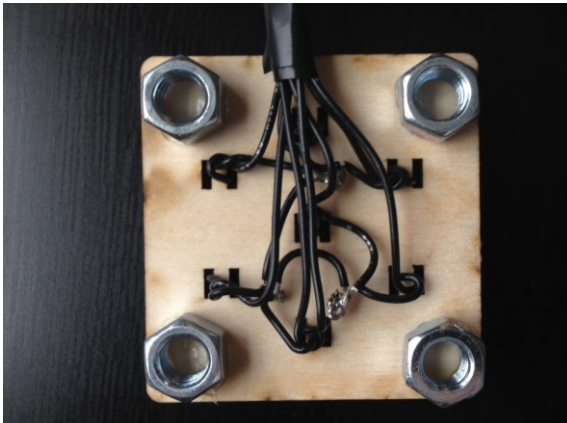
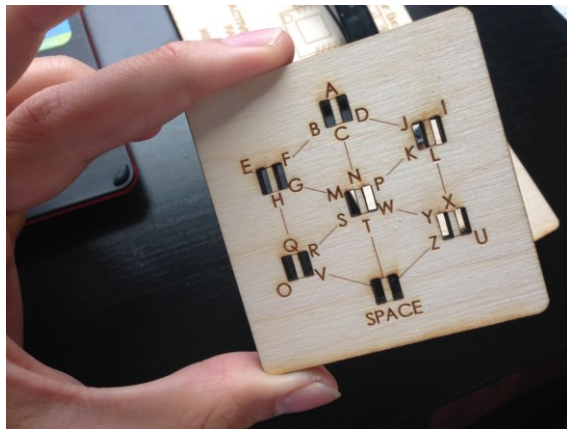
Storing states:

The respective pin number is stored in integers only when there is a falling edge. This ensures that only one press is detected when the button is held for a prolonged period of time (prevents multiple detection per button press). When both button presses are stored, the code then uses the stored integers to access the 2D array, and inputs the corresponding character. After every input, the two integers are then reset to prepare for the next character entry.

Physical device

A hexagonal layout was chosen as it provides access of up to 31 characters, sufficient for the entire alphabet as well as other functions including SPACE. A keypad design was made in Adobe Illustrator, where I assigned the vowels (AEIOU) and space as each primary button, located on the outer ring of the hexagon. More common first letters are then located through the middle button.

The board was lasercut, with through holes on each button location to allow the tactile switch to be easily and snugly attached to the board.



Wiring of the tactile switches was straightforward as all 7 buttons are internal pull-ups. This means that one end of each button was grounded. The other end of each button is then a direct connection to a corresponding pin on the redbear Duo. Wiring looks rather messy as I twisted the wires for each tactile switch to firmly attach them to the board.

As equipment was limited and only black wires were available, I hot-glued and taped the direct pin connections together in the correct sequence for easy setup. To allow the board to rest stably on a flat surface, I attached four nuts to act as “table legs”.

Reflection

I think that this assignment was enjoyable and manageable. Through this assignment I have acquainted with the Arduino software and learnt to use its syntax.

The construction of the device allowed me to consolidate the usage of Adobe Illustrator as well as operation of the Laser Cutter. It also allowed me to get re-accustomed to soldering techniques. On hindsight, the wiring for my device could have been much neater if I had not twisted the wires. One realization is that it is challenging to organize the wiring on small devices. More preparation and planning should go into the actual wiring of the device.