Virtual Keyboard (with the Use of a Leap Motion Controller)

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Overview

Virtual keyboards are normally used on touch screen devices like smartphones and tablets, where users can touch the images of keys to perform typing or data input. But with the Leap Motion Controller, there is a new way to develop a virtual keyboard.
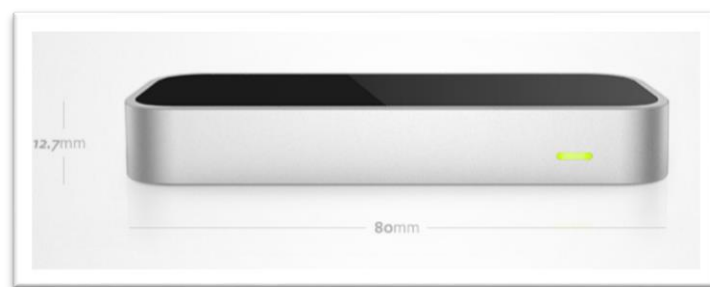
Leap Motion Controller
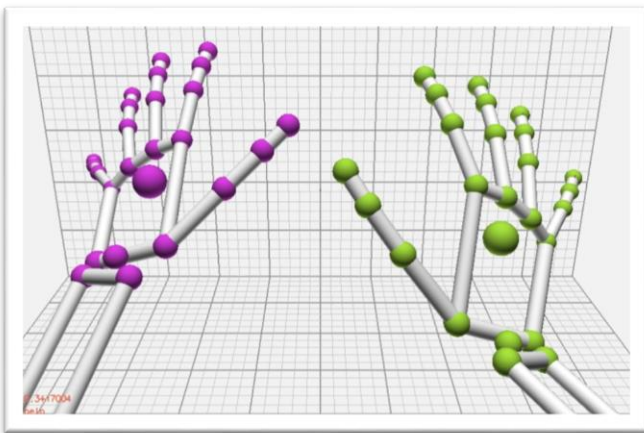

Figure 1 – The Leap Motion Controller
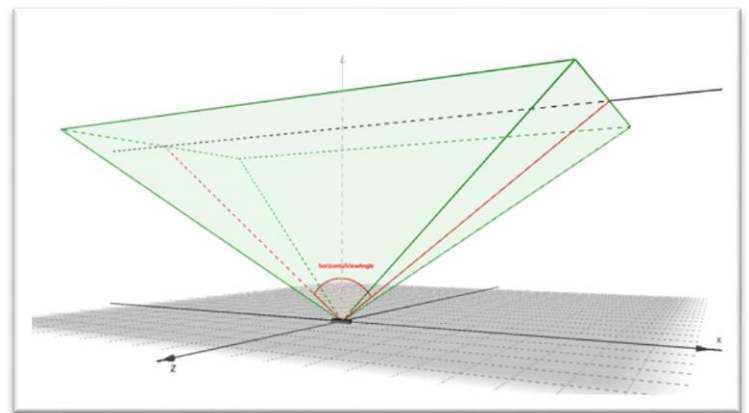

Figure 2 – Hands' view in the LMC

Figure 3 – The LMC field of view

Objectives

Simulates a physical keyboard
Develop additional functions to the virtual keyboard
- Different modes of keyboard
- Gesture control

Methodology

Keyboard events and layout of keyboard

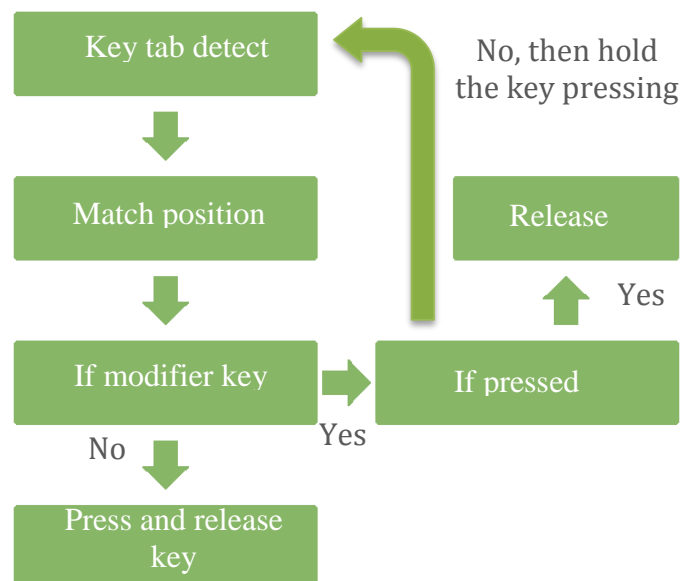By using the Windows API to simulate the keystrokes with virtual-key code.

2 keyboard layout were provided in the virtual keyboard, the 87-key QWERTY keyboard and numeric keyboard.

Figure 4&5 – The 87-key keyboard and numpad layout

Motion detection algorithm

The algorithm started when detect a key tab gesture, then by the key tab position, it will calculate the position to check if map on any key area. If the key was a modifier key (e.g. CTRL, ALT), then it will keep at the pressed state to wait for another key tab detect to simulate the keystrokes, otherwise just per the keystrokes.

Key tab detect

↓

Match position

↓

If modifier key → If pressed

No ↓

Press and release key

Release

Yes ↑

No, then hold the key pressing

Yes

Gesture control

- Key tab gesture – simulate the type action a key on keyboard
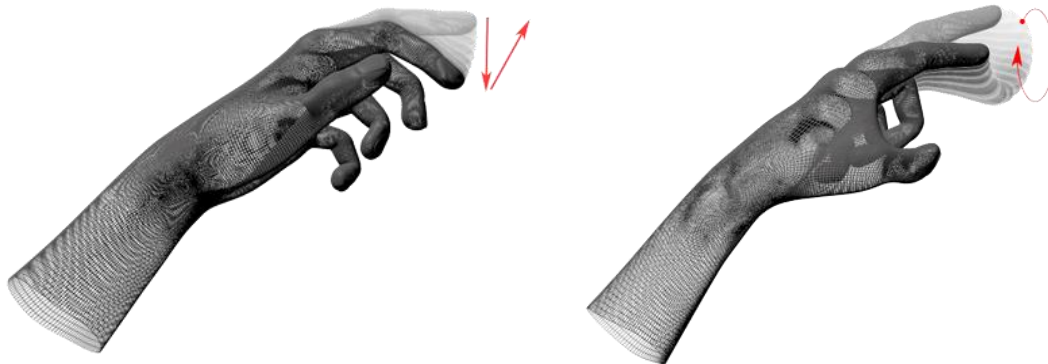- Circle gesture – use the index finger to make a circle movement to change the mode of keyboard (87-key to numpad).

Figure 6 – The key tab gesture (left), the circle gesture (right)

Conclusion

By the testing result, it showed that the typing accuracy was around 70% due to the interference. And take time to type because the paper keyboard was pure black. These two drawbacks made the virtual keyboard less attractive. To overcome these drawbacks, the method was to use a better background paper that with less or no interference.

And at this stage, the virtual keyboard was not perfect, although it already simulate as a physical keyboard. In the future, to make the virtual keyboard more attractive, it can combine with mouse movement or touch screen functions to make the application more useful. And with more motion control functionalities that make use of the feature of the Leap Motion Controller.