Experiments

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1 Recognized motions

In this document, we will list all the motions that are recognized by *Can't Touch This*. These experiments can be conducted by first setting up the platform itself. Instructions for this can be found in the manual. After setting everything up, conducting the experiments is a piece of cake. Start up the platform, open a webbrowser and go to . Click on 'Visualize' to view your fingers being traced.

Please try to make the following gestures above the LeapMotion sensor. You will receive visual feedback if a gesture has been made succesfully. Try to succesfully complete each gesture at least 5 times for consistency sake.

- Straight line
- Circle clockwise
- Circle counter-clockwise
- Big circle clockwise
- Big circle counter-clockwise
- Triangle clockwise
- Triangle counter-clockwise
- Mini square clockwise
- Square clockwise
- Square counter-clockwise

2 Detection speed

Another important aspect of a gesture detection system, is the speed, or rather, delay for correctly detecting a performed gesture. To better define the term delay, we've chosen the following description: the time it takes for the platform to show the name of the correct gesture in the console, after a gesture has been completely performed above the sensor.

Since it can be tricky to accurately measure the time difference between the invocation and the action here, we've decided to use a camera to record 20 invocations. With the resulting footage, we'll be able to count delay in frames, with precision accurately enough for our use case. The gesture that we choose was the square, as is has quite distinctive corners.

After performing the test it was immediately quite clear that delay varies greatly. The *delay* varied from about 5 to 11 frames. With a speed of 60 frames per second, each frame is about 17 milliseconds. This defines a delay varying between 85 to 187 milliseconds. There were two outliers with a delay of 16 to 22 frames which translate to about 270 and 370 milliseconds.

We believe the varying difference has to do with the accuracy of detecting the gesture itself. Imagine you are drawing a perfect square gesture (perfect relative to the square gesture you might have previously recorded) above the sensor, the gesture will be recognized quicker before even fully completing the gesture, as compared to a square motion that differs slightly. Because it's virtually impossible to perform the gesture in exactly the same way every iteration, a difference in detection is indeed expected.

Note that this method of testing latency is still quite simplistic. It doesn't take computer, and screen delay into account. Nor does it test what the latency of the used sensor itself is. Our test strictly focusses on the delay between performing the gesture and seeing visual feedback. We performed the test with the visualizer enabled, which was visible on the material we recorded. What's interesting is that it looks like the

gesture is instantly (meaning; within the same frame) recognized as the last sampled point of a gesture shows up on the visualizer. This would suggest that the actual latency for detection on the processed data is faster than 17 milliseconds. This is of course not very scientific, but we feel it's an awesome result non the less.

What is important though, is how responsive the detection feels. During these tests, the detection (strictly speaking about detection speed) felt snappy even during the case of those outliers. The cool thing is that after you've performed a gesture you don't have to wait for a detection notification before the next gesture can be performed, that helps quite a lot for it to feel responsive to our opinion when when repeatedly experimenting with the sensor.

The platform doesn't support binding generic actions to gestures to control a computer yet. And until that is tested, it's hard to say whether we'd feel the same when controlling a computer with these gestures.