A Human Haptics Experiment

Today you will do a simple human-participant experiment in a group of two. The experiment, known as the two-point discrimination test, highlights the haptic sensing capabilities of different parts of the body.

The two-point discrimination test seeks to determine, for a specific location on the body, the distance between two contact points at the threshold of when they are perceived as a single contact point vs. two separate contact points. I chose this activity because it shows the process of developing a haptic experiment with human users, and the results are meaningful for the design of tactile haptic devices.

You will perform this experiment for two locations on the body:

- The tip of the index finger of the dominant hand (i.e., if your "subject" is right-handed, use the right hand)
- The inside of the forearm (as shown in the image below; use the same arm as the dominant hand)

Test one subject (or two if you have time) for each of these body locations.

Here are some suggested steps for completing this experiment. If you like, share your methods and reflections with other groups.

1. Develop a method for applying two point contacts to the skin. The contacts should be sufficiently blunt that they will not cause pain or injury. You can use paperclips, pencils, and the endpoints of calipers, to name a few possibilities. Ideally the contacts with the skin would be made at the same time and with the same light pressure, but for the purposes of this assignment, it doesn't need to be perfect.

2. Develop a method for measuring the distance between the two contact points. A ruler, string (later measured with a ruler), markings on tape, etc. are a few possibilities.

3. Decide how you will find the point at which two points start to feel like one (or one point starts to feel like two). Will you start with a large distance and move in? Or a small distance and move out? Or do both and average them? How many times will you repeat the test on each body location for each subject? (Do be respectful of your subjects' time!) Come up with your own experimental protocol and be sure to keep it consistent for all your measurements.

4. Record data with your subjects. Please record your data in units of millimeters (mm). Submit your two-point discrimination threshold for each body part by entering it in this google sheet: https://goo.gl/YRAoXp. We will compute the average results for the entire class. If you test more than one subject, average the two-point discrimination threshold across subjects and enter that value in the google sheet.

5. Reflect. Were you surprised at the results? Which body part was the most sensitive? What mechanoreceptors are involved? What are sources of experimental error (bias/accuracy and variability/precision)? What improvements would you make to your experimental procedure, given infinite time and money?