

Lab Assignment 1: Human Haptics

In this week's lab assignment, 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 test because it shows the process of developing a haptic experiment with human users, and the results are meaningful for the design of haptic interfaces.

You will perform this experiment for three 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)
- The **lower back** (over clothing is fine)

Test 3 subjects 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 2 (or more) subjects. It will be helpful to create a table to record the results for each body part and each subject. Please record your data in units of millimeters (mm). When you are done, average the two-point discrimination threshold across subjects for each body part. **This average two-point discrimination threshold must be submitted for each body part by writing it on the whiteboard.** You can also compute the standard deviation if you like, to get an idea of the variability between subjects (and your own ability to conduct the experiment consistently).
5. Reflect. Were you surprised at the results? Which body part was the most sensitive? 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? We will compute the average results for the entire class and you can compare them to your individual results.

