

Assignment 1: Introduction to Haptics and Haptic Devices

PDF file due on Canvas by 11:59 pm PDT on Thursday, April 16, 2020
Please write clearly or type your responses.

Optional Reading

K. E. MacLean. Haptic interaction design for everyday interfaces. *Reviews of Human Factors and Ergonomics*, 4:149–194, 2008. This article is written for individuals who are new to the field and want to create useful haptic interfaces. It provides concise summaries of human haptic capabilities and haptic device functionality. At the end, the author describes several thought-provoking applications for haptic feedback.

You can download papers from Canvas > Files > Papers.

1. Haptics Application Ideas

The article by MacLean discusses how haptic feedback can be applied to many everyday interfaces and gives some example tasks. The goal of this part of the assignment is to get you thinking creatively about new ideas for the use of haptic systems. Responses should be typed or neatly handwritten.

- A. **List:** Brainstorm a list of ten or more specific ideas for potential new applications of haptic interfaces. It is fine if your ideas are somewhat related, but they should be conceptually distinct from one another. You do not need to verify that each one is completely new (they only need to be new to you), and you do not need to give much detail about each idea; a few words is sufficient.
- B. **Choose One:** Which *one* of your ten ideas do you think has the most potential for success, either as a research or commercial product, or in terms of impact on society? Explain your reasoning.
- C. **Develop:** Think more about your chosen idea and what it would take to make it work well and be useful. Describe how you envision this system working. What hardware and software would it need? How much would it cost? How would it interact with the world and/or the user? What benefits might it provide over existing systems?
- D. **Draw:** Create a sketch (neatly *hand-drawn*) of how the system might look. This can be coordinated with the description from the previous step.
- E. **Reflect:** Starting on page 165, MacLean gives several specific recommendations for when to use haptic feedback (Precise Force Versus Position Control, Guidance, Abstract Communication and Information Display: Haptic Icons, Notifications and Background Awareness, Augmentation of Graphical User Interfaces, Expressive Control, Communication of Affect, and Mobile and Handheld Computing). Pick the one or two of these that are most applicable for the system you described above, and explain how MacLean’s recommendations apply.

2. Haptic Box

In the pre-recorded lecture 2, you were asked to create (or have someone else create) a “Haptic Box” to test your ability to explore and use your tactile and kinesthetic sense to identify the objects (a process known as stereognosis). Pick two of the objects – try to pick things that are fairly different – and for each of these two objects, describe:

- A. **What it is:** Explain what the object is.
- B. **What are its tactile (cutaneous) properties:** What features does this object have that are tactile in nature, i.e. involve human cutaneous sensing?
- C. **What are its kinesthetic properties:** What features does this object have that are kinesthetic in nature, i.e. involve human kinesthetic sensing?
- D. **Haptic display:** Do you think it is possible to simulate the experience of interacting with this object with a haptic device? Why or why not? What would the capabilities of a haptic device need to be for interacting with this object?