



# ME 327: Design and Control of Haptic Systems


Spring 2020

## Interactive Session 2: Haptic Design

Allison M. Okamura  
Stanford University

# Zoom Etiquette for questions and comments during interactive sessions

Type your question/comment in the Zoom chat. If I do not see the chat, your question will be repeated out loud by Brandon.

Alternatively, you can use the “Raise Hand” button  in Zoom to get the attention of the teaching team. Once you are called on, unmute yourself and ask your question. (Mute yourself again after.)



# Optional Reading

On Canvas, go to:  
**Files > Papers >  
MacLean08-RHFE-  
Design.pdf**

This may also help you  
come up with ideas and  
clarify definitions if you get  
stuck on Assignment 1

[K. E. MacLean. Haptic interaction design for everyday interfaces. Reviews of Human Factors and Ergonomics, 4:149-194, 2008.](#)

## CHAPTER 5

### Haptic Interaction Design for Everyday Interfaces

By Karon E. MacLean

This chapter sets about to provide the background and orientation needed to set a novice designer on his or her way to bringing haptics successfully into an interactive product. To define appropriate roles for haptic interaction, it is necessary to integrate a basic awareness of human capabilities on one hand and current device technology on the other. Here, I explore this integration by first summarizing the most salient constraints imposed by both humans and hardware. I then proceed to relate perceptual, motor, and attentional capabilities to a selection of emerging application contexts chosen to be relevant to contemporary design trends and opportunities. These include abstract communication and notification, augmentation of graphical user interfaces, expressive control, affective communication, and mobile and handheld computing.

Our touch (haptic) sense is such an integral part of our everyday experience that few of us really notice it. Notice it now, as you go about your business. Within and beneath our skin lie layers of ingenious and diverse tactile receptors comprising our tactile sensing subsystem. These receptors enable us to parse textures, assess temperature and material, guide dexterous manipulations, find a page's edge to turn it, and deduce a friend's mood from a touch of his hand. Intermingled with our muscle fibers and within our joints are load cells and position transducers making up our proprioceptive sense, which tell our nervous systems of a limb's position and motion and the resistance it encounters. Without these and their close integration with our body's motor control, it would be exceedingly difficult to break an egg neatly into a bowl, play a piano, walk without tripping, stroke a pet, write, draw, or even type.

Touch is our earliest sense to develop (Montagu, 1986). It has evolved to work in a tight partnership with vision and hearing in many ways we are only beginning to understand, as we study processes (such as hand-eye coordination) and how we process conflicting or competing information from different senses.

In stark contrast to the importance of touch in our everyday experience, the use of touch is marginalized in contemporary computer interfaces, overlooked in the rush to accommodate graphical capability in desktop-based systems. The primary advances have been in feel-focused improvements in nonactuated pointing tools for both function and aesthetics. Scroll wheels have been designed for the user to click with just the right resistance and frequency; and most cell phones now come with vibrators that indicate incoming calls. Meanwhile, the use of haptic feedback in the consumer sphere is largely limited to gaming, and tactile feedback to simple cell phone alerts.

DOI 10.1518/155723408X342826. Copyright 2008 Human Factors and Ergonomics Society. All rights reserved.

# Trends motivating haptics

# Trends motivating haptics

- Networking
- Ubiquity of computing devices
- Multitasking
- Virtualization
- Information management
- Fragmentation

go to [pollev.com/haptics](https://pollev.com/haptics)

or

text **haptics** to 22333  
once to join  
and then text your  
response

# Trends motivating haptics

- What else?

go to [pollev.com/haptics](https://pollev.com/haptics)

or

text your response

# When to use haptic feedback

# When to use haptic feedback

- Precise force vs. position control
- Guidance (for training or shared control)
- Abstract communication and information display
- Notifications and background awareness
- Augmentation of graphical user interfaces
- Expressive control
- Communication of affect
- Mobile and handheld computing

go to [pollev.com/haptics](https://pollev.com/haptics)

or

text your response



# When to use haptic feedback

- What else?

go to [pollev.com/haptics](https://pollev.com/haptics)

or

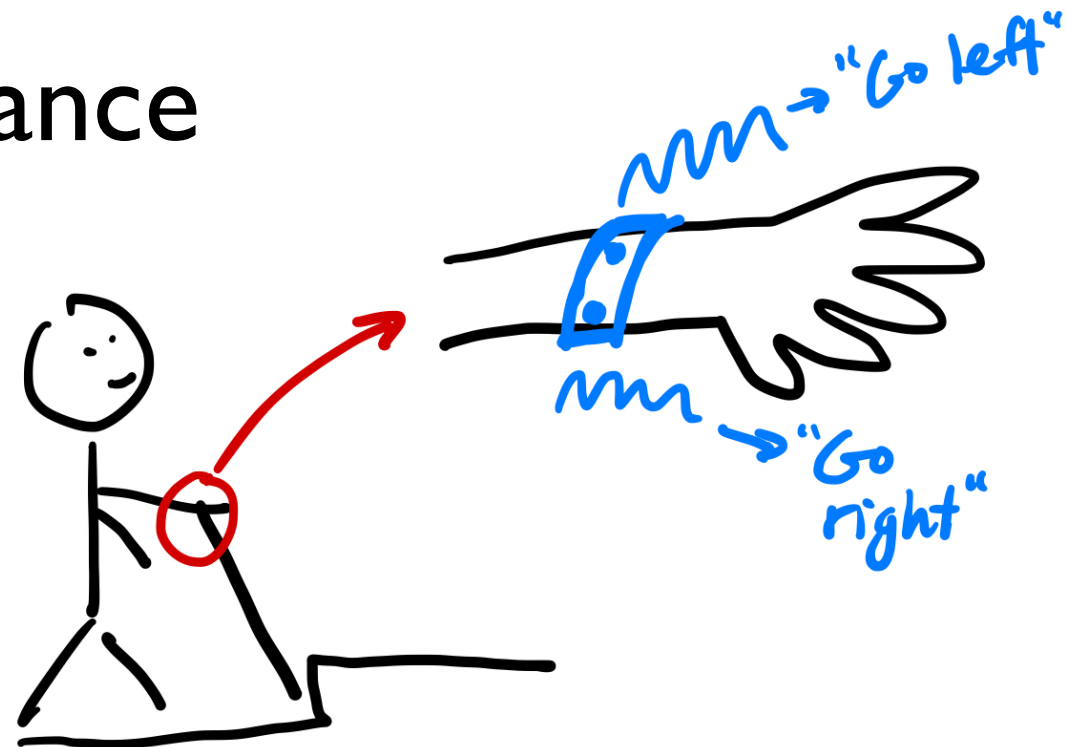
text your response

# Group Design Exercise

# Example

1. Application: Haptic turning directions for visually impaired (connected to map on phone)
2. Trend: Mobile computing
3. Application area: Guidance

Sketch:



enter your answer at [pollev.com/haptics](https://pollev.com/haptics) or text your response

# Now you!

We will put you into groups of ~4 students in a breakout session for 10 minutes.

In this session, decide on a haptic application (existing or new) and one person respond to the poll on one line with:  
1. what is the application, 2. what trend does it address, 3. what application area (when to use haptics) does it address?

Also, make a sketch and prepare to show it on-screen

enter your 3-part answer at [pollev.com/haptics](https://pollev.com/haptics)

Make sure to watch the next posted lecture video  
*before* Tuesday's interactive session.

Please post your questions to the Canvas  
discussion board.

Look for an assignment and OH poll to be posted  
later today. Make sure Canvas notifications are on.

Office Hours/Q&A with Allison until 10 am.  
Question queue (see tab with today's date):  
<https://tinyurl.com/HapticsAllison>