

# Sketching Haptics

## Workshop

UBC, Vancouver, August 12-17 2011

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### Summary

This 4 day workshop will explore the meeting point of Design and Haptics, and probe various ways that researchers can quickly evolve interfaces that actively engage with our sense of touch. The workshop will be very hands-on as we will *sketch* various haptic ideas right from the start. Participants will use various prototyping tools, mediums and approaches, from non-tech to high-tech, to build evocative and explorative *haptic hardware sketches*.



## **Introduction**

Designing and building haptic interfaces can be very challenging. The technical requirements are often very strict, in order to comply with our very capable sense of touch. Traditionally, the development of new haptic and multimodal interfaces coincides with significant technical advances. Design, its tools and various approaches, often play a very limited role in the development of haptic works and research.

This workshop activity proposes to explore Haptics from a design sketching perspective, often called Experience Prototyping. It will investigate various design processes, tools and approaches to rediscover how one can think about haptic interfaces and evolve ideas/concepts quickly and efficiently. The workshop participants will be invited to use various non-tech materials and low-tech tools to build hardware sketches of haptic interfaces, and iterate rapidly. The emphasis will be on materializing haptic concepts quickly, and evolve tangible sketches that are informative and revealing to its builder(s)/user(s).

Sketches are inherently different than final and refined solutions. They are often open-ended and evocative, more than reliable and precise. Sketching haptic hardware ideas has numerous limitations that designers and researchers should be aware. Nevertheless, such quick, intense and explorative activities can be very revealing in many ways.

My current PhD work at the Umeå Institute of Design explores how designers can understand better, embrace and design for our sense of touch. This class at UBC fits in a series of workshops that I am running in order to observe people (designers, researchers) exploring and designing haptic ideas. My research interests relate to approaches and tools that can support a greater sensitivity to haptics from designers. It also intends to expose valuable design processes and approaches to haptic experts.

## **Learning outcomes**

Participants are expected to learn about Experience Prototyping and Sketching in Hardware approaches in relation to HCI, Interaction Design and Haptics. As the workshop is short and intense, participants will have to develop quickly their ideas/concepts in semi-working sketches to continually manifest, evaluate and refine their design activities. Participants will be exposed to a full range of topics and challenges: actuator and sensor technology, mechanisms and electronics prototyping, haptic illusions and more. They will necessarily have to take various shortcuts to deliver hardware sketches rapidly. There are no right or wrong results, but students will have to motivate the relevance of their design activities and the development of their work.

Participants should thoroughly document their activities during the workshop in video, hardware sketches and/or other mediums found appropriate.

## **Required materials and equipment**

Participants are expected to work in pairs or teams of three. Each team should have access to a computer with internet access. The computer will mostly be used to program the Arduino and support sketches requiring more computation power.

## Equipment list (10-12 participants, 5-6 teams of 2)

Qty.	Description	Unit Price	Total price
6	Arduino	30	180
6	Adafruit Motor Shield <a href="http://www.adafruit.com/products/81">http://www.adafruit.com/products/81</a>	25	150
6	Wall-plug power supply with 6-12V DC output to power Arduino board + shield, <i>If fixed only, 12V is preferable.</i>	10	60
30+	Buttons, switches, potentiometers, simple analog sensors, to act as input/trigger for the actuation. <i>Already available in your lab? I will bring a selection</i>	????	????
1+	Haptuator (ref. Vincent Lévesque) <i>If you have already, don't buy specifically for the workshop</i>	-----	-----
3	Meccano kit or similar construction kit (ideally one per team, ok with one set for 2 teams) <a href="http://www.meccano.com/models/super-construction-set.html/">http://www.meccano.com/models/super-construction-set.html/</a>	80	240
20	Vibrotactile motor <a href="http://www.robotshop.com/ca/solarbotics-vpm2-vibrating-motor.html">http://www.robotshop.com/ca/solarbotics-vpm2-vibrating-motor.html</a>	4	80
10	Servo motors, different sizes	10	100
6	Solderless breadboard <a href="http://www.robotshop.com/ca/elenco-9830-breadboard.html">http://www.robotshop.com/ca/elenco-9830-breadboard.html</a>	6	36
	Corrugated cardboard and/or foamcore panels	????	????
	Hot glue guns and refill sticks	????	????
	Wires and cables, various sizes and materials	????	????
	Blue tack, instant glue, adhesives, double-sided tape	????	????
	Various motors, solenoids, gears, linkage parts, surplus electronics. <i>Camille will buy this in Montreal</i>		150
		<b>Total (\$CAN)</b>	<b>996</b>

If there are financial constraints, the Motor Shields and Arduinos can be omitted. I will bring some with me from Sweden. Also the construction kits (Meccano, Lego Mindstorm, or similar) are not essential to the workshop, but are quite useful and great time-savers.

## References and reading list

Marion Buchenau and Jane Fulton Suri. 2000. Experience prototyping. In Proceedings of the 3rd conference on Designing interactive systems: processes, practices, methods, and techniques (DIS '00), Daniel Boyarski and Wendy A. Kellogg (Eds.). ACM, New York, NY, USA, 424-433. DOI=10.1145/347642.347802 <http://doi.acm.org/10.1145/347642.347802>

Camille Moussette and Richard Banks. 2010. Designing through making: exploring the simple haptic design space. In Proceedings of the fifth international conference on Tangible, embedded, and embodied interaction (TEI '11). ACM, New York, NY, USA, 279-282. DOI=10.1145/1935701.1935763 <http://doi.acm.org/10.1145/1935701.1935763>

Youn-Kyung Lim, Erik Stolterman, and Josh Tenenber. 2008. The anatomy of prototypes: Prototypes as filters, prototypes as manifestations of design ideas. ACM Trans. Comput.-Hum. Interact. 15, 2, Article 7 (July 2008), 27 pages. DOI=10.1145/1375761.1375762 <http://doi.acm.org/10.1145/1375761.1375762>

It would be appreciated if the participants could read the three articles prior to the workshop. A full list of relevant references will be provided during the course.

## Documentation

The workshop's activities are part of my PhD work and I intend to document the participants' activities and results in various ways via my PhD blog and my upcoming thesis. In exchange I am ready to make all my documentation (photos, videos, preparation materials) available to everyone.

If anyone has concerns regarding these actions, please discuss them with me prior to the workshop, or as the issues arise during the week. I will do my best to accommodate everyone and make sure the participants' learning activities come first.

## Deliverables and Attendance

Deliverables will be documented with photos and videos, as most of the equipment and components are only guaranteed availability during the duration of the workshop.

# Preliminary Schedule and Activity Plan

Lectures, active tutoring and workshop activities from 9h30 to 17h00 unless specified. One hour lunch and shorter breaks as needed to stay physically and intellectually fit!

## Friday August 12

### 9h30: Intro (1 hour)

- + Who am I and my background (15 minutes)
- + Introduction of this workshop (10 minutes)
- + The challenges of designing Haptic Interfaces, Sketches vs Prototypes (20 minutes)
- + Expectations from workshop participants

### Arduino recap/intro (1 hour)

- + Get Arduino up and running for everyone, crash course for novices.

### Homo Faber, make to learn (0.5 hour + 2 hours task)

- + level of sketches, fidelity needed, wizard of oz, shortcuts and complexity table

**Assignment #1: make 3 hardware sketches that move 1, 10 and 100 mm each. No electronics. Human actuation.**

### Some control (2 hours + 1 hour task/over the weekend)

- + actuators, moving atoms in the real world, servo, dc motor, stepper, pulse driven, etc.
- + control mechanisms: substitute experimenter, trigger, configure, sensing

**Assignment #2: control a motor/actuator with an Arduino with some level of variability and repeatability.**

## Monday August 15

### 9h30: Continue working on assignment #2 (1h30)

### 11h00: Review of assignment #2 (30 minutes)

- + What worked and what didn't

### My PhD work presentation (1 hour)

- + Haptic Kinect and MSR internships

### Mechanisms (30 minutes + 2 hours task)

- + motion and actuation
- + converting linear to rotation, cranking, position sensing, etc.

**Assignment #3: make 1 hardware sketch converting rotation to linear movement, or vice-versa.**

## Tuesday August 16

**9h30: Build your first Haptic Interface (presentations at 15h00)**

**Assignment #4: make 1 hardware sketch triggered by a sensor using Arduino and the motor shield.**

- + Tutoring by Camille
- + Video documentation of the hardware sketches.

**Commercial haptics review/demos/discussion**

- + Review some currently available haptics equipment and their *sketching* capabilities.

**Impromptu sessions about building robust and reliable prototypes, and specific technology and processes.**

## Wednesday August 17

**9h30: Build your second Haptic Interface (all day)**

**Assignment #5: make 1 refined hardware sketch, offerings a minimum of 3 variations/configurations/haptic rendering**

- + In teams of 2, first write down a paragraph describing your idea before building
- + Tutoring by Camille for each team.

**IMPORTANT: Be realistic and choose the right shortcuts.**

**Workshop debrief (1 hour)**

- + Feedback, what was good, what was not, suggestions for improvement

**Workshop cleanup**

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