LEARN TO MAKE, MAKE TO LEARN

Camille Moussette, 19.04.2012, DeSForM 2012
PHD STUDENT + TEACHER

UMEÅ INSTITUTE OF DESIGN

PHD IN INDUSTRIAL DESIGN, STARTED IN 2007, ETA FALL 2012

40% TEACHING FOR VARIOUS IXD COURSES
PHD PROJECT

SIMPLE HAPTICS, SKETCHING PERSPECTIVES FOR HAPTIC INTERACTION DESIGN

DANIEL FÄLLMAN, INTERACTIVE INSTITUTE UMEÅ

BILL BUXTON, MICROSOFT RESEARCH
LEARN TO MAKE, MAKE TO LEARN

Reflections from 4 Sketching Haptics Workshops
GUI > TUI > NUI > physical

Interaction Design

Haptics

“we need more HCI and Design”
Haptic IxD

Interaction Design

Haptics
Laxton’s 3 design skills model (1969)

from How Designers Think, Bryan Lawson (2005)
DESIGNING IN THE UNKNOWN
PROBLEM-SOLVING WITH DETOURS
(EXPERIENCE) PROTOTYPING VS SKETCHING (IN HARDWARE)
(EXPERIENCE) PROTOTYPING

VS

SKETCHING (IN HARDWARE)

PROTOTYPES

VS

SKETCHES
The Anatomy of Prototypes
Lim, Y.-K., Stolterman, E., and Tenenberg, J. 2008

Prototypes are filters that traverse a design space and are manifestations of design ideas that concretize and externalize conceptual ideas.

A “good” prototype is very dependent on what you are trying to explore, evaluate, or understand.
The Anatomy of Prototypes
Lim, Y.-K., Stolterman, E., and Tenenberg, J. 2008

The Principles of Prototyping

Fundamental prototyping principle
Prototyping is an activity with the purpose of creating a manifestation that, in its simplest form, filters the qualities in which designers are interested, without distorting the understanding of the whole.

Economic principle of prototyping
The best prototype is one that, in the simplest and the most efficient way, makes the possibilities and limitations of a design idea visible and measurable.
Characterizing a sketch/prototype?

Fidelity scale (low/hi/mixed)

Audience, materials, resources

“Show & Tell” (sales)

“Show & Ask” (usability)

Prototype as a Hypothesis
(scientific method)

Prototype as a Marketplace
(exchange values, platform for productive collaboration, generation of knowledge/value)

Prototype as a Playground
(serious play, relaxation of rules, play vs serious vs real)
Sketching vs prototyping

Transaction cost (Coase/Buxton)

When/where can you afford to really explore alternatives?

Design calls for multiple equally viable variations

Consideration beyond the common and the expected

Priorities: discovery, sensitivity, non-committal actions, reflective practice
## Sketching Haptics Workshops

<table>
<thead>
<tr>
<th></th>
<th>Host program level</th>
<th>Group size</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Interaction Design MA level</td>
<td>9</td>
<td>Umeå, Sweden</td>
</tr>
<tr>
<td>B</td>
<td>Computer Science MA level</td>
<td>16</td>
<td>Gothenburg, Sweden</td>
</tr>
<tr>
<td>C</td>
<td>Computer Science MA, PhD and Post-Doc</td>
<td>9</td>
<td>Vancouver, Canada</td>
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<tr>
<td>D</td>
<td>Interaction Design MA level</td>
<td>11</td>
<td>Umeå, Sweden</td>
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## Typical schedule

<table>
<thead>
<tr>
<th>Day</th>
<th>AM</th>
<th>PM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>kick-off presentation + what is haptics + intro to movement, mechanisms and actuation</td>
<td>assignment #1 no technology (cardboard, glue, tape, rubber band, etc.)</td>
</tr>
<tr>
<td>2</td>
<td>review of assignments #1 + design process lecture + presentation of various actuators + assignment #2 (3 different scales of actuation)</td>
<td>work on assignment #2 + recap Arduino</td>
</tr>
<tr>
<td>3</td>
<td>review of assignments #2 + lecture about motors and actuators with Arduino</td>
<td>rework assignment #1 or #2 with Arduino control</td>
</tr>
<tr>
<td>4</td>
<td>assignment #3 (significant challenge) + code/hardware clinics</td>
<td>collective literature review/discussion + work on assignment #3</td>
</tr>
<tr>
<td>5</td>
<td>work on assignment #3</td>
<td>final presentations, video documentation and debrief</td>
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</tbody>
</table>
TECHNO CENTRIC ↔ HUMAN CENTRIC
Orders of magnitude
## haptics/actuation

<table>
<thead>
<tr>
<th>1s</th>
<th>vibration</th>
<th>servo/solenoid</th>
<th>mechanism</th>
<th>gravity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1mm</td>
<td>10mm</td>
<td>100mm</td>
<td>10000mm</td>
<td></td>
</tr>
</tbody>
</table>
# Haptics/Actuation

<table>
<thead>
<tr>
<th>Time (s)</th>
<th>Method</th>
<th>Description</th>
<th>Distance (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>vibration</td>
<td>servo/solenoid</td>
<td>1mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>mechanism</td>
<td>10mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>gravity</td>
<td>100mm</td>
</tr>
<tr>
<td>0.001</td>
<td>piezo</td>
<td>EAP</td>
<td>10000mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Haptics/Actuation

<table>
<thead>
<tr>
<th>Time</th>
<th>Mechanism</th>
<th>Organic Growth</th>
<th>Gravity</th>
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<tbody>
<tr>
<td>1000s</td>
<td>mechanism</td>
<td>???</td>
<td>???</td>
</tr>
<tr>
<td>1s</td>
<td>vibration</td>
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<table>
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<tr>
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<th>10mm</th>
<th>100mm</th>
<th>10000mm</th>
</tr>
</thead>
</table>
grow, explode, shrink, scale, rotate, pulse, flick, rest, disappear, clutch, release, hold, capture, pin, prompt, confirm, repeat, stable, glide, slide, stop, hit, kick, cancel, ease in/out, ramp, augment, increase, decrease, agitate, shake, twist, transform, bounce, cycle, follow, guide, grab, screw, implode, circulate, constrain, channel, force, lead, invite, smooth, hard, harsh, solid, soft, compliant, bounce, spring, break, stop, collide, permute, accelerate, react
SKETCHING HAPTICS
SKETCHING HAPTICS
Reflections and insights
Learn to make

Make to learn

Sensing and moving atoms

Hardware is hard!

Establishing the right sketching level

Always room to grow

Making/building challenges
Learn to make

- Sensing and moving atoms
- Hardware is hard!
- Establishing the right sketching level
- Always room to grow
- Making/building challenges

Make to learn

- Visual equivalent: build your monitor!
- Platform to engage/discover haptics
- Common/shared understanding
- Affinity with your design materials
- Exhilarating simplicity!
a. Haptic qualities vs available resources/skills

b. Building haptics to learn haptics

c. Actuation alone is not haptics
Rapid Prototyping/Sketching Haptics

people + hardware + control + psychophysics + context

(design) constraints are stimulating

fail early, fail often, multiple valid alternatives, orders of magnitude

human centric vs technology centric

know and exploit material properties, assembly mechanisms matter

“use the world to control the world”

acknowledge the various limitations of sketching/prototyping
“FAIL EARLY AND FAIL OFTEN”

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