Sketching Haptics

Workshop

IxD2, week 43, Oct 24-28 2011

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Summary

This 5 day workshop will explore the world of haptics and probe various ways that designers can work with 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. Students will use various prototyping tools, mediums and approaches to gradually refine their sensitivity to the topic.

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 proposes to explore the world of Haptics from a design sketching perspective. 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. In addition, participants will be introduced to the latest advances in haptic technology using research grade toolkits and SDKs.

The emphasis will be on materializing haptic concepts quickly, and evolve tangible sketches that are informative and revealing to its builder(s)/user(s). Hardware 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, like any prototyping activities, has numerous limitations that designers have to understand and compose with. 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 course at UID 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.

This workshop is part of the larger Experience Prototyping course and its **Social Dynamics** theme. Students will be invited to explore, develop and build haptic sketches that preferably focus on personal, handheld and ungrounded haptics, and interfaces that relate to 3D space and whole body interaction.

Learning outcomes

Students are expected to learn about the sense of touch, its psychophysical characteristics relevant to design, multi-modal interfaces, and how haptics fit in today's IxD world. As the workshop is part of the Experience Prototyping course, students will have to develop quickly their ideas/concepts in semi-working sketches to continually manifest, evaluate and refine their design activities. Students will be exposed to a full range of topics and challenges: HCI theory, 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 week in video, hardware sketches and/or other mediums found appropriate. A reflective **video report** (duration 2-4 minutes) must be produced and submitted at the end of the week, before Friday 23h59.

Required materials and equipment

During the workshop, various setups will be available to students to quickly sketch haptic interfaces. These pre-configured hardware + software solutions serve both as demos and building blocks available for further development.

2 x PC workstation with Kinect sensor (Photo Studio)
For each workstation:
Kinect sensor with dedicated power supply cord
Windows 7 (64-bit), with MSR Kinect SDK installed (see corresponding requirements)
Arduino + Adafruit Motor Shield

1 x PC workstation with Sensable Omni haptic device
**PC and Omni device supplied by Camille*

2 x Android devices
Nexus One or newer phone/tablet with Immersion's app installed

2 x Ungrounded Dev Box
For each box:
Arduino Uno
9 Degrees of Freedom - Razor IMU - AHRS compatible from Sparkfun
Haptuator with audio amplifier

Beside these pre-configured solutions, the workshop will make available a selection of servos, motors, vibro-tactile actuators, solenoids, geared micro-motors, sensors and others hardware items to explore/build/generate haptic stimuli.

Some additional common items that should be available during the whole week:
-Cardboard and foamcore panels
-Hot glue guns and refill sticks
-Wires and cables, various sizes and materials
-Mecano kits
-Blue Tack
-Crazy Glue
-Arduino (one per student or per team)
-Adafruit Motor Shield (one per student or per team)
-Selection of analog sensors (Sharp distance sensors, accelerometers, etc)
-Rotary potentiometers

Additionally, I will contribute and make available a full set of actuators, sensors, boards and construction materials pooled from my PhD work. Please take good care of the equipment and return at the end of the week.

References and reading list

Lectures, slides, PDFs, links and additional resources will be made available on the IxD wiki at http://www.interactiondesign.se/wiki/courses:2011_exp_prototyping_week43

Participants are required to read/review the following documents prior to Wednesday 09h30:

Buchenau, M.,Fulton Suri, J. 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. http://doi.acm.org/10.1145/347642.347802

Lim,Y.K., Stolterman, E., and Tenenberg, J. 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. http://doi.acm.org/10.1145/1375761.1375762

Houde, S., Hill, C. **What do prototypes prototype?**, in Handbook of Human-Computer Interaction (2nd Ed.), Helander M., Landauer T., Prabhu P. (eds.). Elsevier Science B. V. Amsterdam, 1997.

Hayward, V., MacLean, K. E. 2007. **Do It Yourself Haptics, Part I**, IEEE Robotics and Automation Magazine, vol. 14, no. 4, pages 88-104, December 2007.

MacLean, K. E., Hayward, V. 2008. **Do It Yourself Haptics, Part II: Interaction Design**, IEEE Robotics and Automation Magazine, vol. 15, no. 1, pages 104-119, March 2008.

[optional] NUI - What's in a Name?, Bill Buxton, Microsoft Research, 90 minutes presentation

Documentation

The workshop activities are part of my PhD work and I intend to document the students' activities and results in various ways via the IxD wiki, 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 students' 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 week.

The students are expected to be present and actively working on the workshop's activities everyday from 9h00 to 17h00. Work in teams of 2 or 3 is strongly encouraged, but individual work is also possible.

Schedule and Activity Plan

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

Updates and modifications of the schedule will be posted on the wiki
http://www.interactiondesign.se/wiki/courses:2011_exp_prototyping_week43

Monday Oct 24

09h00 Introduction, aims and goals of the week, practicalities, expectations,reading assignment
10h30 Presentation: What is Haptics, Homo Faber, make to learn and learn to make, Prototyping skills/attitude, Table of complexity
11h00 Task 1: Making Things Move, no Arduino allowed!
13h00 Arduino and Processing crash course, (if you feel you need it)
15h00 Mechanisms and Actuation
16h45 Recap of the day

Tuesday Oct 25

09h00 (HCI students, iLab intro)
09h00 Creature project, Creative Summit and social dynamics (Rich and Stoffel)
11h00 Stoffel's research and demo of experiential prototypes
13h00 Degree project guidelines
14h00 Prepare observation and data gathering from wednesday lecture
15h00 Work on Task 1 and reading time

Wednesday Oct 26

09h30 Review and documentation of Task 1
10h30 Literature Circle
13h00 Review of the various haptic setups,
14h30 Pick and choose a setup + familiarize
15h00 UID Wednesday lecture
16h00 Task 2: Build your first Haptic Interface

Thursday Oct 27

09h00 Introduction + Demos of MSR work
09h45 Work on Task 2, Camille available for tutoring/assistance
15h00 Review and documentation of Task 2
16h00 Task 3, Build your second Haptic Interface

Friday Oct 28

09h00 Work on Task 2, Camille available for tutoring/assistance
14h00 Review and documentation of Task 3
16h00 Workshop debrief
16h30 Workshop cleanup
17h00 End of the workshop

Build as much as you can, try something you are not good at, and most importantly have fun!

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