CS 160: User Interface Design

Sound-Based Interaction 01/29/14
cs160 class accounts

Come to the front of the room to pick them up.
Affordance:...
Signifier:...
Mapping:...
Feedback:...
Conceptual Model:...
Due Friday 11:59pm

Individual Design Exercise Part 2

Programming Assignment 1

use 277 Soda if you need a lab machine; run:
/usr/local/adt-bundle-linux-
x86_64-20131030/eclipse/eclipse

If you haven’t joint the Piazza site yet, do it today!
Lots of concrete Q&A for both assignments.
Topics for Today

1. Brainstorming
2. Critique
3. Sound-based Interaction
Brainstorming
Goals of Brainstorming

1. Explore a design space, quickly.
2. Generate many ideas
3. Generate a variety of ideas
IDEO’s Brainstorming Rules

1. Sharpen the Focus
2. Playful Rules
3. Number your Ideas
4. Build and Jump
5. The Space Remembers
6. Stretch Your Mental Muscles
7. Get Physical

Aim for quantity
Hope for quality
Sharpen the Focus

Posing the right problem is critical – neither too narrow, nor too fuzzy

Not “bicycle cup-holders” but “helping cyclists to drink coffee without accidents”
Number Your Ideas

Obvious but very useful

Helps keep track of them when the brainstorm is successful (and 100 or more ideas are in play)

Allows ideas to take on an identity of their own
Build and Jump

**Build to keep momentum on an idea:**
“shock absorbers are a great idea; what are other ways to reduce coffee spillage on bumps?”

**Jump to regain momentum when a theme tapers out:**
“OK, but what about hands-free solutions?”
Premature idea rejection is a serious barrier to good design.

One big differentiator between good designers and great ones is the latter’s ability to successfully develop unusual ideas.

This requires a strong instinct to be able to distinguish fatal vs. minor flaws in an idea.
Covering whiteboards or papering walls with text is extremely useful in group work.

It’s a very effective form of external (RAM) memory for group

Even better, its shared RAM. Helps group share understanding
**Stretch your Mental Muscles**

**Warm-ups:** word games, puzzles

Get immersed in the domain: go visit the toy shop, or the bicycle shop, phone shop etc…

**Props:** Bring some examples of the technology to the brainstorm
Get Physical

Sketch
Make models
Act out

Moggridge, Designing Interactions, p. 732
Critique

How to give & receive constructive criticism
What is a critique?

Show a project in progress through sketches and prototypes

Solicit feedback from peers (*small groups work best*)

History: Studio art education

http://www.flickr.com/photos/pjchmiel/2972140234/
What is the point of a critique?

Show off how great your project is.

Get honest reactions, ask for input on open questions.

**Q:** How is a critique different from a brainstorm?

http://www.flickr.com/photos/crystiancruz/2353909834/
Designer: Frame the discussion!

State Explicitly: What would you like comments on?
- Overall idea?
- Specific interactions?
- Usability?
- Technical Feasibility?
- Pixel-level graphic design?

Take a dispassionate stance (this is hard!)
- Show alternatives where possible
  (makes comparison easier)
Critic: How to avoid deaf ears

Comments are about the **design**, not the designer.

Point out positive aspects – be specific

Not:  “I like this, but…”

Instead:  “The layout effectively communicates the hierarchical nature of the data. However, …”

Ask for alternatives instead of offering solutions

Not:  “You should really change X”

Instead:  “Have you considered alternatives for X?”
Sound-based Interaction

1. Degrees of Freedom
2. Vocal Sounds
3. Sounds from Objects
4. Speech Recognition
5. Multimodal techniques
Sounds Input: Degrees of Freedom
What does Clapper sense?

Volume?
Aspects of sound signal

What aspects of sound can people “easily” control?
Aspects of sound signal

Volume
Duration
Pitch
Rhythm (pattern of durations over time)
Melody (pattern of pitches over time)
Dynamics (pattern of volume over time)
Words/speech

Each is distinct degree of freedom that people can control & microphones/software can sense
Vocal Sounds
Voice as Sound: Using Non-verbal Voice Input for Interactive Control

Takeo Igarashi
John F. Hughes
(Brown University)
Voice as sound

Igarashi & Hughes explore 3 aspects of sound input
- Duration for on/off
- Pitch for rate control
- Tonguing/Clicking for discrete control

How does tonguing/clicking differ from duration?
Voicedraw: Fluid Hands-Free Drawing Using Voice

Susumu Harada
Jacob O. Wobbrock      James A. Landay

University of Washington

Voicedraw. Harada et al. SIGACCESS 2007
VoiceDraw

Use vocalization to control continuous parameters

- Stroke direction (vowels)
- Brush width (volume)
- Brush down (click)
- Speech reco. for cmds

Can you really draw with it?
Vocal Joystick Demonstration. Harada
VoiceDraw

Use vocalization to control continuous parameters

- Stroke direction (vowels)
- Brush width (volume)
- Brush down (click)
- Speech reco. for cmds

Can you really draw with it?

Who are target users?

How do they benefit from this approach?
Vocal Joystick. Bilmes et al. 2005
Sounds from Objects
Scratch Input: Creating Large, Inexpensive, Unpowered and Mobile Finger Input Surfaces

Chris Harrison    Scott E. Hudson

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Interacting with objects makes sound

Scratching
Rubbing
Tapping

Sense sound and learn unique sound signature

What other actions could generate recognizable sound signatures?
Touch & Activate: Adding Interactivity to Existing Objects using Active Acoustic Sensing

Makoto Ono, Buntarou Shizuki, and Jiro Tanaka
University of Tsukuba
Resonant sound changes with touch

Play sound with contact speaker
Detect sound with contact mic
Sweep freqs. (20-40kHz) to find resonant freqs.
- Resonant freqs changes depending on touch
- Learn mapping between resonant freqs. and touch type

How would you use this type of interaction?
Who are target users?
Acoustic Barcodes. Harrison et al. UIST 2012
Acoustic barcodes

Physically alter object so that scratch produces a distinguishing sound

Use cases?
Recognition
Music
Music Recognition

1. From music tracks build DB of signatures
2. Capture music, build signature and match to DB

Where else can we apply this strategy?
Speech

Google Voice Search - http://www.youtube.com/watch?v=y3zTwlKI7A
Speech Recognition

Require more advanced machine learning techniques

But public APIs and open source codes are available:
Android: built-in - android.speech.SpeechRecognizer
Windows: Microsoft Speech API (SAPI)
iOS: OpenEars, based on CMU Sphinx (C, Java)

Commercial: Nuance SDK