User interface technology

CS 347

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Announcements

Extra session: methods and stats
Led by Danaë next Wednesday, 5 PM

If you don’t know

- how to do a t-test, one-way and two-way ANOVA, or chi square,
- how to write up the results and effect size for a paper,

join!
Announcements

Project Brainstorm Round 2 due next Wednesday

Today at the end of class: team mixer
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Recall: ubiquitous computing

“The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it.”

— Mark Weiser

In contrast to visions of machines everywhere, Weiser advocated a vision of calm computing where computing receded into the background.
How to achieve this vision?

Interaction

UI Technology ("UIST")
Input, output, and interaction modalities

Ubiquitous computing ("Ubicomp")
Integration into life and into the lived environment
User interface technology

How can the user interact fluidly with the world around them?

- New **input** modalities: e.g., radar, acoustics
- New **output** modalities: e.g., fabrication, swarm robots
- New user **vocabulary**: e.g., voice, gestures

Increasingly, this research is often driven by, or involves the creation of, new hardware
Recall: tangible computing
[Ishii and Ullmer 1997]
What makes an interface tangible?

Ubicomp: integrated into the environment

Tangible: stronger claim — input and output are both in the physical world and are manipulable in the physical world, not purely on a screen

[Follmer et al. 2013]
Input: sensor-driven interaction
Goals

How might people provide more fluent and effective input to interactive systems?

Typical approaches

- Come up with new signals
- Find new ways to recombine known signals

Always: demonstrate the technique in compelling interaction scenarios
Bolt. “Put-that-there”: voice and gesture at the graphics interface. SIGGRAPH ’80.
Put That There

Contribution: combined gesture and voice input

In a closed world
With a toy goal
Using simple manipulation operations
Using a laser attached to the wrist

In many ways, our goal since 1980 has been to relax those assumptions
DigitalDesk

Contribution: fluid boundaries between digital and physical objects

- In a constrained space
- On a small set of tasks
- With predefined behaviors

Again, we work to relax these assumptions
General operating principle

Derived from [Saponas et al. 2009]

Features, e.g.:
- Root Mean Square (RMS) ratios between channels
- Frequency band z-score
- Derivatives, FFTs, etc.

Machine learning model
User specific fine-tuning (optional)

Classification
No, the other changing the world.
How can we make the environment reactive?

We can make pixels dance — how do we make atoms dance too?
What is a minimal instrumentation of the environment that we can perform to produce feedback that is as expressive as possible?
LaserOrigami produces physical 3D objects with a laser cutter.

Output: changing the virtual world
Virtual experiences

Physics, and our own perceptual systems, impose constraints on what can be believably conveyed.

Research in AR, VR, and mixed reality often seek to push the boundaries of the realism of that experience.
Traxtion: perceived forces

[Rekimoto 2013]

Creates a haptic sensation without mechanical links to the ground

Traxion is a new tactile feedback device that creates force sensation based on human illusion.
Haptic Retargeting

[Azmandian et al. 2016]

Use “perceptual hacks” to make a single cube appear multiplied
Skill sets for UIST research

Learn “enough to get by” in...

- Electrical engineering
- Mechanical engineering
- Computer graphics

Known techniques for research in these domains often have direct mappings onto open questions in interaction
Remote UIST research

Possible approaches:
Commodity hardware,
used or combined in new ways
Using simulation, handing off hardware

Conducting a safe user study is important.
Chat with us about your ideas!
Project Teams

All project-related submissions after today are done with your team.

Submit this form (1 per team) by Friday at noon:

http://bitly.com/cs347-teams

By the end of lecture today, you should be in a team of 3.

If you are not, send us an email by midnight:

cs347@cs.stanford.edu
When discussing a potential partnership with someone, you should discuss

your **background** (e.g., programming proficiency or other skills you bring),
**availability** (e.g., your time zone, working evenings or mornings? weekends?),
**motivation level** (ambition for a Turing award? Or to just barely graduate?),
and **grading** (credit no credit, vs. letter grade).

It's important to be honest with your partners up front, and to follow through on commitments you make.
See you next week :) 

Action items

If you don’t have a team of 3:

  Go to the Studio Room now
  If you don’t have a team, send us an email today

If you don’t have a studio or a discussant date: Go to TAs’ office

By noon Friday: submit team application (1 per team)

Email: cs347@cs.stanford.edu   Course website: cs347.stanford.edu