Due Wednesday

Pilot Usability Study (Apr 23)
Refine your implementation
Evaluate your implementation
Section this week

Fill out Section Topic Form by Tuesday 11:59pm.
We’ll announce topic sections based on your answers on Wednesday.
1. Tackle your recognizer/… problems now,
Xerox Star (1982)
FLEX SENSOR OFFERS VARIABLE RESISTANCE READINGS:

- At rest nominal resistance value
- 45° bend increased resistance value
- 90° bend resistance value further increased

Graph showing the relationship between resistance (Ohms) and deflection (degrees).
VISION-BASED INTERFACES
Myron Krueger
Videoplace 1969-75

http://youtu.be/dmmxVA5xhuo?t=2m17s
Scott Snibbe
Compliant, 2003
http://www.youtube.com/watch?v=PSdvN7c25ml

Boundary Functions, 2003
http://youtu.be/1p96bTARFKc?t=20s
Reactable
Jordà, Kaltenbrunner, Geiger and Alonso, 2003
http://youtu.be/Oh-RhyopUmc?t=2m7s
Approach: Fiducial Tracking
Figure 3: Some simple topologies and their corresponding region adjacency graphs.
Low-cost Audience Polling Using Computer Vision
(Cross, Cutrell, Thies)
Original image from webcam.

Step 1: Binarize image.

Step 2: Detect connected components. Blue/Red shapes indicate centroid locations of white/black components.

Step 3: Detect anchors.

Steps 4-5: Detect qCards.

Steps 6-8: Read out bits and rotation.
Multitouch

Jeff Han,
Perceptive Pixel
FTIR

- Total Internal Reflection
- LED
- Baffle
- Diffuser
- Acrylic Pane
- Scattered Light
- Projector
- Video Camera
Approach: blob tracking
The FourBySix Table
Table Infrastructure

- 12 MP Digital Still Camera
- XGA Projector with 45 Degree Mirror
- VGA Camera with IR-Pass Filter
- IR Illuminant Panel
- Acrylic tabletop with vellum cover

Dimensions:
- 120 cm
- 91 cm
- 180 cm
UNDISTORT → NORMALIZE → EDGE IMAGE:
FIND CONTACTS
SHAPE IMAGE:
ESTIMATE POS, ANGLE
B. Hartmann, M. Morris, H. Benko, A. Wilson,

*Augmenting Interactive Surfaces with Mice & Keyboards*, Proc. UIST 2009
Multitouch for Set Dressing

(c) Pixar
Start at 1:00
Sphere

Multi-touch Interactions on a Spherical Display

Hrvoje Benko
Andrew D. Wilson
Ravin Balakrishnan

Microsoft Research – University of Toronto
Projection + Sensing

- Diffuse ball
- Illumination ring (IR LEDs)
- Wide angle lens
- Cold mirror
- IR pass filter
- IR cut filter
- IR camera
- Projector
VISION-TRACKING OF HANDS
imaginary interfaces

Sean Gustafson
with
Daniel Bierwirth
Patrick Baudisch
Camera with IR Ring Light
(Prototype just connected to laptop)
ASL recognition

good results with simplified grammar, restricted vocabulary
(Starner IEEE PAMI ’98)
Glove tracking
Wang and Popovic, TOG 2009
OmniTouch
Wearable Multitouch Interaction Everywhere

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Microsoft
Carnegie Mellon University
OmniTouch
Harrison, Benko, Wilson UIST’11
robust 1-bit pose: pinching
1. Obtain a binary segmentation of the hand and background.

2. Compute connected components of the background pixels from the binary image. Label each border pixel with the component that contains it.

3. Take components of significant size (in number of pixels) that do not have pixels on the border of the image. Each of these is a ‘hole’ indicating a pinching hand.
AUGMENTING PCS WITH ADDITIONAL DISPLAYS
per-key displays

Art Lebedev Studio
Optimus Maximus
2007
“Magic desk”

Bi et al, CHI 2011

Decreased switching time when touch areas are on desk, around mouse + keyboard
NOVEL MOBILE DEVICE INTERACTIONS
Pick and Drop

Rekimoto, UIST 97
Same idea, different sensor

Bump Technologies, 2012
Another Variation

PhoneTouch, Schmidt, UIST 2010
NEW FORM FACTORS: GOING SMALL
Facet
Lyons et al, UIST 2012
Some saponas / Chris Harrison thing

Sigables, David Merrill
siftables
Merrill, Kalanithi, TEI’ 07 - now sifteo.com

Graduate project at the MIT Media Lab
siftables  

Merrill, Kalanithi, TEI’ 07 - now sifteo.com

http://youtu.be/fEqq8JykQoQ?t=59s
Abracadabra (C. Harrison)

http://www.youtube.com/watch?v=lEM61__ZDRyA
3D using two Magnetometers: uTrack (Chen, UIST’ 13)

Figure 1. uTrack enables real-time 3D input from the thumb and fingers using one permanent magnet (thumb) and two magnetometers (ring finger).

http://youtu.be/o4cgpQUW8HI?t=33s
iRing: Ogata, Sugiura, Osawa, Imai, UIST’ 12

http://youtu.be/DcF7AWhgdP4?t=42s
Figure 4. Measuring reflectance using iRing marked with a blue line that expresses angles by 10°.

Figure 5. Reflectance of the first author’s finger skin at 10° intervals expressed by voltage.
PROJECTION
MouseLight

Song et al, CHI’ 10
play anywhere vision
Pico Projectors
SideBySide
(Willis, Disney Research)
SideBySide:
Ad-hoc Multi-user Interaction with Handheld Projectors
Next Up

**Wednesday:** Panel on Mobile Start-Ups!
HKN Evaluations