



Human Computer Interaction

Intro to Surface Computing

CSCI 4620 U/G | SOFE 4850
Dr. Christopher Collins

Acknowledgement: Parts of these lectures are based on material prepared by Ron Baecker, Ravin Balakrishnan, John Chattoe, Ilona Posner, Scott Klemmer, and Jeremy Bradbury.

Last Time

- We:
 - Discussed term project
 - Introduced the concepts of usability and usefulness

From the Readings

- What is the PACT Framework?

PACT

- People
- Activities
- Context
- Technologies

Applications

SURFACE COMPUTING

*Isn't this just a monitor
on it's side?*

Or a giant iPad?

What makes tables different?

- Content orientation
 - Approach from any side
- Direct interaction
 - Reachability of interface elements
- Surface orientation
 - Horizontal vs. sloped (drafting)
- Presence of other objects on the table
 - Tangible computing
- Learning gestures
- Ergonomics encourage collaboration

Design Considerations

- Content Orientation
 - Users on any side need to be able to read info
- Implications:
 - Traditional menus don't work
 - OS-level window manager doesn't work

Interface Currents

Supporting Fluid Face-to-Face Collaboration

Uta Hinrichs
Dept. of Computer Science
University of Magdeburg
Magdeburg, Germany

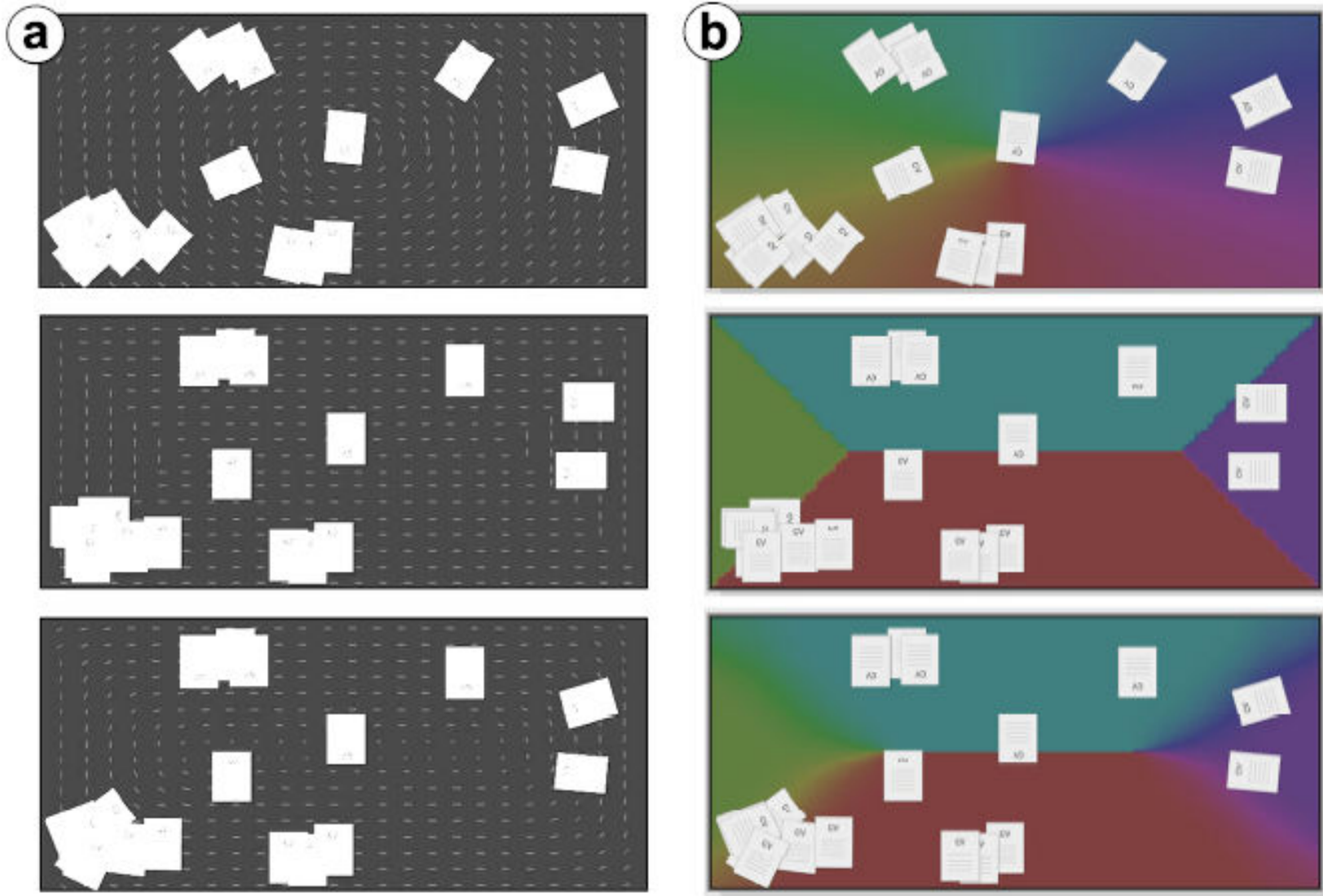
Sheelagh Carpendale
Dept. of Computer Science
University of Calgary
Calgary, Canada

Stacey D. Scott
Humans and Automation Lab
Massachusetts Institute of
Technology
Cambridge, MA, USA

DiamondSpin: An Extensible Toolkit for Around-the-Table Interaction

Chia Shen	Mitsubishi Electric Research Labs
Frédéric D. Vernier	University of Paris
Clifton Forlines	Mitsubishi Electric Research Labs
Meredith Ringel	Stanford University

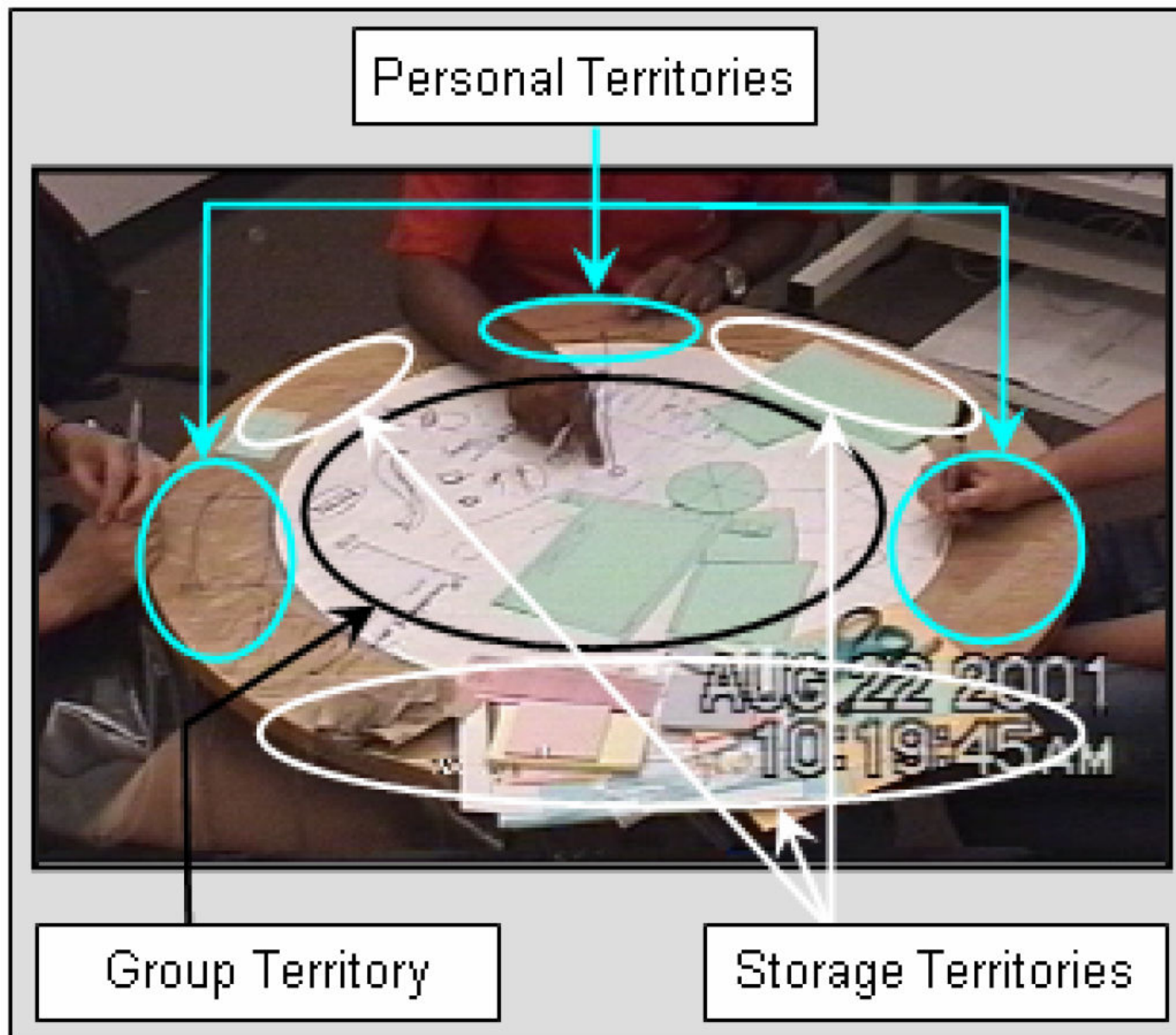
CHI 2004



Dragicevic P., Shi Y. [Visualizing and Manipulating Automatic Document Orientation Methods Using Vector Fields](#). *Proceedings of the International Conference on Interactive Tabletops and Surfaces (Tabletop '09 short paper), Banff, Alberta, November 23-25, 2009. ACM Press, New York, NY, 65-68.*

Direct Interaction

- People can touch interface elements to interact with them
- A feeling of “territory” is immediately established – affects collaboration
- Reaching distant objects is a challenge



Scott, S.D. (2003). Territory-Based Interaction Techniques for Tabletop Collaboration. In Conference Supplement of Symposium on User Interface Software and Technologies (UIST) 2003, Nov. 2003, Vancouver, BC, pp. 17-20.

Getting Practical with Interactive Tabletop Displays: Designing for Dense Data, “Fat Fingers,” Diverse Interactions, and Face-to-Face Collaboration

S. Volda, M. Tobiasz, J. Stromer, P. Isenberg, S. Carpendale. Getting Practical with Tabletop Displays: Designing for Dense Data, “Fat Fingers,” Diverse Interactions, and Face-to-Face Collaboration. In proceedings of Interactive Tabletops and Surfaces 2009 (ITS '09).

The Continuous Interaction Space:
Integrating Gestures Above a Surface with Direct Touch

Nicolai Marquardt
Saul Greenberg

Interactions Lab
University of Calgary

Ricardo Jota
Joaquim A. Jorge

VIMMI group
Inesc-ID, Portugal

<http://grouplab.cpsc.ucalgary.ca/>

Surface Orientation

- Horizontal: collaboration, tangibles, sitting
- Sloped: individual work, drawing, design, standing



Presence of Other Objects

- Tables hold things
 - Cups, papers, elbows, keys, phone...
- Sometimes we want to ignore these objects
- Sometimes they become part of the interface





Urp: A Luminous-Tangible Workbench for Urban Planning and Design John Underkoffler and Hiroshi Ishii

Exploring Tangible and Direct Touch Interfaces for Manipulating 2D and 3D Information on a Digital Table

Exploring Tangible and Direct Touch Interfaces for Manipulating 2D and 3D Information on a Digital Table
Mark Hancock, Otmar Hilliges, Christopher Collins, Dominikus Baur, and Sheelagh Carpendale
Proc. of ITS, November 2009

reactable

a musical instrument
with a tangible user interface

Sergi Jordi, Gunter Geiger, Marcos Alonso, and Martin Kaltenbrunner. 2007. The reacTable: exploring the synergy between live music performance and tabletop tangible interfaces. In *Proceedings of the 1st international conference on Tangible and embedded interaction* (TEI '07). ACM, New York, NY, USA, 139-146.

The Haptic Tabletop Puck

The Video

Nicolai Marquardt, Miguel A. Nacenta,
James E. Young, Sheelagh Carpendale,
Saul Greenberg, Ehud Sharlin

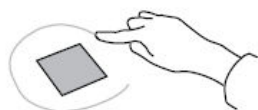
Interactions Lab
University of Calgary

Learning Gestures

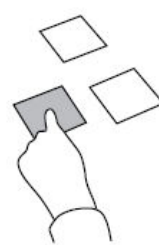
- Make gestures feel natural
- Support recall
- Multimodal interaction



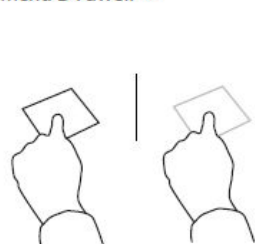
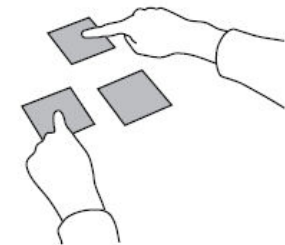
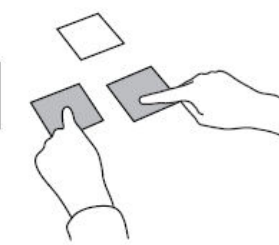
tap
 Select Single (U/R) ★
 Select Group (U/R)
 Menu D : dwell ★



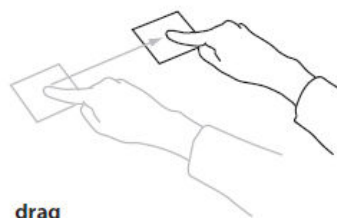
lasso
 Select Single (U)
 Select Group (U/R)



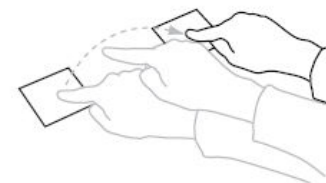
hold and tap
 Select Group (U/R) ★



hold and tap with second hand
 Move (U/R) : object jumps to index finger
 Duplicate (R)
 Paste (U) : off-screen source and on-screen destination
 Delete (U) : on-screen source and off-screen destination
 Reject (U) : dismiss dialog with off-screen destination
 Minimize (U/R) : move to bottom of display



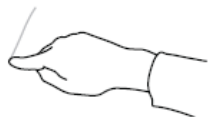
drag
 Move (U/R) ★
 Delete (U) : drag off-screen
 Paste (U) : drag from off-screen ★
 Reject (U) : dismiss dialog by dragging off-screen



tap source then destination
 Duplicate (U/R)



tap on background
 Paste (U/R)



slash
 Cut (U) ★
 Reject (R)



draw 'U'
 Undo (R) ★



draw check
 Accept (U/R) ★



draw 'X'
 Reject (U/R) ★
 Delete (R) ★



draw 'M'
 Menu (R)



pull out
 Menu (U/R)
 Duplicate D ★



draw arrow
 Next (R)
 Previous (R) : reverse



scratch out
 Undo (U)



draw arc right to left
 Undo (R)



draw '?'
 Help (U/R) ★



double tap
 Open (U) ★



right click
 Menu (R)

Morris, M. R., Wobbrock, J. O., and Wilson, A. D. Understanding users' preferences for surface gestures. In *Proceedings of Graphics Interface 2010* (Ottawa, Ontario, Canada, May 31-June 2, 2010). Canadian Information Processing Society, Toronto, Ont., Canada, 261-268.



ShadowGuides

**Visualizations for In-Situ Learning of
Multi-Touch and Whole-Hand Gestures**

Motivating Multimodal Interaction Around Digital Tabletops

A photograph showing two individuals, a woman in a green shirt and a man in a white shirt, leaning over a large wooden table. They are interacting with a large digital display that shows a map or a complex diagram. The woman is pointing at the screen with her right hand, while the man is holding a red marker. The background is slightly blurred, showing an office or meeting room environment.

Edward Tse, Saul Greenberg, Chia Shen

Ergonomics Support Collaboration

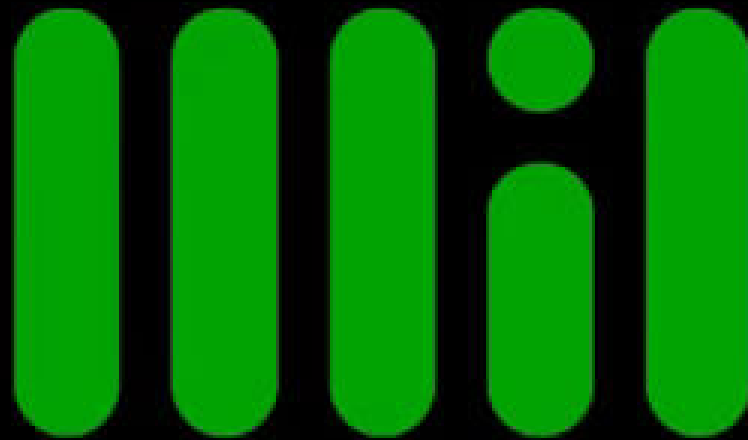


What makes walls different?

- Collaboration
 - Large space for multiple people to work together
- Space for Content
 - High resolution allows for a lot of content
- Viewing Distance
 - Physically stand back to get ‘big picture’
- Direct and Indirect Interaction
 - Touch, pen, Kinect, mouse, ...

MSEs: Multi-Surface Environments

NiCE Discussion Room



media interaction lab

MSE-API

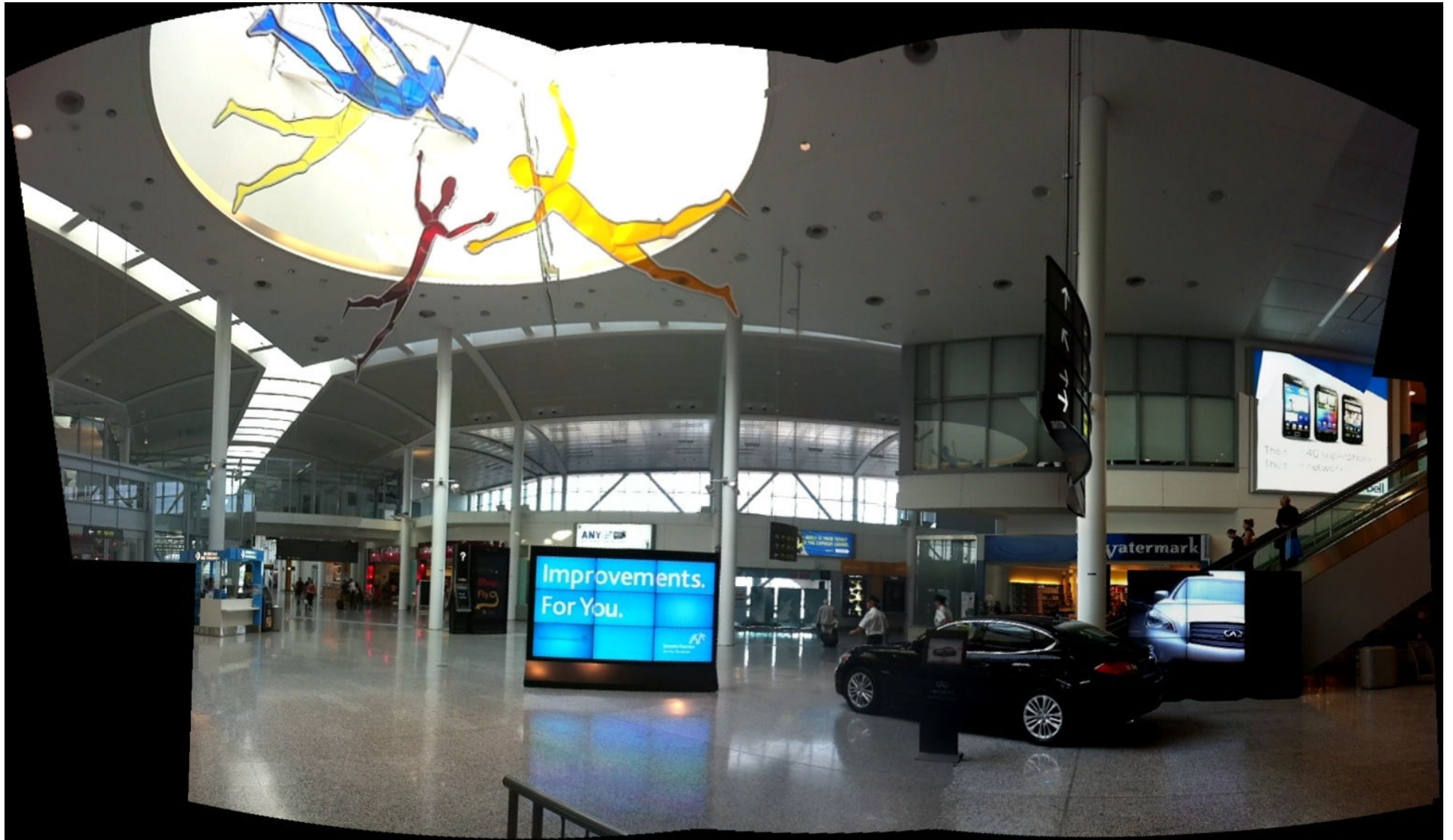
- Projects by Frank Maurer's lab at U of Calgary:
- <http://ase.cpsc.ucalgary.ca/index.php?page=video-demo>

Interactive Surfaces in Real Life

- Hotel Concierge
- Shopping Mall
- Museums
- Airports
- Classrooms
- Meeting rooms
- Control Centers
- Gaming
- Others?

The image shows a digital representation of a sandtray. It is a rectangular area filled with a textured, greyish-blue material that looks like sand. The entire area is framed by a dark blue border with glowing light blue corners and a glowing light blue base at the bottom. The text "Supporting Sandtray Therapy on an Interactive Tabletop" is centered over the sandtray in a white, serif font with a slight drop shadow.

Supporting Sandtray Therapy on an Interactive Tabletop





Summary

- Today we:
 - Reviewed tabletop and multi-touch computing

Your Action Items

- New Required Readings:
 - Excerpts from “The Trouble with Computers” by Thomas K. Landauer (Sept 19)
 - “What is Interaction Design?” by Preece, Rogers, Sharp (Sept 19)
- *Ideation* assignment: Read intros and project ideas from the Blackboard discussion

Lab next week

- Brainstorming exercise
- Talk with classmates and the TA about project ideas
- Try to find team members

Ongoing Course Evaluation

- Feedback form in lecture folder:



Lecture 3 Daily Feedback

Next Time

- Review HCI Basic Concepts:
 - Human & computer capabilities