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# Overview

- Pointing Techniques

- Whole Body
  - proxemics
  - F-Formation
  - micro-mobility

Pointing interaction design

- ## interactions using head tracking

  - object selection is often preceded by a visual search for the target.

  - good approximation of where users look at

  - in conjunction with any pointing device used in the environment.

- ## dual-mode target acquisition

  - absolute pointing for rapid cursor movements

  - relative pointing for accuracy

  - implicit and explicit mode switch

- ## pointing via mobile touch-screens

  - control remote cursor via mobile device's touch-screen

  - example: touch projector

Pointing via mobile touch screens

- interaction through video
  - mobile phone used as a lens (remember another technique doing that?)
  - touch input is "projected" onto remote displays
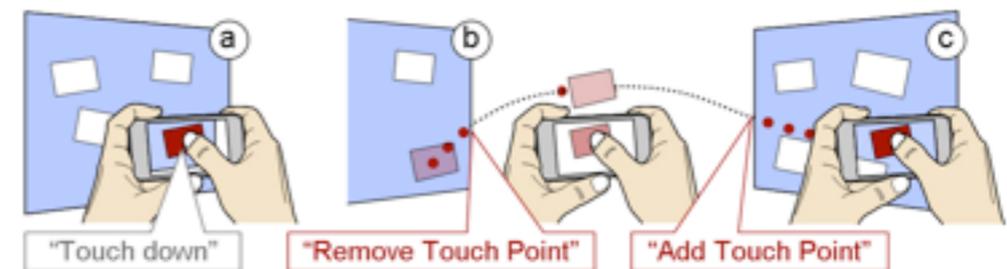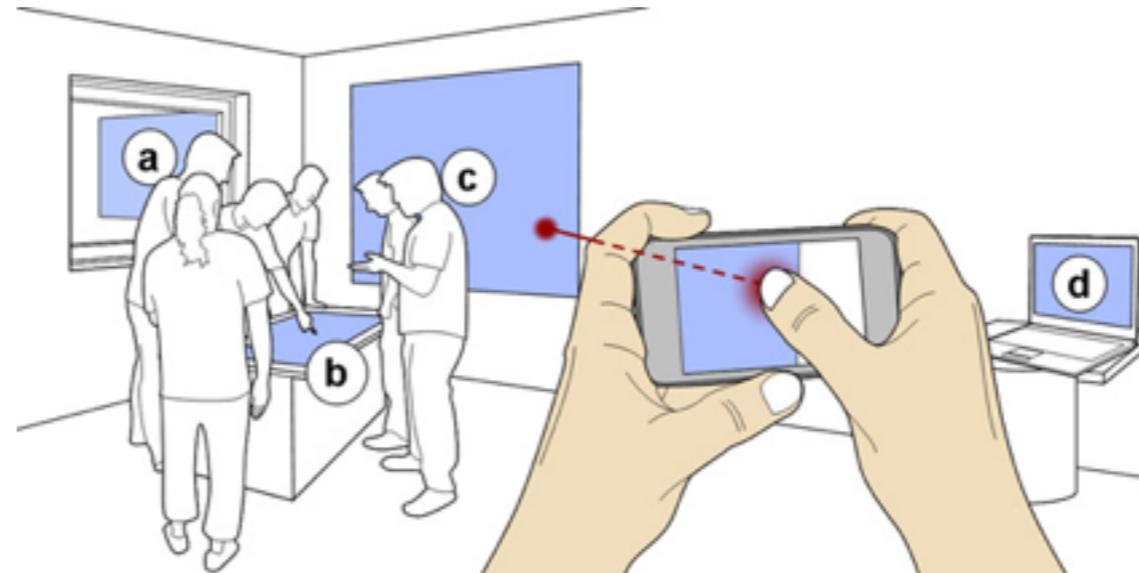
Drag-and-Drop

Literature: Boring S. et al: Touch Projector: Mobile Interaction Through Video, CHI 2010

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Pointing facilitation techniques

- Drag-and-pop. Do you remember?
- shadow-reaching paradigm

Whole Body Large Wall Display Interfaces
Garth Shoemaker, Takayuki Tsukitani, Yoshifumi Kitamura, Kellogg S. Booth

Literature: Shoemaker G. et al: Body-centric interaction techniques for very large wall displays, NordiCHI 2010

Shadow reaching

- dynamic light-source positioning
- single virtual light source per user
  - changing projection of shadow allows users to reach all on-screen positions.
  - altering light location controls CD gain
- control shadow position and size (and resulting CD-gain)
  - point in direction where shadow should appear and press button
  - light source is positioned behind user in the opposite direction.
  - distance between light source and user is a function of the distance between users' hand and body. (exaggerated because of limited arm length)
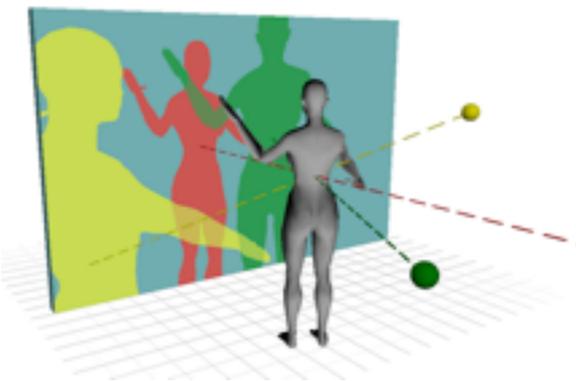
Literature: Shoemaker G. et al: Body-centric interaction techniques for very large wall displays, NordiCHI 2010

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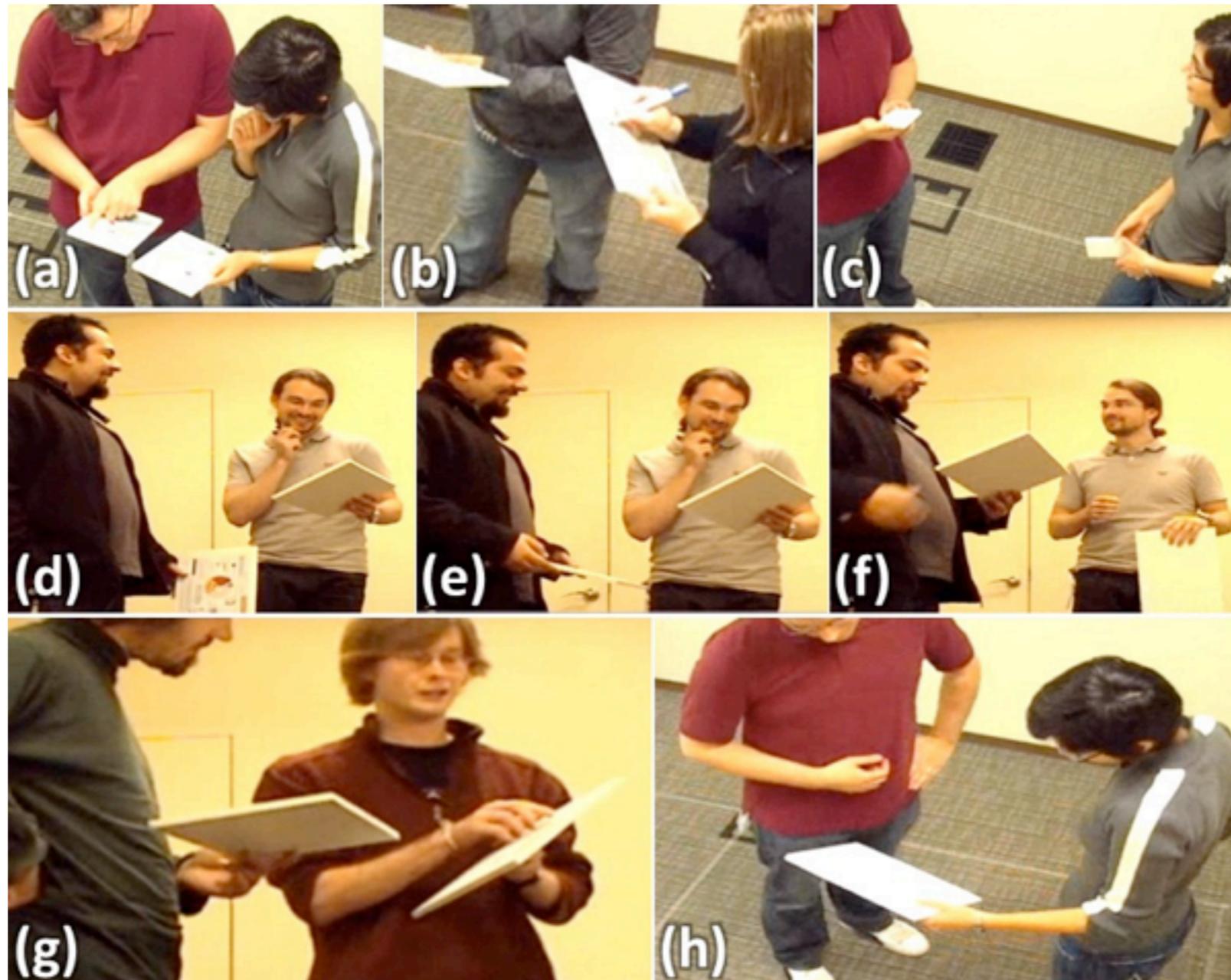
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Do you notice anything?

Literature: Marquardt N. et al: Cross-Device Interaction via Micro-mobility and F-formations, UIST'12

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Proxemics

- coined by anthropologist Edward Hall in the 60s.

- human use of space within the context of culture

  – unconscious internalization of cultural patterns used for communication through the use of space.

    - intimate space: 'bubble' surrounding a person, for close friends and intimates.

    - social space: people feel comfortable conducting social interaction with acquaintances and strangers.

    - public space: area beyond which people perceive interaction as impersonal or anonymous.

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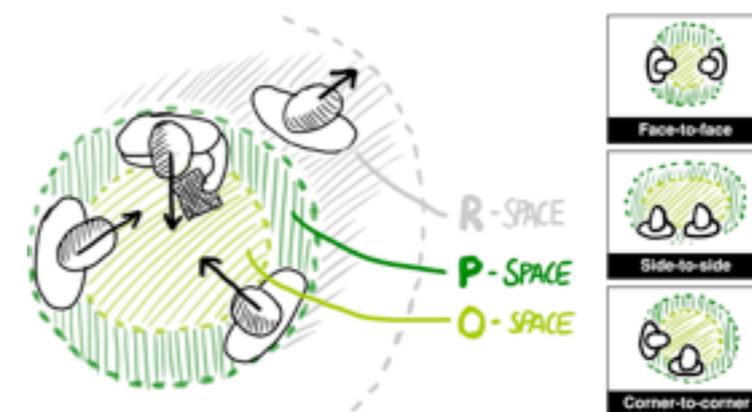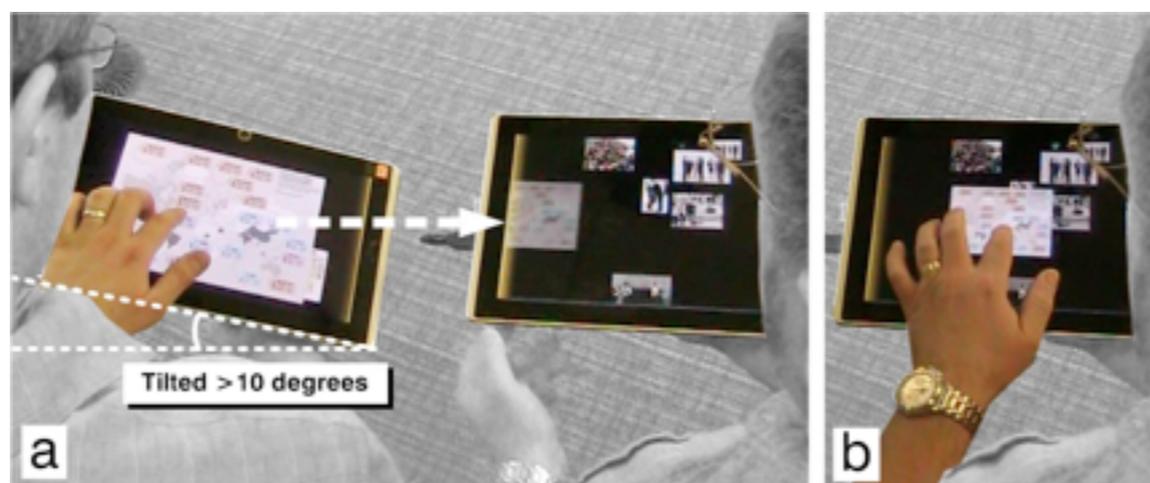
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Proxemics

- proxemics: people's use of personal space to mediate social interactions

  – interpersonal physical distance = social distance

  – estimation of people's desire to communicate with one another via devices they carry

- dimensions of proxemics relationships

  – position: spatial relationship between two entities

  – orientation: facing direction of entities (person's eyes, tip of a pencil)

  – movement: understand changes of position and orientation of entity over time (e.g. person approaching particular devices or object)

  – identity: uniquely describe entities in space, categories of objects, group affiliations etc.

Literature: Marquardt N. et al: Cross-Device Interaction via Micro-mobility and F-formations, UIST'12

F-formations and Micro-mobility

- F-formations: distance and relative body orientation among multiple users reveals when and how people position themselves as a group

  – physical arrangement that people adopt when engaging in conversations.

- Micro-mobility: how people orient and tilt devices towards one another to promote sharing during co-present collaboration

Literature: Marquardt N. et al: Cross-Device Interaction via Micro-mobility and F-formations, UIST'12

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between user and device

Literature: Marquardt N. et al: Cross-Device Interaction via Micro-mobility and F-formations, UIST'12

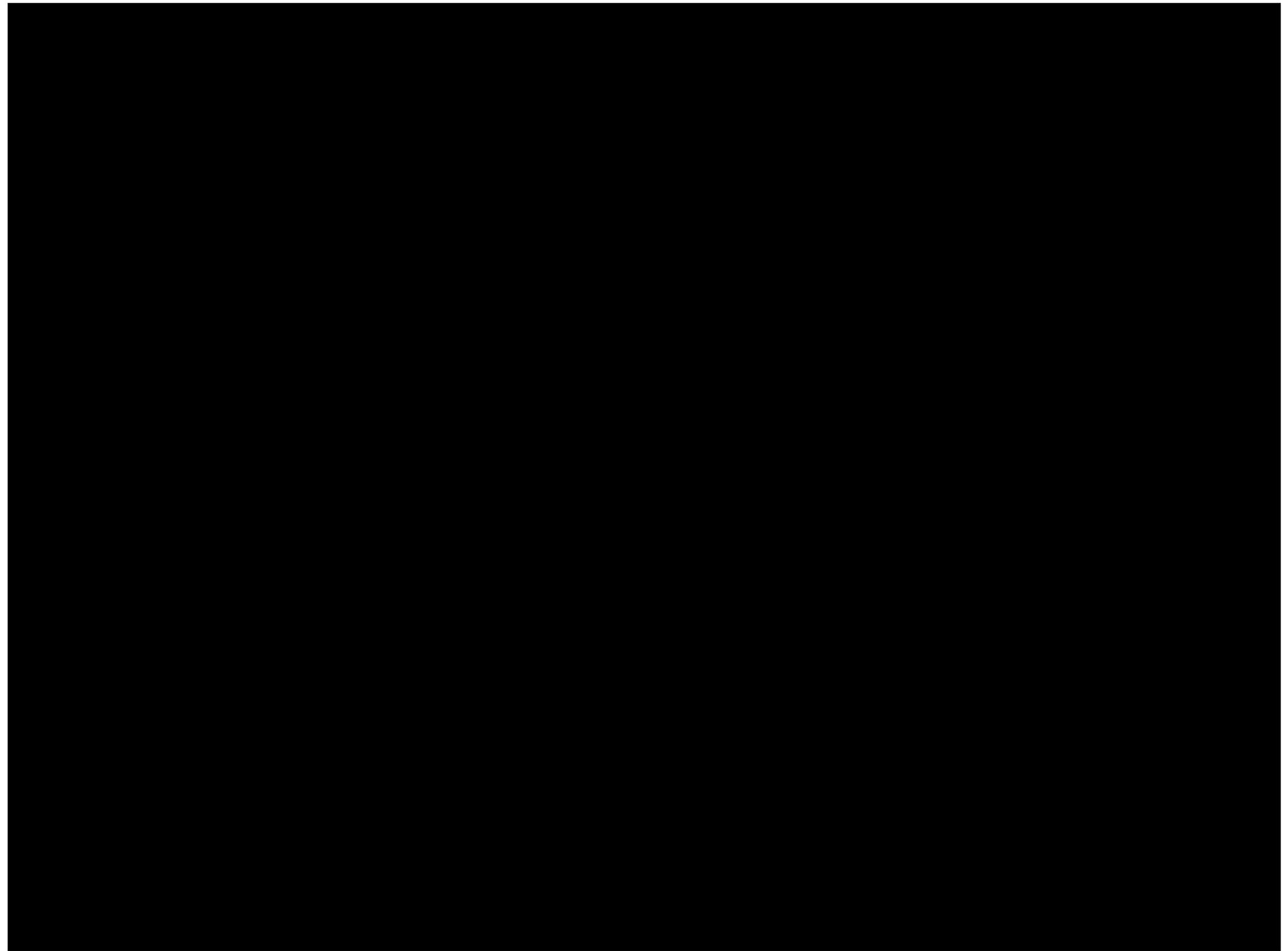# between multiple users

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Literature: Marquardt N. et al: Cross-Device Interaction via Micro-mobility and F-formations, UIST'12

Tangible interaction example: Urp

- physical workbench for urban planning

- physical architecture models placed on table cast shadows for specific times of day.

- One common problem:
  - might a proposed tall building take sunlight from an existing building? (potential source of a lawsuit?)
  - easy to experiment with possible solutions
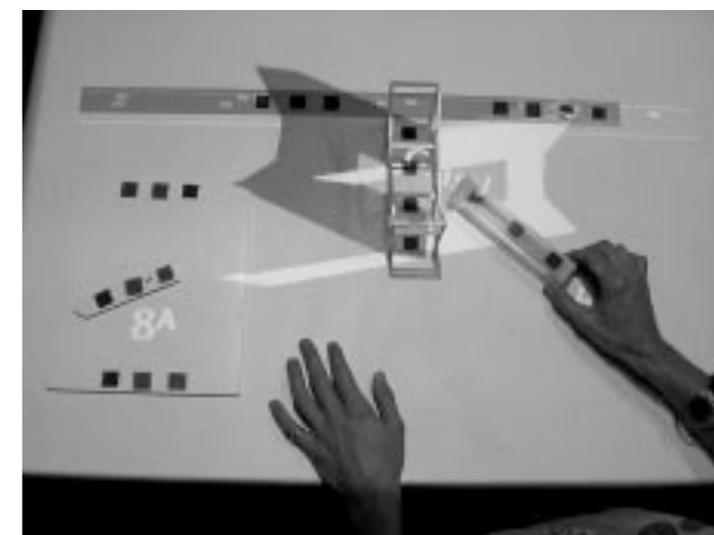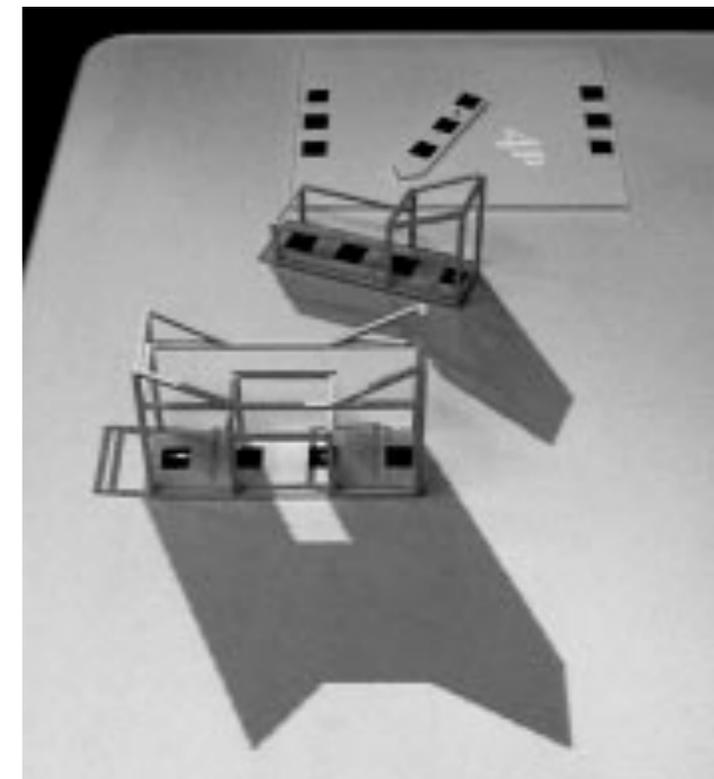
Literature: Underkoffler, J. et al.. Urp: a Luminous-Tangible Workbench for Urban Planning and Design, CHI'99

Tangible interaction example: ReacTable

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https://www.youtube.com/watch?v=0h-RhyopUmc

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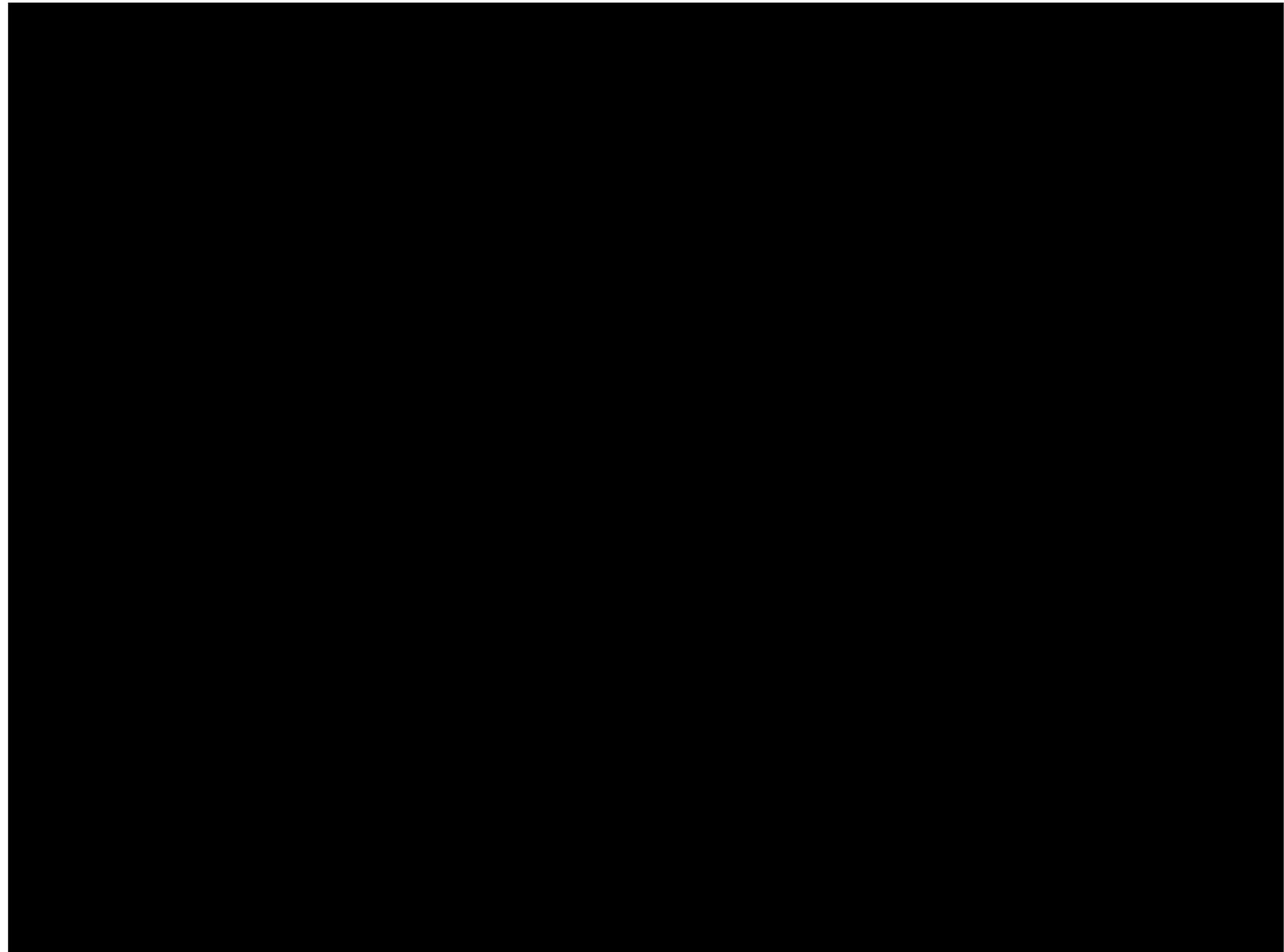
Tangible interaction example: ReacTable

https://www.youtube.com/watch?v=0h-RhyopUmc

Tangible interaction example: SLAP widgets

- transparent objects made from acryl
  - knob, buttons, slider, keyboard

- specific marker pattern recognized by interactive table
- table displays the appropriate interface below widget (dynamic relabeling)
- Guide users' motion through tangible, keep the power of dynamic relabeling of interactive surfaces.
- widget-virtual object pairing through simultaneous double tap next to both
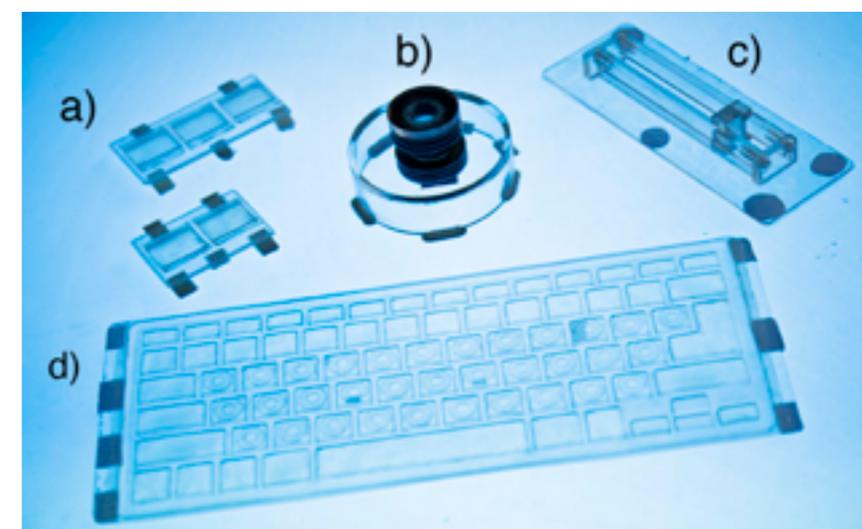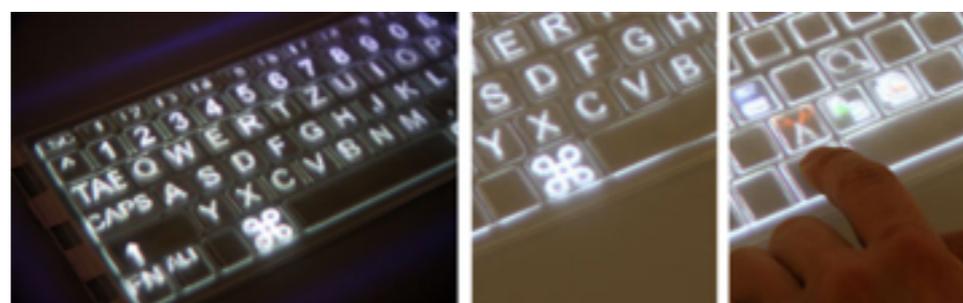
http://hci.rwth-aachen.de/slap

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What is similar/different between those projects?

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Discussion: Urb, ReacTable, SLAP

- Ullmer and Ishii: "giving physical form to digital information" and its subsequent physical control. (Urb, ReacTable)

- guidance of input movement for increased input precision (SLAP widgets, clock in Urb)

- spatial interaction embedded in real space, interaction through movement in space (Urb, ReacTable)

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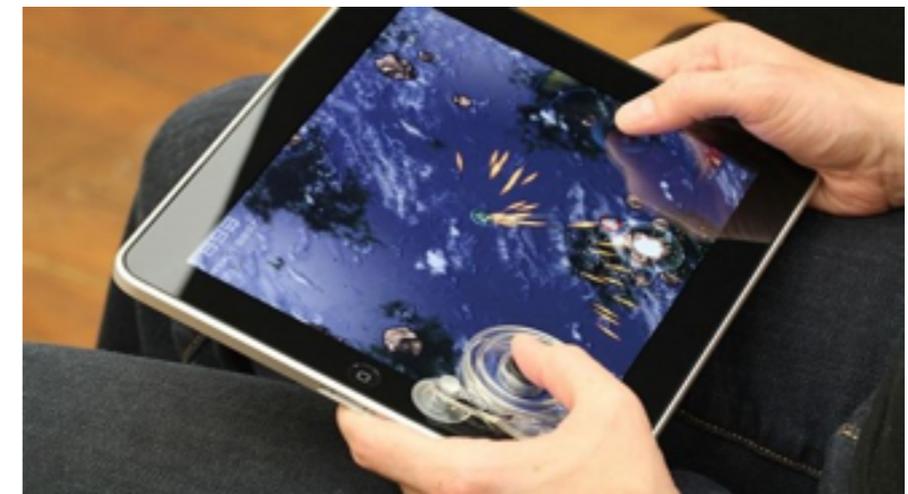
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Tangible interaction on Tablets

- DIY: what do you need for creating tangibles for off-the-shelf tablets?

https://hal.inria.fr/hal-00694305/file/interaction.png

http://images.gizmag.com/hero/fling.jpg

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Tangible interaction on Tablets

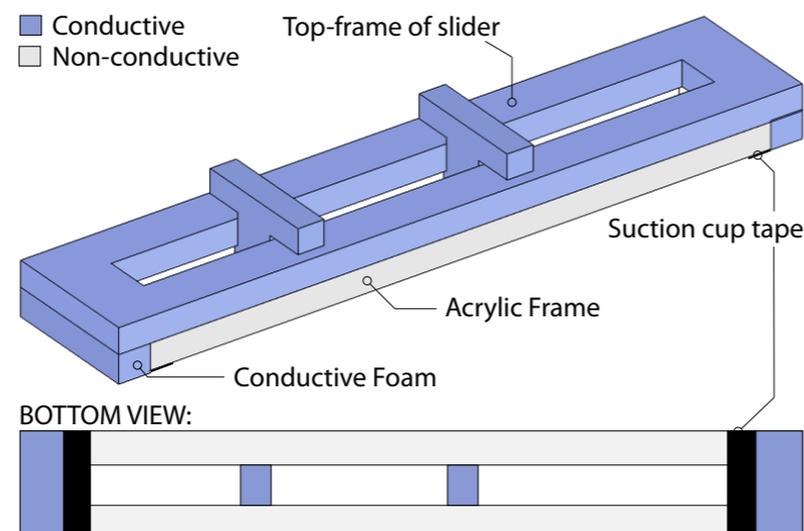- DIY: what do you need for creating tangibles for off-the-shelf tablets?

https://hal.inria.fr/hal-00694305/file/interaction.png

Conductive
Non-conductive

Top-frame of slider

Suction cup tape

Acrylic Frame

Conductive Foam

BOTTOM VIEW:

http://images.gizmag.com/hero/fling.jpg

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ShadowGuides

- on-demand assistance to users visualizing
  - users' hand pose as interpreted by the system
  - system-recognized gestures

Literature: Freeman, D. et al: ShadowGuides: Visualizations for In-Situ Learning of Multi-Touch and Whole-Hand Gestures, ITS'09

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ShadowGuides

- Problem: reveal complex hand pose and subsequent gesture.
  - Reveal dynamic gestures through animations or arrows
  - Reveal hand pose through static cheat sheets

Literature: Freeman, D. et al: ShadowGuides: Visualizations for In-Situ Learning of Multi-Touch and Whole-Hand Gestures, ITS'09

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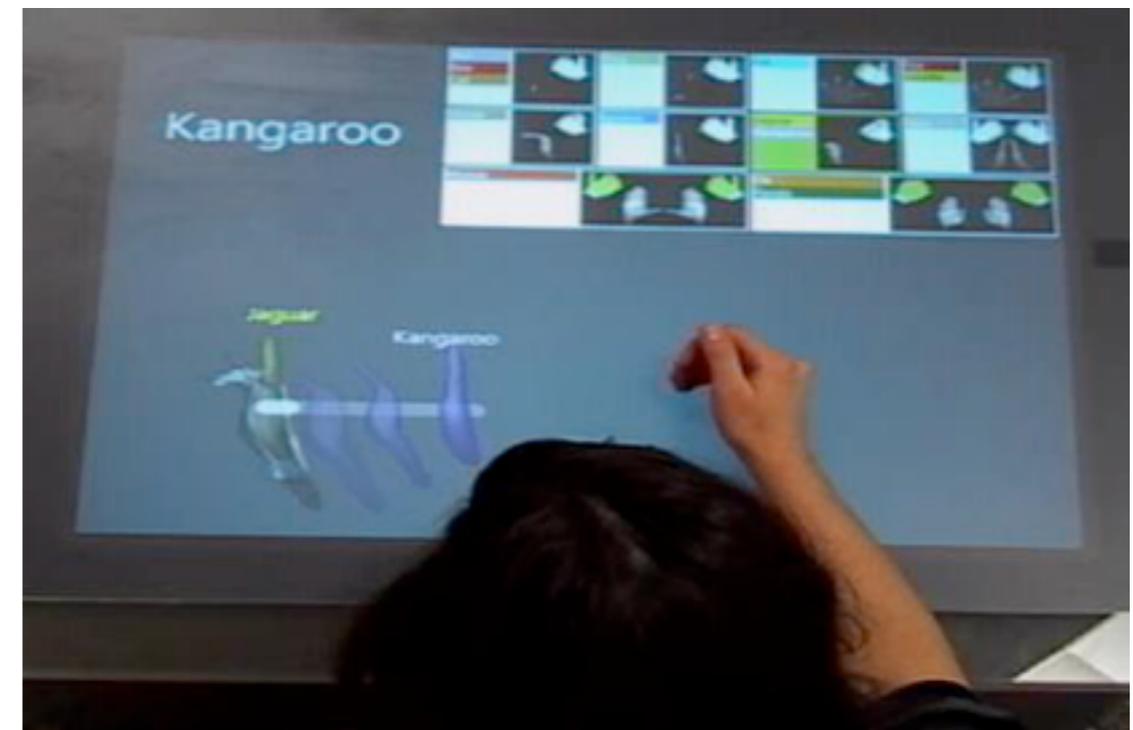techniques

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    whole body

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- the following slide contains an on-going research project currently in review process for a conference
- for reasons of confidentiality, we pause the recording
- for people in class it shall act as example master thesis project at our chair
- it is not relevant for the exam

Tuesday 13 January 15