Chapter 3: Interactive Tabletops and Surfaces

Vorlesung „Mensch-Maschine-Interaktion II”
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(slides today partly courtesy of Dr. Otmar Hilliges)
Interactions in the Air (Hilliges 2009)
Problems and Particularities

• Asymmetric bimanuality
• Territoriality on tables
• Direction and orientation on tables

• Occlusion Problem
• Fat finger problem
Asymmetric Bimanual Interaction (Guiard 1987)

- Human bimanual interaction is largely asymmetric
- Hands are simply regarded as “motors”
  - Non-dominant hand provides a reference frame
  - Dominant hand interacts fine-grained in it
- In this sense, both motors form a logical chain
Example: Handwriting

- Recordings of the same handwriting
  - relative to the sheet of paper
  - relative to the table (obtained with the help of carbon paper)

- Translation movements for writing lines were made obliquely on the table: slant of the paper

- Rectangle within which right-hand motion (relative to the table) was confined = roughly 1/3 of the page
  - Movement of the pen tip from the first to the last line (24 cm)
  - upward displacement of the page (16 cm)
  - downward displacement of the right hand (8 cm)
Territoriality on tables (Scott 2004)

• Studies on how people use the space on a table
  – puzzle, game, Lego activities + room planning on round tables

• Different areas on the table surface
  – personal space (directly in front of person)
  – group space (reachable by all members)
  – storage space (in the periphery)

• Boundaries between areas are flexible
Territoriality on tables (Scott 2004)
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• Design Implications:
  – Provide visibility and transparency of action
  – Provide appropriate table space
  – Provide functionality in the appropriate locality
  – Allow casual grouping of items and tools in the workspace
Orientation on tables (Kruger 2003)

• Basic problem: no clearly defined „up“ direction when interacting with multiple users around a table

• Known approaches:
  – Fixed orientation
  – Manual orientation
  – Person-based automatic orientation
  – Environment-based automatic orientation
Orientation on tables (Kruger 2003)

- Variant orientation can serve as a collaborative resource:
  - Using someone else’s alignment conveyed support
  - Orientation could establish the intended audience
  - Orientation was also used to create a personal space.
Orientation on tables (Kruger 2003)

• 3 main roles of orientation:
  • Comprehension
    – Ease of reading
    – Ease of task
    – Alternate perspective
  • Coordination
    – Establishment of personal spaces
    – Establishment of group spaces
    – Ownership of objects
  • Communication
    – Intentional communication
    – Independence of orientation
Concept: Hybrid widgets

- How can we bring tangibility to interactive surfaces?
- Graphical UI widgets are only virtual (i.e., graphical) objects
- Tangible UI are only physical objects
  - Sometimes combined with a screen, tabletop (see MetaDesk, DataTiles)
- Take the concept of a GUI widget, but make part of it physical
  - Tightly coupled physical and virtual parts
  - supports asymmetric two-handed interaction
  - provides visual and haptic stimulus
- Several prototypes currently developed
Example: PhotoHelix
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Occlusions and the Fat Finger Problem

- Fingers and hands can occlude screen objects
  - minimize by choosing a good screen layout!
- fingers may hit several small objects
  - just use large objects ;-)
- exact hit point is occluded
Example: Shift (Baudisch 2007)

Example: Lucidtouch (Baudisch 2007)

Literature


