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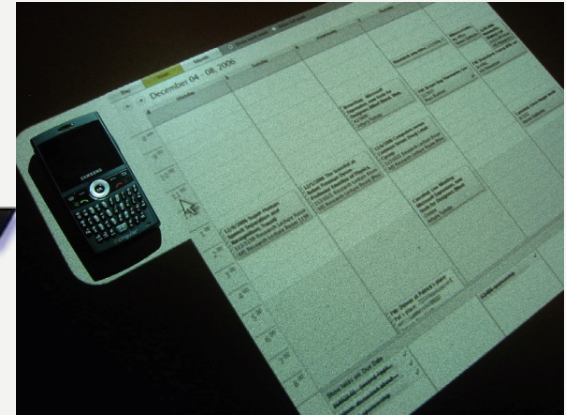
Hybrid Interaction on Interactive Surfaces

**Medieninformatik Hauptseminar
Sommersemester 2009
„Interactive Surfaces"**

[2] A mobile and Microsoft Surface

[8] Interaction on the BlueTable

Hybrid Interaction on Interactive Surfaces

[10] Interaction on the reacTable

[6] SLAP: acryllic widgets

Abstract

Content
• Detailed overview
> • Important terms & definitions
> • Starting point: interactive tabletops as well as virtual and physical realm

• Comparison of different hybrid widgets
> • Widgets are comparable
> • Characteristics are well-defined
> ➔ Development of groups

• Examples and related work
> • Developed systems
> • Classification referring to groups of objects

Definition & Terms

- Interactive Surfaces
  - Interaction: ability to directly manipulate the upcoming behavior of a system
  - Lots of interaction possibilities
  - Stands for a direct manipulation of a virtual environment
  - Touchable and tangible user interface

- Touch Interfaces
  - Control by using fingers or other body parts
  - No explicit learning of these congenital gestures
  - Much more intuitive, contextual and evocative
  - Problem: Limited tactile feedback ➜ lack of fluid and precise control

Definition & Terms

• Tangible User Interfaces
  • Supports physical artifacts as representation and control elements
  • Inputs are created by simply working with physical objects
  • Can enable a virtual shadow
  • Rooted in our physical surroundings, employing objects, surfaces and spaces as embodiments of digital information
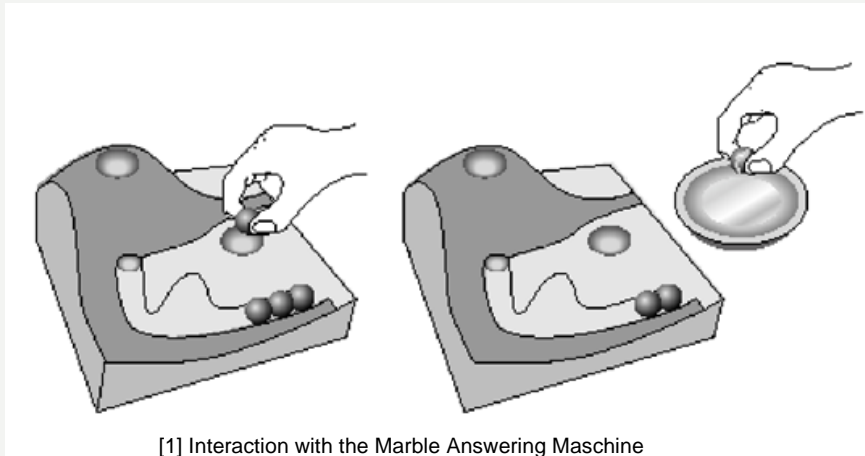

[1] Interaction with the Marble Answering Maschine

Digital or Virtual Shadow: Is the digital surrounding which appears when objects are connected with the underlying surface

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Components of an Interactive Tabletop

- Construction
    - Often very similar to regular tables
    - Table form ➔ support multi-user inputs in a proper way
    - A screen as table surface
    - Tracking is an important part: rich diversity
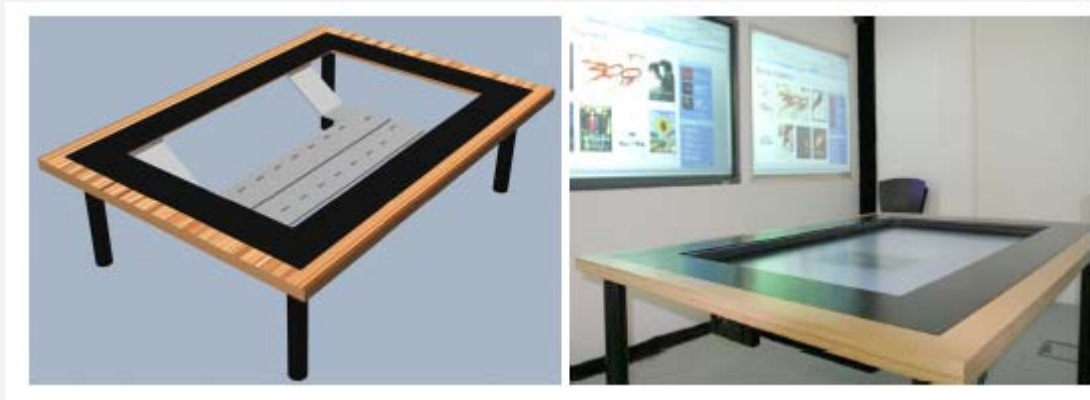
[3] An interactive tabletop build-up

Hybrid Interaction

Summary
- Input via fingers or other body parts as well as physical objects
- Artifacts create a link between themselves and the digital data they refer to
- Fixing problems of natural and tangible user interfaces
- Recognizable and reusable interface objects with physical handle [3]
- The digital part is closely coupled to the physical handle
- Providing a haptic quality to interaction with the screen content

[3] Interaction with hybrid widgets: PhotoHelix & PhotoLens

[7] Hybrid Interaction on an Interactive Surface

Hybrid Interaction

History
- Expansion of tangible user interface and multi-touch systems
- Single objects linked to digital data
- By-and-by: support of multi-inputs
- Improvement of precise
- Development of examples for hybrid interaction:
  - Urp: Urban Planning Tool (1999) [5]
  - The reacTable (2005) [10]
  - PhotoHelix and PhotoLens (2007) [3]
  - Microsoft Surface (2007) [2]
- Ongoing research and continuous improvement

Hybrid Interaction

Related Work
- Intensive work in this field was / is done by:
  - H. Ishii, A. Wilson, L. Terrenghi, J. Underkoffler

- Current developments:
  - "SLAP Widgets: Bridging the Gap Between Virtual and Physical Controls on Tabletops" by M. Weiss and J. Wagner and Y. Jansen and R. Jennings and R. Khoshabeh and J. D. Hollan and J. Borchers [6]
    - Introducing of silicon widgets that can be placed on a multi-touch tabletop
    - Evaluation of certain scenarios to figure out the needs of SLAP widgets
    - A user study underlines the wish for hybrid widgets like these
  - "SurfaceWare: Dynamic Tagging for Microsoft Surface" by Paul H. Dietz and Benjamin D. Eidelson [4]
    - Widgets that can be used on Microsoft's interactive tabletop called Surface
    - Demonstrates techniques of dynamic tagging
    - Dynamic tags can be thought of as transducers that convert physical variables into optical changes
    - Introduction of level-sensing glassware

Differences between Hybrid Widgets
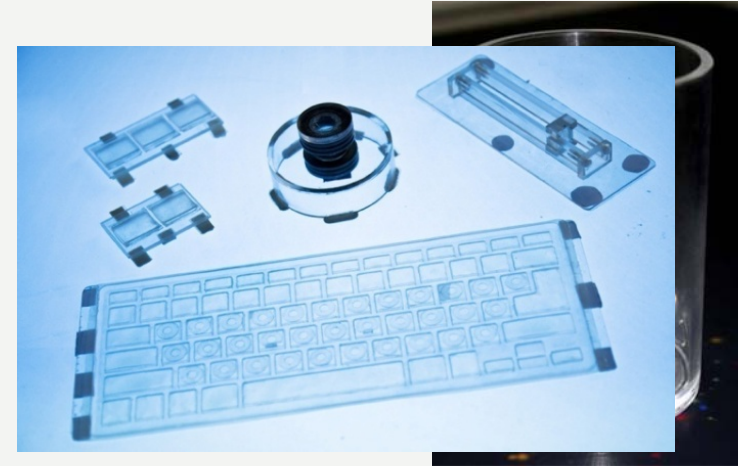
[11] Direct influence of the widgets

- Link between object and digital data
  - Link to digital data
  - Virtual surrounding or indirect influence

- Way of Manipulation
  - Input through moving them or the objects have a static position
  - Objects have to be moved to achieve a certain effect ➔ become direct control elements

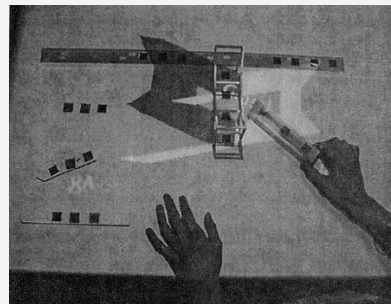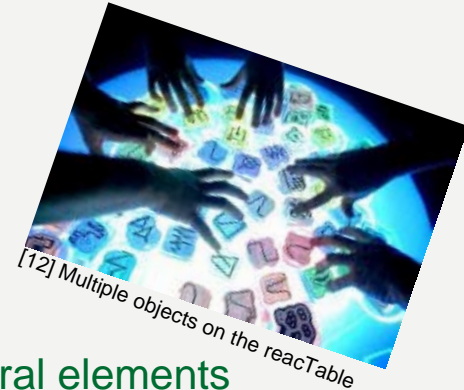[6] Non-static position of SLAP widgets

Differences between Hybrid Widgets

- Tracking
  - Tracking techniques of objects
  - Differing between tagging and non-tagging methods
  - Standard tagging methods consists of a special tag for identification
- Location
  - Differentiate between locally bound and local unbound
  - Locally Bound: A variation of the position can completely change the system's state
  - Locally Unbound: Location does not matter

Differences between Hybrid Widgets

[12] Multiple objects on the reacTable

- Multiple Objects
- Multiple objects which stand in consideration to each other ➔ Several elements create one unit
- Multiple or single objects which have no special coherence ➔ often supporting objects

- Object types
- Objects for one single system ➔ special tools just created to serve in one system
- Objects for multiple systems ➔ Secondary way of utilization (other primary functions e.g. articles of daily use)

[5] Special objects on Urp

[4] A SurfaceWare widget

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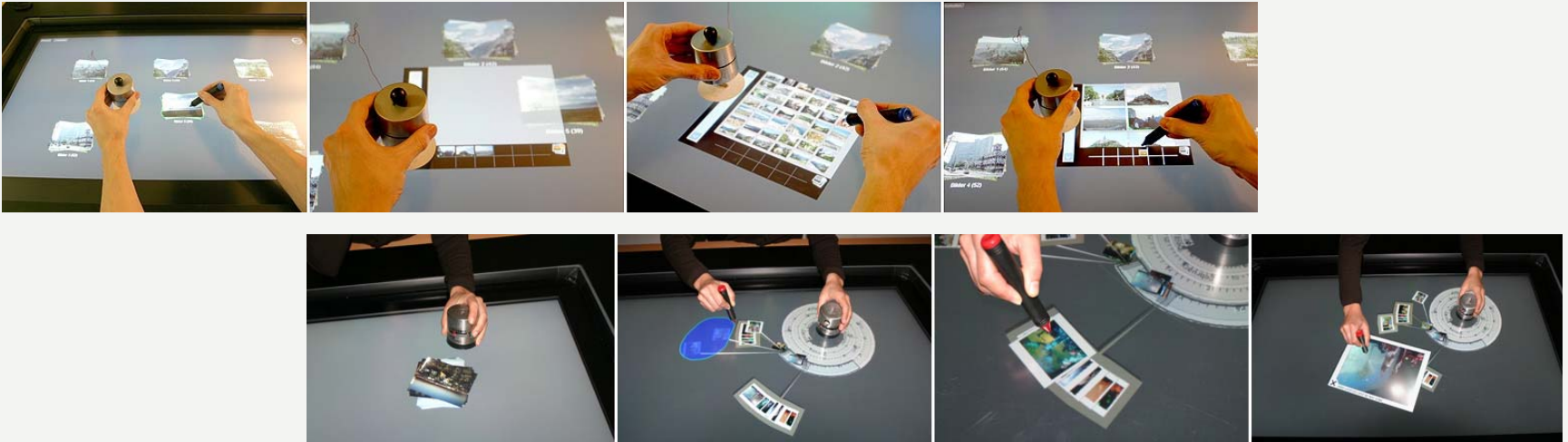MAXIMILIANS-
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Differences between Hybrid Widgets

- Evaluation
  - Locally dependent or independent: local-context objects which stands for location and interaction between objects on a surface
  - Direct and indirect widgets: way of manipulation and the link between realms including direct-context elements

| Category	Surface	Urp	Helix & Lens	reacTable	BlueTable
Location	Doesn't matter	Matters	Doesn't matter	Matters	Doesn't matter
Manipulation	Direct	Indirect	Direct	Direct	Direct
Multiple Interactions	No	Yes	No	Yes	No
Tracking	Differs	Tagging	Tagging	Tagging	Visual
Link between realms	Direct	Indirect	Direct	Direct	Direct
Object's life	Differs	Single	Multiple	Single	Multiple

Examples

- PhotoHelix and PhotoLens [3]
  - PhotoHelix is a metallic knob whose upper part can be rotated
  - It supports image sorting using a timeline and "event folders"
  - PhotoLens serves for a thumbnail preview of photo piles
  - Photo piles are a folder metaphor on interactive surfaces
  - Both are direct and independent widgets

[3] Interaction on an interactive surface: with PhotoLens (above), with PhotoHelix (below)

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Examples

- The reacTable [10]
    - Supports touch inputs and physicals to provide live music
    - Introduced at the Audio Engineering Society Conference in 2005
    - Consists of an input screen and many different pucks ➔ Each with a unique ability
    - Creates music by bringing all inputs into consideration
    - Reaction of "reacTable musicians" is very positive
    - Is a direct, dependent system

[10] Interaction on the reacTable

[10] Interaction between single pucks on the reacTable
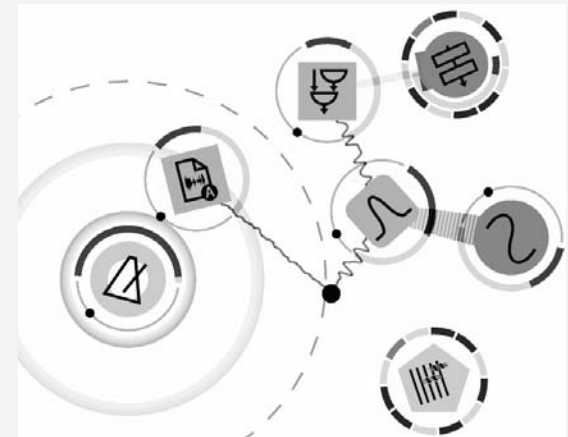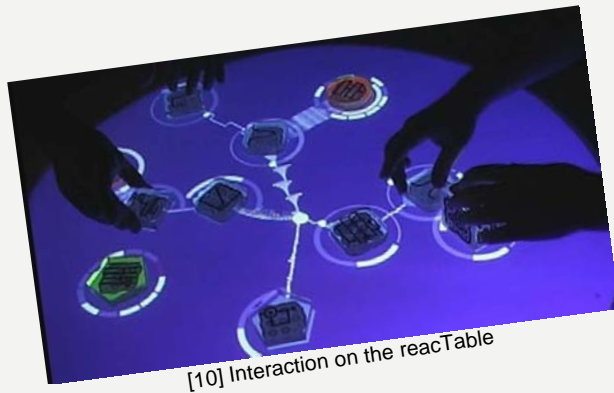
Summary and Outlook

- Important facts:
    - Difference between the digital and physical world
    - Overlook of hybrid widgets for a better understanding of hybrid designed systems
    - User behavior referring to hybrid interaction
    - The formed object groups because of object's characteristics

- Problems:
    - It is a thin line between tangible user interface and hybrid interactions
    - Hard to find characteristics that are well-defined and leave the possibility for classification

- Outlook:
    - Fading the border between physical and virtual realm
    - Improvement of usability and ease-of-use
    - Generalizing of tracking methods & conversion to other metaphors

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Thank you for your attention!