LFE Medieninformatik • Martin Hommer

Prototyping of Interactive Surfaces

Medieninformatik Hauptseminar
Wintersemester 2009/2010
„Prototyping"

Motivation

"Please enter your search term"

Quelle: http://www.karikatur-cartoon.de/computer/usability.htm

Motivation

Apple iPhone [1]

Microsoft Surface [2]

Glass multi-touch screen [3]

Interactive Surfaces appear numerously in our daily life

↳ Researching sophisticated features is not enough!

Quellen: [1] http://seattletimes.nwsource.com/html/businesstechnology/2004316697_btiphonesocial31.html,
[2] http://www.microsoft.com/presspass/presskits/surfacecomputing/gallery.mspx, [3] http://www.flickr.com/photos/desertzarzamora/3875636854/

Motivation

Microsoft Surface [1]

- User requirements should be taken into account
- Sometimes less functionality but as much more usability is advisable

This work's focus:
How can Prototyping support an efficient user-centered design process of Interactive Surfaces?

Quelle: [1] http://www.microsoft.com/presspass/presskits/surfacecomputing/gallery.mspx

Roadmap

1. Defining the Terms
    I. Interactive Surfaces
    II. What Prototyping is about
2. Tools for Prototyping Interactive Surfaces
3. Usage of Prototyping in Research
    I. Interactive Surfaces
    II. Interaction Techniques
4. Lessons Learned

1. Defining the Terms

I. Interactive Surfaces
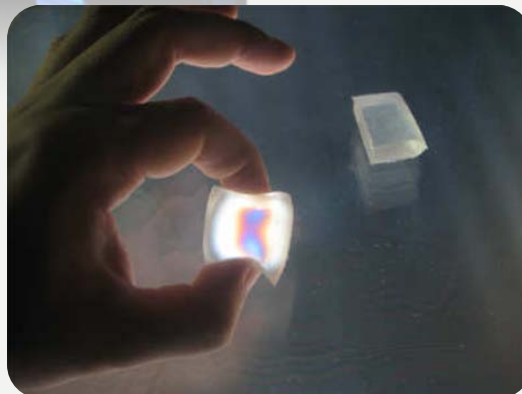
What are Interactive Surfaces?

Microsoft Interactive Wall [1]

Microsoft Surface [2]

↳ Example for *multi-touch*

Photoelastic Touch [3]

Quellen: [1] http://www.flickr.com/photos/46373967@N07/4261094495/, [2] http://www.flickr.com/photos/simonread/2932257006/, [3] Sato T. et al. (2009)

Interactive Surfaces – Another Example

Quelle: http://www.liveleak.com/view?i=484_1236967337

1. Defining the Terms

II. What Prototyping is about

Prototyping…

- … helps getting user feedback during the design process.
- … reveals usability and acceptability problems.
- … examines whether features are persuasive.
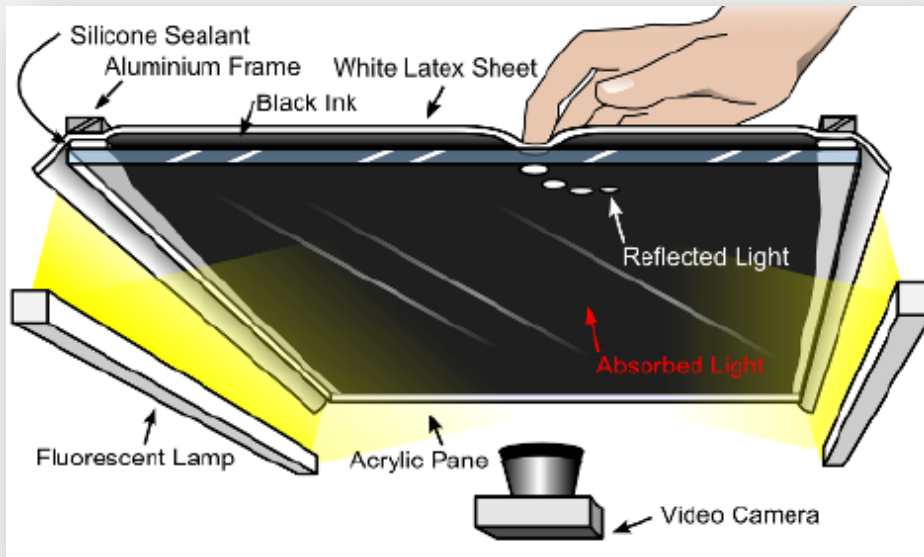
But it is more than just receiving opinions from users!!

- … builds a basis for designers to discuss.
- … supports creative thinking.
- … can convince investors or principals more easily.

2. Tools for Prototyping Interactive Surfaces

Creating Malleable Interactive Surfaces
using Liquid Displacement Sensing

- Technology:
  - Malleable surface pushes black ink away
  - Subjacent camera recognizes white spot

- Features:
  - Multi-touch
  - Uses front-projection
  - Limited to horizontal use

✎ **Rapid Prototyping of Interactive Surfaces**

e.g. to explore gestures, evaluate dimensions or test applications

Quelle: Hilliges O. et al. (2008)

OIDE
Open Interface Development Environment

- Purpose:

  Rapid integration of interactions

- Features:
  - Works with common devices, e.g.
    - Wiimote
    - iPhone
  - Graphical drag-and-drop interface
  - OpenSource

⤷ Rapid Prototyping of Interactions

Quelle: McGee-Lennon M. R. et al. (2009)

Other Tools

- Augmented Reality   ☞ *ARdesk, DisplayObjects*
  - Tracking of mockups
  - Projecting onto them ⇨ faked display

↳ **Quick "attachment" of displays to mock-ups**

- Gesture Recognition   ☞ *$1 Recognizer*
  - Pre-defined gesture pattern
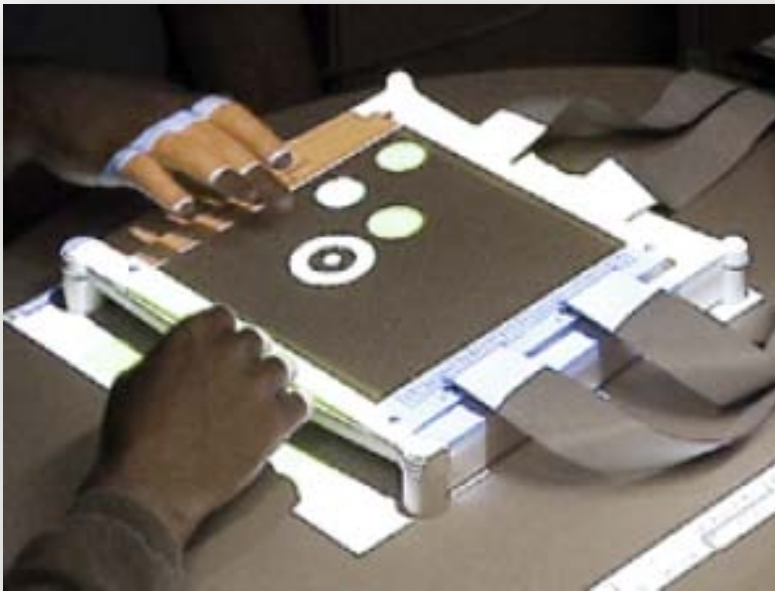 - Recognition of those in 100 lines of code

↳ **Quick integration of gestural interaction**

Quellen: Nam T.-J. (2007), Akaoka E., Vertegaal R. (2009), Wobbrock J. O. et al. (2007)

3. Usage of Prototyping in Research

I. Interactive Surfaces

DiamondTouch

- Description
  - Capacitive touch technology
  - Multi-touch & multi-user
- Methodology
  - Off-the-shelf components
  - Small-sized high-fidelity prototype
  - Internal testing
    - ⇨ Revealed failures
    - ⇨ Discovered new features

⇨ **Example of Prototyping for internal purpose**
(no integration of the user during this phase)

Quelle: Dietz P. H., Leigh D. (2001)

Hermes

- Description
  - Interactive office-door displays
  - Supports leaving and sending notes to other displays

- Methodology
  - Process split up in phases
  - In each phase more features added
  - User evaluation of every prototype
  - Long term studies
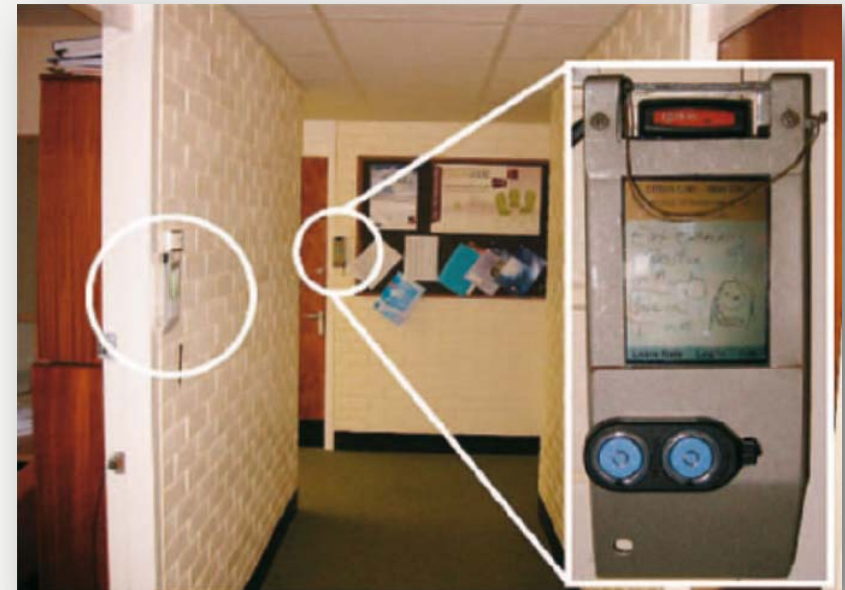
↪ **User-centered and iterative design process**

Quelle: Fitton D. et al. (2005)

Curve (1)

- Description
    - Ergonomic interactive surface
    - Combination of horizontal and vertical display

Curve (2)

- Methodology
  - Extensive user study
  - Paper prototyping
  - 18(!) different prototypes

⇨ Similar approach: **BendDesk**

- But
  - Inclined vs. fully vertical display
  - 80dpi vs. 26dpi

⇨ **Thorough user studies are highly recommended
for a proper ergonomic design**

Quellen: Wimmer R. et al. (2009), Weiss M. et al. (2009)

3. Usage of Prototyping in Research

II. Interaction Techniques

Dynamo

- Description
  - Integration of displays in large social spaces
- Methodology
  - Various evaluations
  - From low-fidelity to high-fidelity prototyping
  - For internal purposes *and* to get user feedback
  - Separate evaluation for every key aspect

↬ **Paradigmatic development process of an interactive display**

Quelle: Izadi S. et al. (2005)

Children Fighting for Control

- Description
  - Examining children's' behavior when interacting with a tabletop
- Realization
  - Task: classroom seating plan
  - Paper prototype vs. tabletop
- Results
  - Fights over bricks emerged
  - Hiding bricks limited to digital boundaries
⇨ More physical shoving when using the tabletop

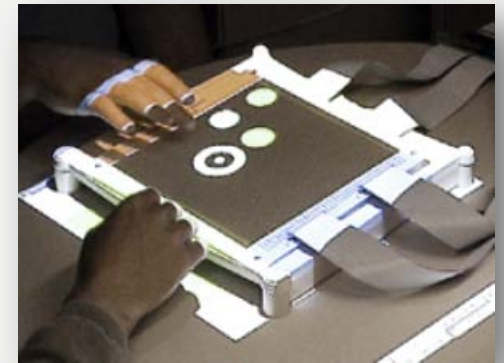⇨ **kids require a different approach towards prototyping techniques**

Quelle: Marshall P. et al. (2009)

4. Lessons Learned

Advantages

Prototyping
is advisable

Integrates
the user

Supports
creative thinking

Reveals
problems

Helps developers
to discuss

Watch out!

Deficits

Likely to be overloaded

Limited level of detail

Process not easy to manage

if applied wrong:
Losses in time
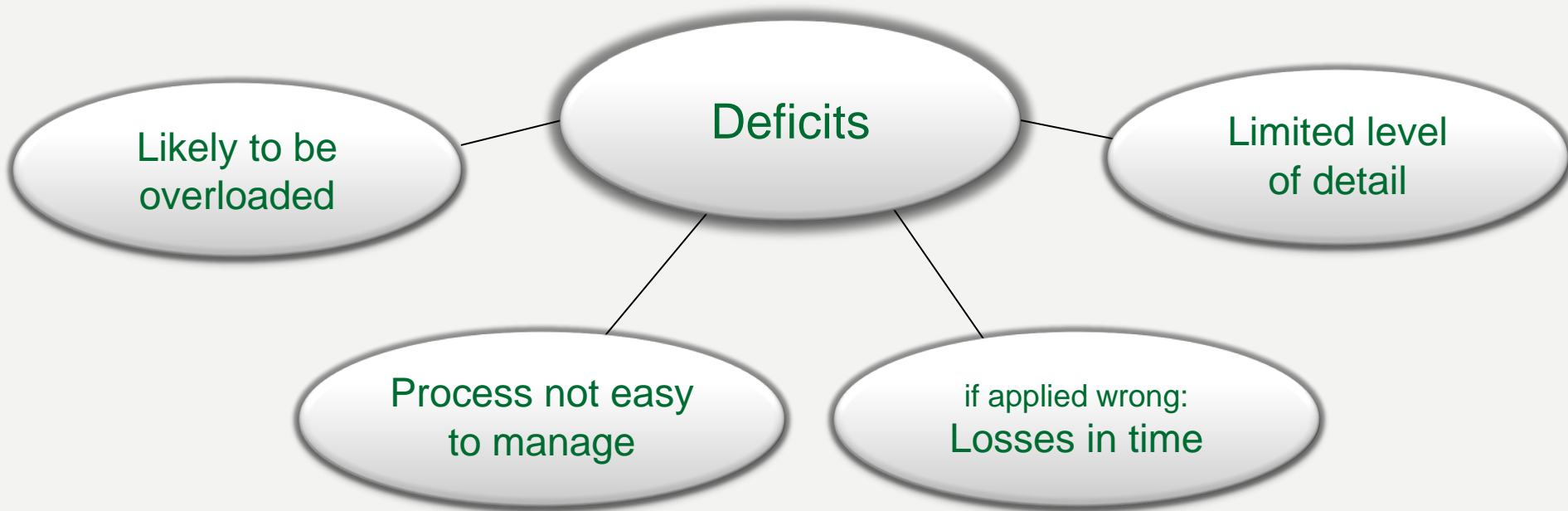
⇨ Appropriate and efficient use is essential to benefit from prototyping

Outlook

March 2009:

- Only 1 out of 4 persons would use a tabletop instead of a PC
  (though all were familiar with tabletops)

- Reason: text entry and ergonomics are inadequate

  …enough to improve!

Future Work:

Usability should be considered more!

↳ **The use of prototyping helps to focus on usability!**

Quelle: Benko H., Ringel Morris M. (2009), http://www.courant.com/media/photo/2010-01/51512419.jpg

Thank you for your Attention!

Questions?

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