LMU LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN

Visual Design

of Physical Interfaces for RFID / NFC-based Mobile Interaction

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Diploma Thesis

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Responsible Professor: Prof. Dr. Heinrich Hußmann

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World of invisible things[1]

[1]Arnall, Timo.Wireless in the World:http://www.nearfield.org/2009/03/wireless-in-the-world.

Goals

- investigate the visual design of physical interfaces for NFC-base mobile interaction
- design of physical interfaces for their discovery
- representation of NFC-tags as visual elements
- vizualization of the functionalities of NFC-tags
- guidance cues to support the interaction workflow

Outline

- Related Work
- Phases of Interaction
- Symbol Categorization
- 1st User Study and Results
- Conclusions
- Further Work

Related Work (I)

- difficulties for users during the interaction:
  - which components are interactive? [Blöckner et al, 2009]
  - how to start the interaction?[Herting et al, 2008]
  - what is the further sequence of interaction? [Geven et al, 2007]
  - how to orient the device? [Geven et al, 2007]
  - description of phone-tag interaction [O'Neill et al, 2007]: hover, slide, wave, press, ... ?
  - people would interact with the interface differently [Belt et al, 2006]:
    text messaging, bluetooth, infrared port, dial a number

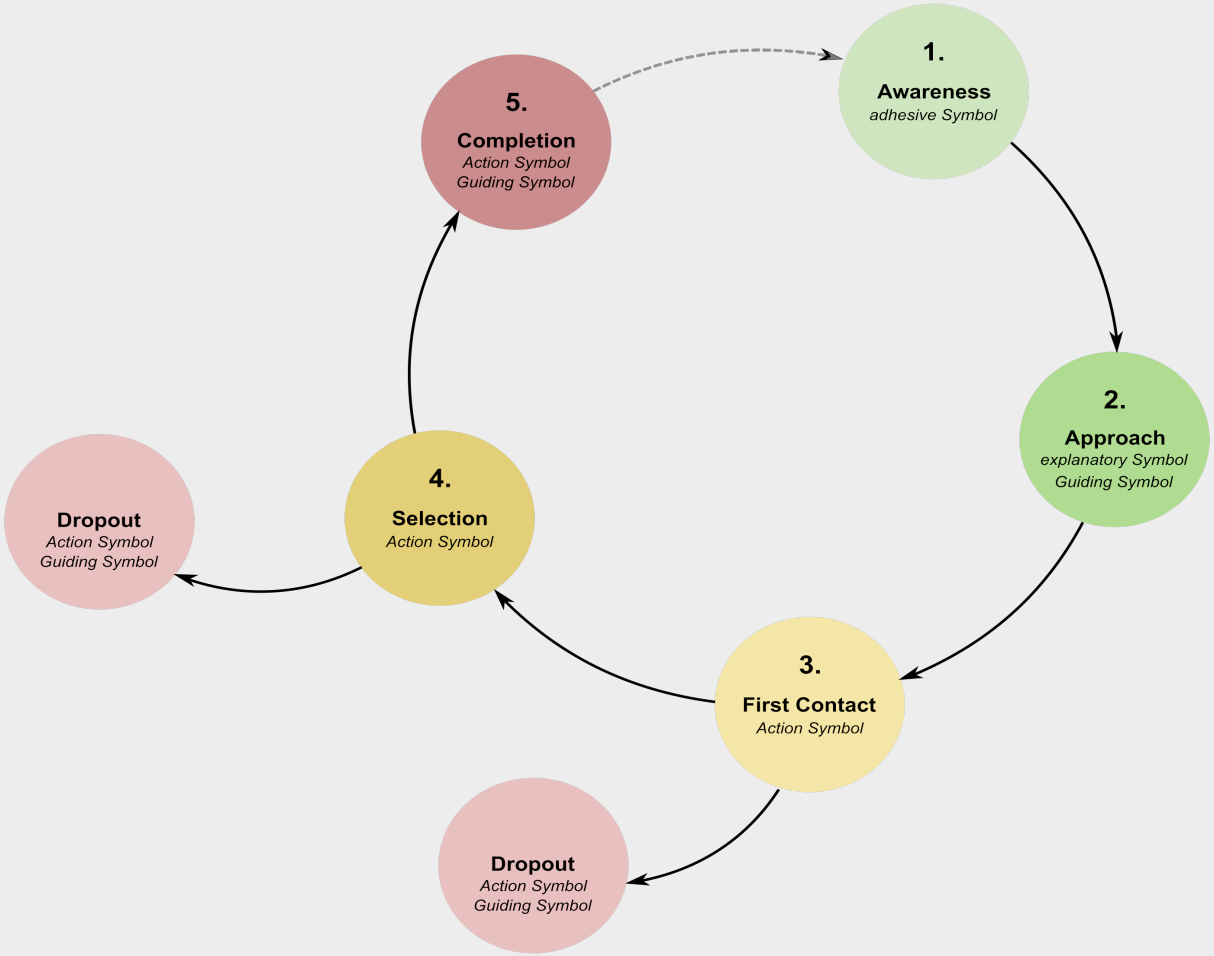
Related Work (II)

- improving the accessibility through: Learnability and Guidance [Broll et al, 2009]

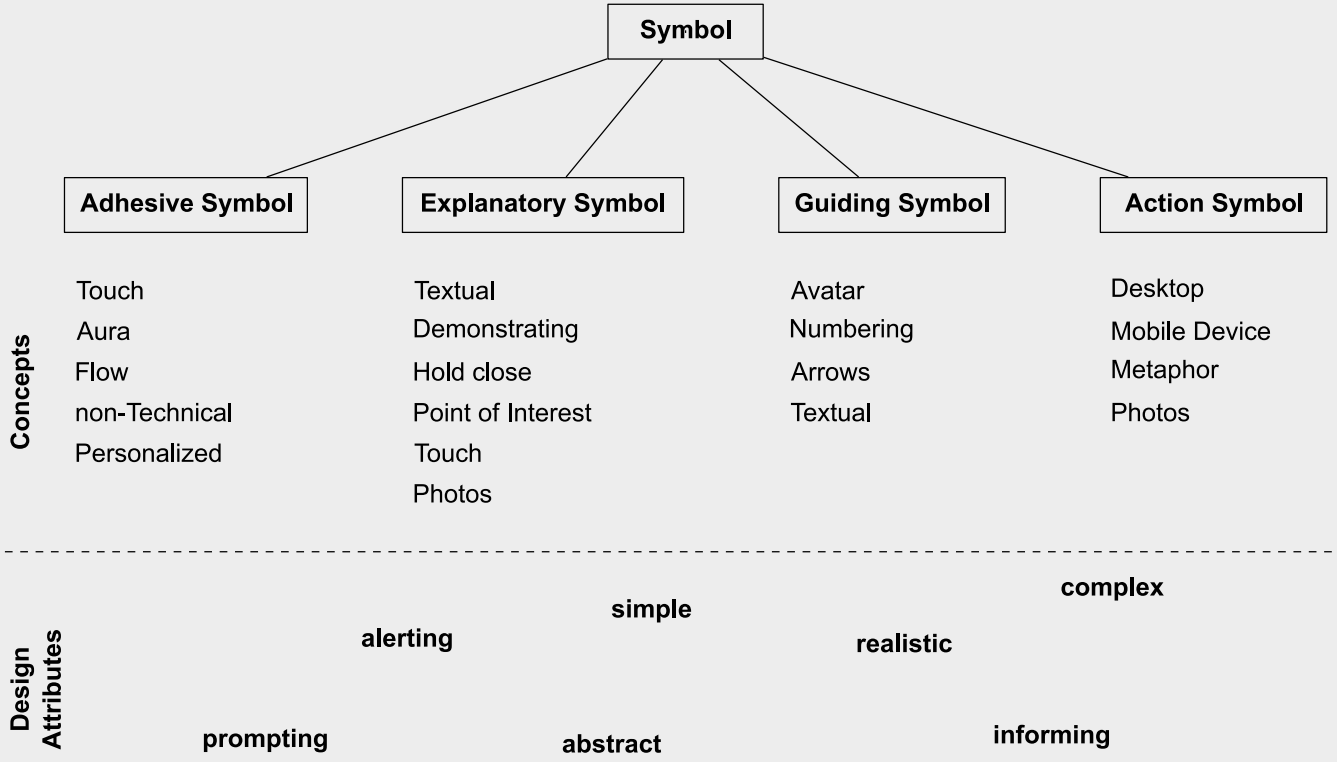
- [Riekki and Salminen, 2006] introduced different kinds of tags:
  - general tag
  - special tag

- [Arnall, 2006] has developped a graphic language for touch-based interactions:

Phases of Interaction

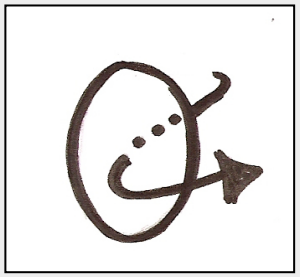


Symbol Categorization

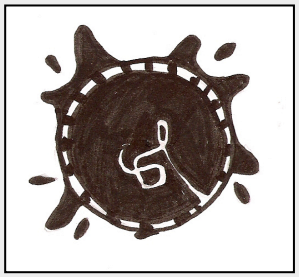


Symbols of Awareness

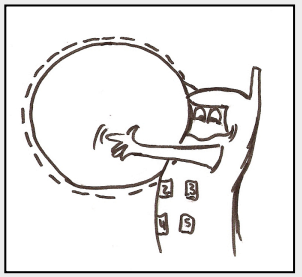
- symbols which aim at gaining the attention of the user.
- symbols are based on different concepts:



a. Flow



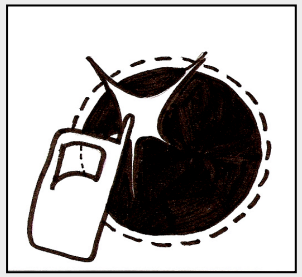
b. Touch



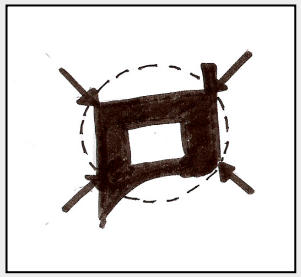
c. Personalized

Symbols of Approach

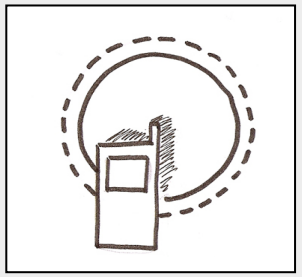
- symbols which explain the interaction to the user
  - Where?
  - With what?
  - How?



a. Touch



b. Arrows



c. Hold close to

Study Design

- interview to gather qualitative data
- 15 subjects (aged between 24-30)
  - 8 subjects had prior experience with NFC
  - 7 subjects with no experience

- outline of user study
  - Awareness and Approach
  - Use Cases
  - Overall Designs
  - Paper Prototyping

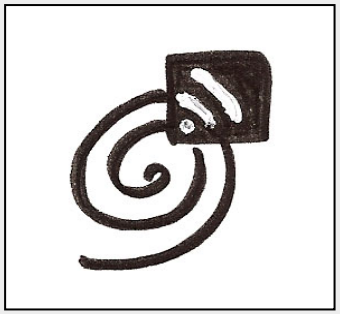
Awareness/Approach

- 19 symbols of awareness
- 15 symbols of approach

- subjects had to choose the three symbols they
  - liked the most
  - like the least

- for the three most liked symbols, subjects had to:
  - state their associations
  - make suggestions for improvements
  - state their opinion

Results: Awareness



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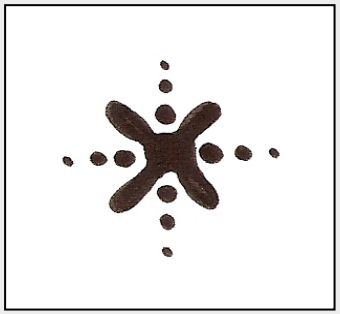
(8 / 0)



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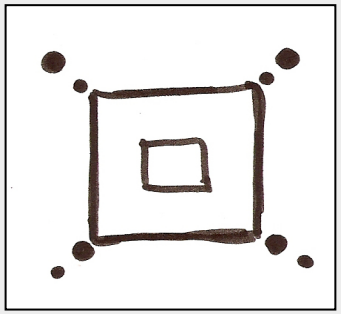

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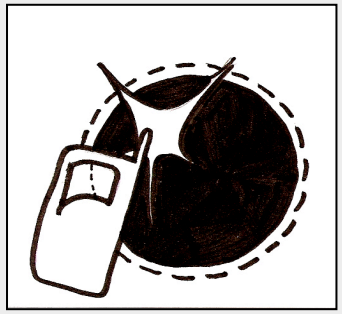
Results: Approach



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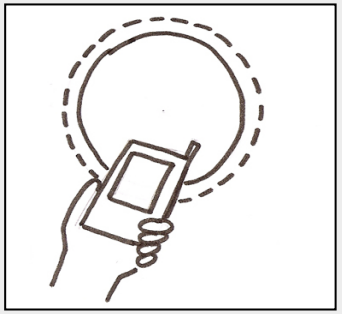

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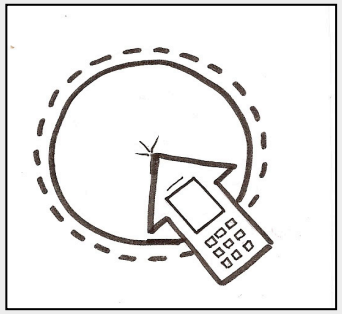

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Use Cases

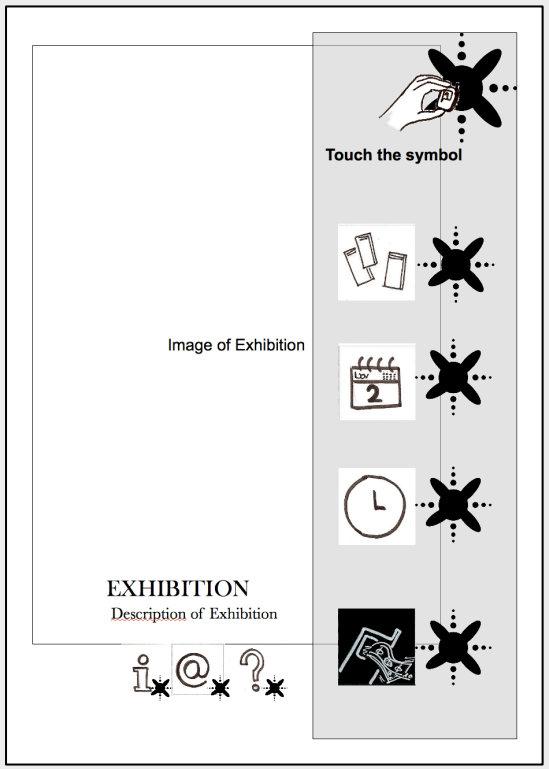
Advertisement

Office

Catalogue

User Study: Overall Designs

Results: Overall Designs (I)



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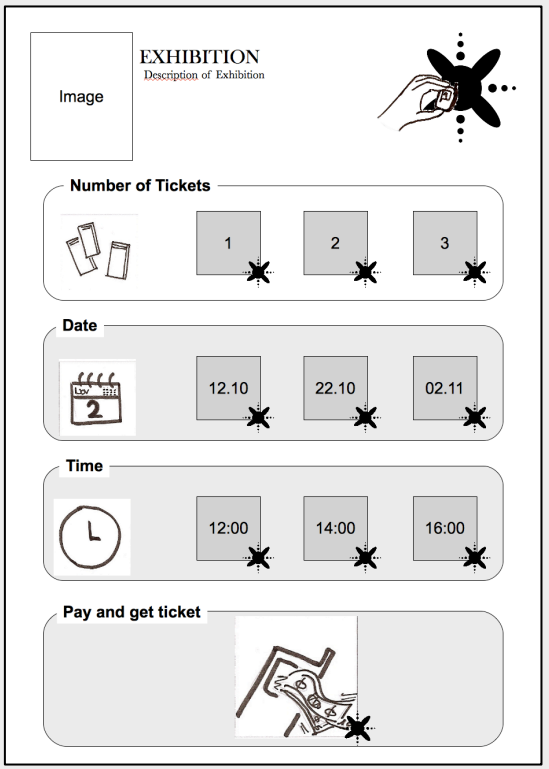

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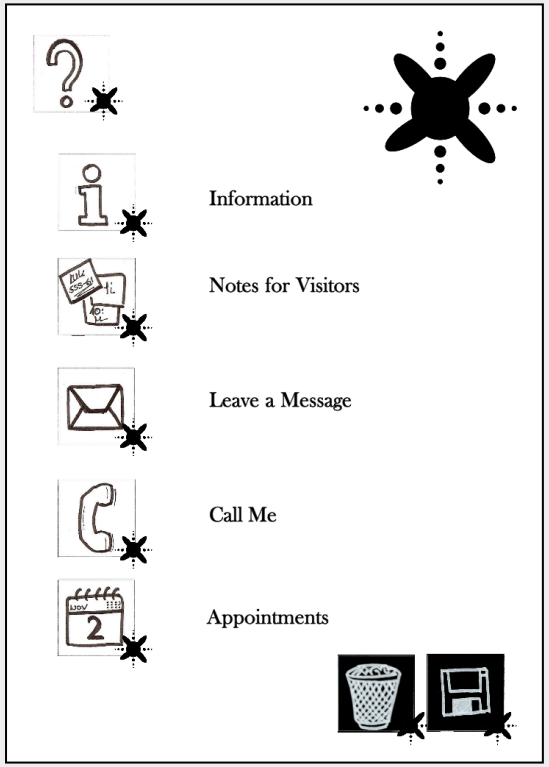
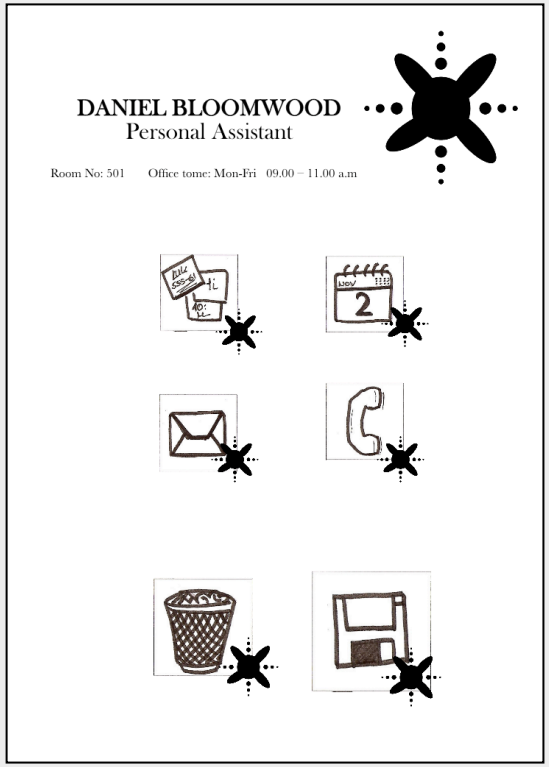
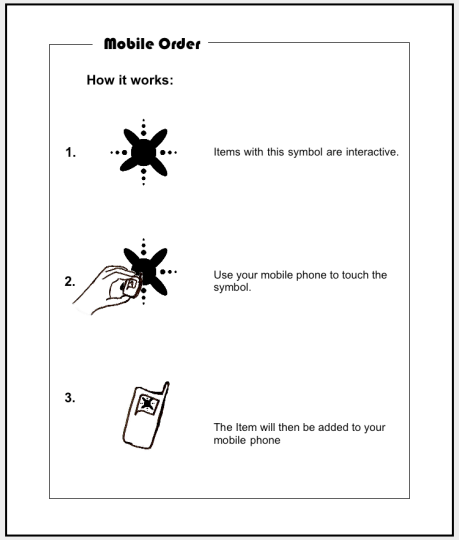
* some images are replaced due to copyright issues

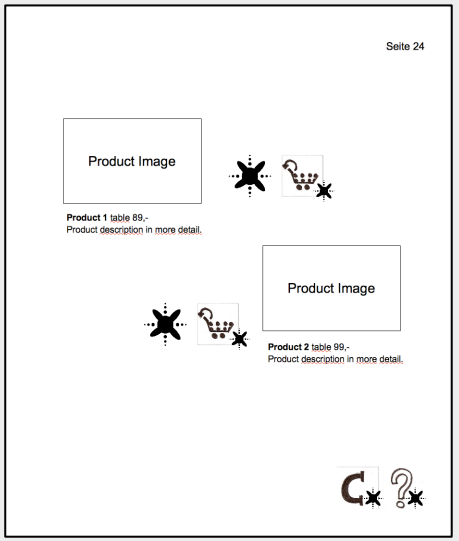
Results: Overall Designs (II)

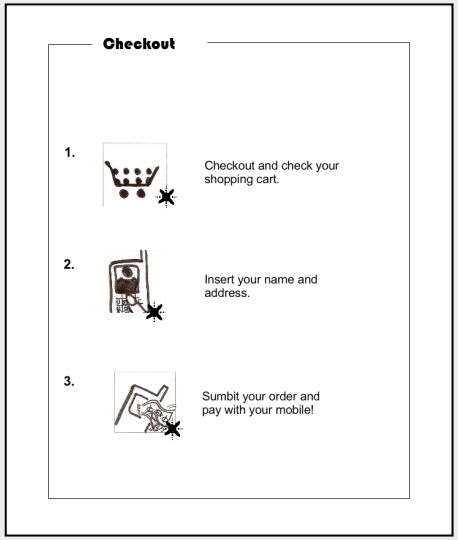




Results: Overall Designs (III)







* some images are replaced due to copyright issues

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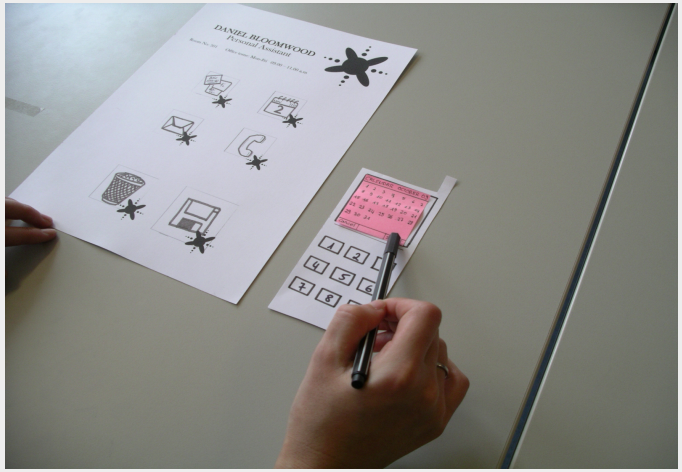
User Study: Tasks

- **Task 1:** Buy 2 tickets for exhibition
- **Task 2:** Visit a friend at his office:
- **Task 3:** Order a specific table



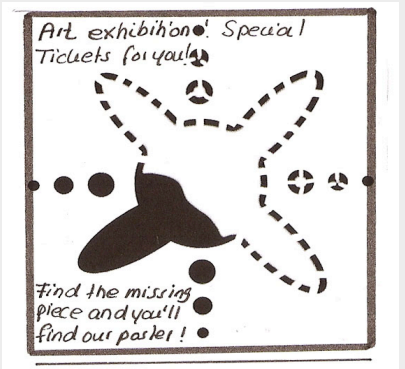
- **Observations**
  - do critical actions on the mobile device
  - delete and save often unclear
  - meaning of symbols not clear
  - shift of attention is confusing
  - further selection after attention shift not clear

Conclusions

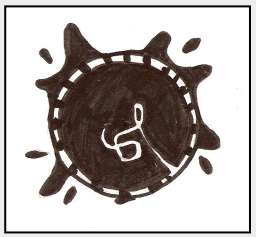
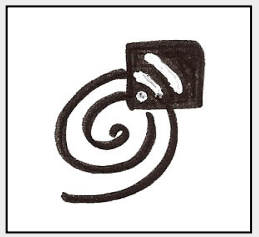
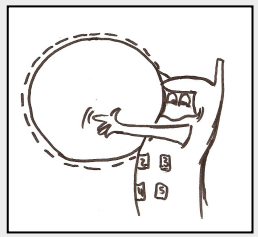
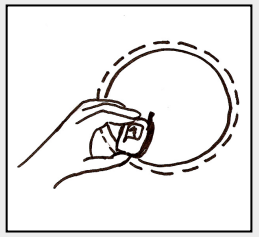
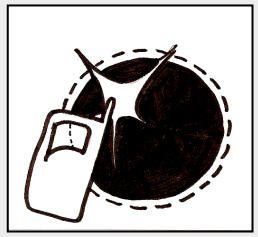
- **Symbols of Awareness**
  - Combination of text and symbol
  - simple and not too abstract
- **Symbols of Approach**
  - no abstract symbols
  - important elements
- **Overalldesign / Interaction**
  - general information should be displayed on the interface
  - implicit guidance preferred
  - accentuation of critical actions

Further Work

- Online Survey: 21st october 2009 – 4th november 2009
  http://www.onlineforschung.org/visualdesign
- draw design consequences
- refine puzzle metaphor and develop further ideas



- pick up interesting aspects and realize them in a high fidelity prototype
- test the high fidelity prototype in another user study

Questions?

Thank You!