Chapter **5**
Designing Interactive Systems

- **Design Cycles & Prototyping**

- **Prototyping Methods, e.g.**
  - Storyboards
  - Paper Prototyping
  - Wizard Of Oz
  - Video Prototyping

Design Cycles & Prototyping

- **Creating prototypes is important to get early feedback**
  - from the project team (prototypes help to communicate)
  - from potential users

- **Different types of prototypes**
  - Low-fidelity prototypes (e.g. paper prototypes, sketches)
  - Hi-fidelity prototypes (e.g. implemented and semi-functional UI, could look like the real product)
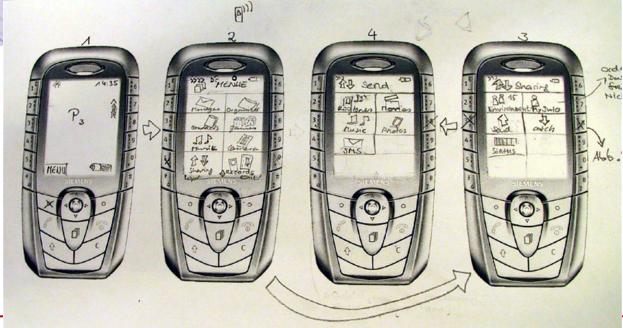 - Fidelity is referring to detail

Design Cycles & Prototyping

- **Tools & Methods**
  - Sketches & Storyboards
  - Paper prototyping
  - Using GUI-builders to prototype
  - Limited functionality simulations
  - Wizard of Oz

Sketches & Storyboards

- Storyboards as in movies
  - A picture for each key scene
- Sketch out the application
  - Key screens
  - Main interaction
  - Important transitions
- Helps to communicate and validate ideas
  - Easy to try out different option, e.g. document base vs. application based
- Ignore details, e.g.
  - what font to use, how icons will look like

Paper Prototypes

- Specify the set of tasks that should be supported
- Create a paper prototype using office stationery
  - Screens, dialogs, menus, forms, …
  - Specify the interactive behavior
- Use the prototype
  - Give users a specific task and observe how they use the prototype
  - Ask users to "think aloud" – comment what they are doing
  - At least two people
    - One is simulating the computer (e.g. changing screens)
    - One is observing and recording
- Evaluate and document the findings
  - What did work – what did not work
  - Where did the user get stuck or chose alternative ways
  - Analyze comments from the user
- Iterate over the process (make a new version)

Low-Fidelity Prototyping

- Advantages of paper prototypes
  - Cheap and quick – results within hours!
  - Helps to find general problems and difficult issues
  - Make the mistakes on paper and make them before you do your architecture and the coding
  - Can save money by helping to get a better design (UI and system architecture) and a more structured code
  - Enables non-technical people to interact easily with the design team (no technology barrier for suggestions)

- Get users involved!
  - To get the full potential of paper-prototypes these designs have to be tested with users
  - Specify usage scenarios
  - Prepare tasks that can be done with the prototype

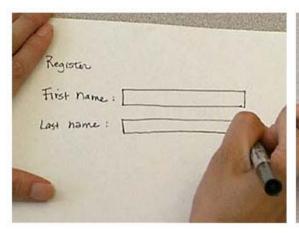# Minimize the time for design Iterations Make errors quickly!

- Idea of rapid prototyping
- Enables the design team to evaluate more design options in detail
- If you go all the way before evaluating your design you risk a lot!
- Sketches and paper prototypes can be seen as a simulation of the real prototype

- Without paper prototyping:
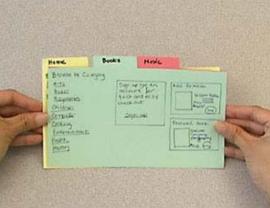 - Idea – sketch – implementation – evaluation

  Slow Iteration

- With paper prototyping:
  - Idea – sketch/paper prototype – evaluation – implementation - evaluation

  Quick Iteration   **Slow Iteration**

Albrecht Schmidt
Embedded Interaction Research Group
University of Munich, Germany
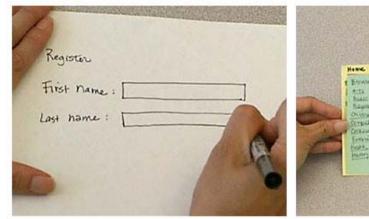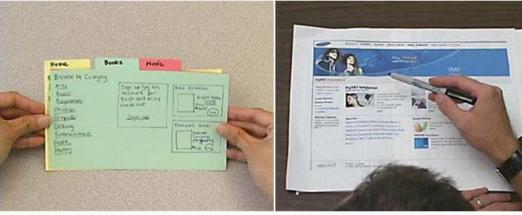
MMI 2005/2006

Video – N&N Paper Prototyping

Nielsen Norman Group Video:
  Paper Prototyping: A How-To
  Training Video

MMI 2005/2006

High-fidelity Prototype

- Looks & feels like the final product to the user
  - Colors, screen layout, fonts, …
  - Text used
  - Response time and interactive behavior
- The functionality however is restricted
  - Only certain functions work (vertical prototype)
  - Functionality is targeted towards the tasks (e.g. a search query is predetermined)
  - Non-visible issues (e.g. security) are not regarded
- Can be used to predict task efficiency of the product
- Feedback often centered around the look & feel
- Standard technologies for implementation
  - HTML, JavaScript
  - Flash, Director, Presentation programs
  - GUI Builder (e.g. Visual Basic, Delphi, NetBeans)

Video – N&N High Fidelity

Nielsen Norman Group Video:
  Paper Prototyping: A How-To
  Training Video

Functional Prototypes

- Often used as synonym for high-fidelity prototype

- To encourage feedback that is not related to the look & feel it may be helpful to make the GUI look rough, see reading:
  R. Van Buskirk and B. W. Moroney: Extending Prototyping, IBM Systems Journal - Vol. 42, No. 4, 2003 - Ease of Use.
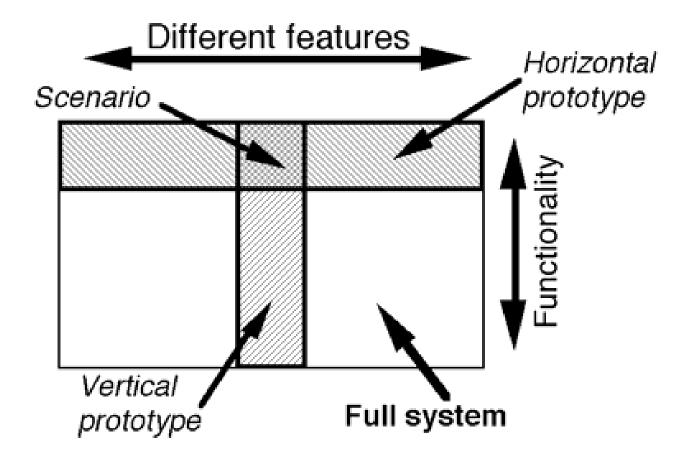
Horizontal Prototyping

- Demonstrate the feature spectrum of a product
- Allows the user to navigate the system
- The actual functions are not implemented
- Helps to evaluate/test
  - Navigation (e.g. finding a specific function or feature)
  - Overall user interface concept
  - Feature placement
  - Accessibility
  - User preferences
- Applicable in low-fidelity prototyping and high-fidelity prototyping
- Used in early design stages
  - To determine the set of features to include
  - To decide on the user interface concept
- Example: overall usage of a mobile phone

Vertical Prototyping

- Demonstrate a selected feature of a product
- Allows the user only to use this specific function
- The details of the function/feature are shown/implemented
- Helps to evaluate/test
  - The optimal design for a particular function
  - Optimize the usability of this function
  - User performance for this particular function
- Mainly use in high-fidelity prototyping but can be applicable to low-fidelity prototyping
- Used in early design stages
  - To compare different designs for a specific function
- Used in later design stages
  - To optimize usage of a function
- Example: a new method for writing SMS on a mobile phone

Addition – about Prototypes

http://www.useit.com/papers/guerrilla_hci.html

1984 Olympic Message System
A human centered approach

- A public system to allow athletes at the Olympic Games to send and receive recorded voice messages (between athletes, to coaches, and to people around the world)

- Challenges
  - New technology
  - Had to work – delays were not acceptable (Olympic Games are only 4 weeks long)
  - Short development time

- Design Principles
  - Early focus on users and tasks
  - Empirical measurements
  - Iterative design
  - → Looks obvious – but it is not!

- … it worked! But why?

1984 Olympic Message System Methods

- Scenarios instead of a list of functions
- Early prototypes & simulation
  (manual transcription and reading)
- Early demonstration to potential users (all groups)
- Iterative design
  (about 200 iterations on the user guide)
- An insider in the design team
  (ex-Olympian from Ghana)
- On-site inspections (where is the system going to be deployed)

The 1984 Olympic Message System: a test of behavioral principles of system design John D. Gould , Stephen J. Boies, Stephen Levy , John T. Richards , Jim Schoonard Communications of the ACM September 1987 Volume 30 Issue 9
http://www.research.ibm.com/compsci/spotlight/hci/p758-gould.pdf

1984 Olympic Message System Methods

- Interviews and tests with potential users
- Full size kiosk prototype (initially non-functional) at a public space in the company to get comments
- Prototype tests within the company (with 100 and with 2800 people)
- "free coffee and doughnuts" for lucky test users
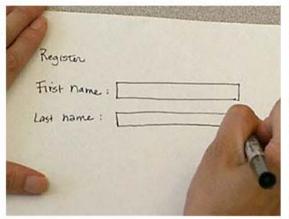- Try-to-destroy-it test with computer science students
- Pre-Olympic field trail

The 1984 Olympic Message System: a test of behavioral principles of system design John D. Gould , Stephen J. Boies , Stephen Levy , John T. Richards , Jim Schoonard Communications of the ACM September 1987 Volume 30 Issue 9
http://www.research.ibm.com/compsci/spotlight/hci/p758-gould.pdf
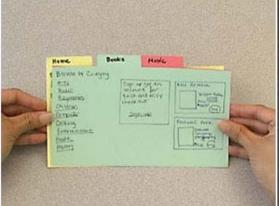
Wizard-of-Oz

- "The man behind the curtain"
- Basically don't not implement the hard parts in the prototype – just let a human do

- Typical areas
  - Speech recognition
  - Speech synthesis
  - Annotation
  - Reasoning
  - Visual Perception

- Provides the user with the experience without extensive implementation effort for the prototype

Video – N&N Wizard Of Oz

Nielsen Norman Group Video:
  Paper Prototyping: A How-To
  Training Video

Albrecht Schmidt
Embedded Interaction Research Group
University of Munich, Germany

MMI 2005/2006

Chapter **5**
Designing Interactive Systems

- ▪ **Design Cycles & Prototyping**

- ▪ **Prototyping Methods, e.g.**
  - ● Storyboards
  - ● Paper Prototyping
  - ● Wizard Of Oz
  - ● **Video Prototyping**

Steps to a "Quick Video"

- Have an idea :-)
- What are the key issues? How to visualize them?
- What is convincing use-case story – make a storyboard
- take one or more photos digital for each key scene
- If required manipulate the digital photo to highlight a certain action/device/interaction within the picture
- Script audio and written text to explain
- Speak audio and record it or use a good text2speech engine
- Make a movie…
  - Add pictures in a sequence
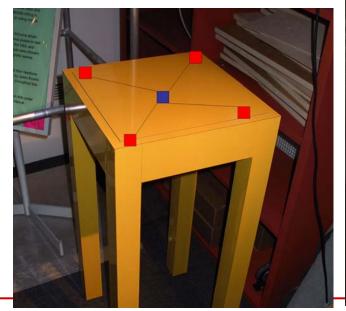 - Use transitions and motion

Manipulation of the images (1)

- **Highlight the center of interest How-To:**
  - Select the area of interest (e.g. center of action)
  - Inverse selection
  - Reduce color and/or contrast
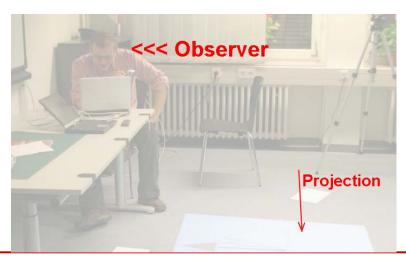
Manipulation of the images (2)

- **Overlay images or drawings How-To:**
  - Select a base image
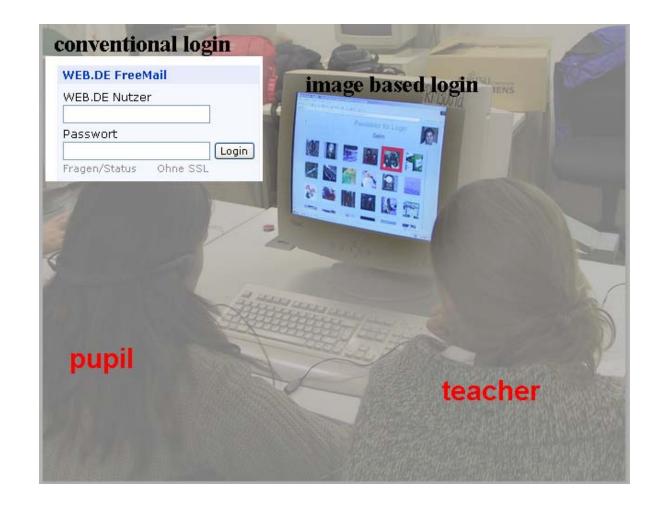 - Insert overlay image(s) / drawings on top

Albrecht Schmidt
Embedded Interaction Research Group
University of Munich, Germany

MMI 2005/2006

Manipulation of the images (3)

- **Insert labels and explanations How-To:**
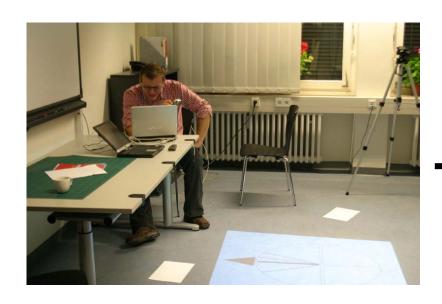 - Select a base image
  - Insert text, symbols and arrows on top

<<< Observer

Projection

mobile phone in the pocket
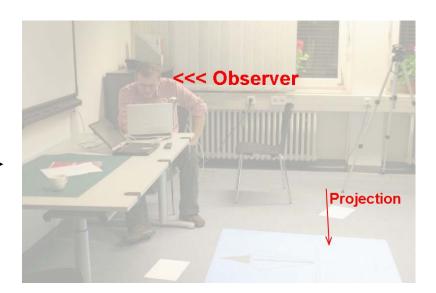
Combine image manipulation
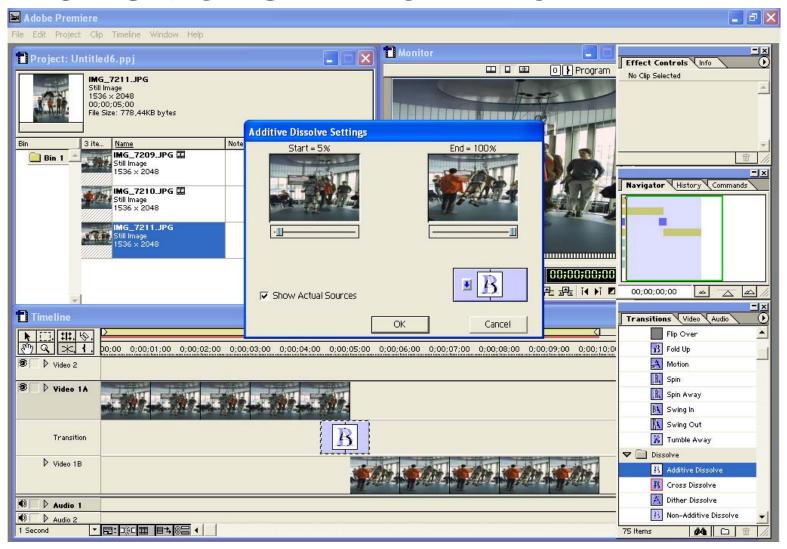
- **Highlight**
- **Overlay**
- **Label**

Transitions

- Use transitions between stills to introduce motion
- Use transitions between images careful (flying animations usually do not look good ;-)
- Example below: use a fade from one image to the next

Albrecht Schmidt
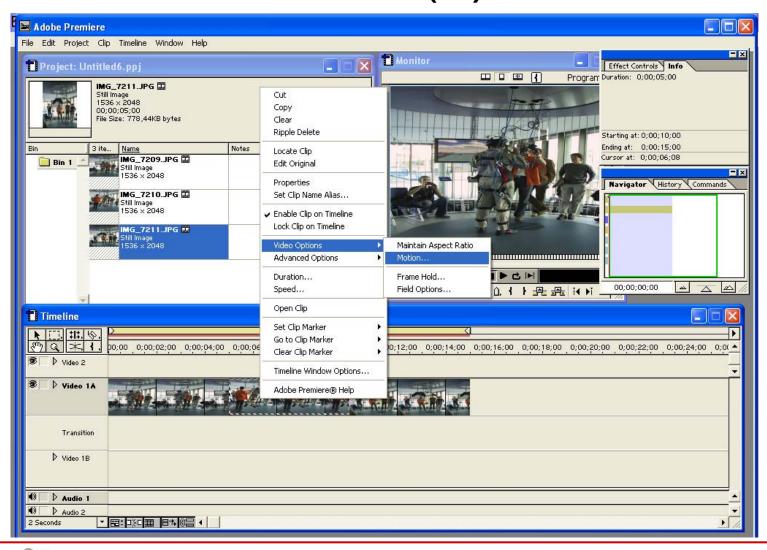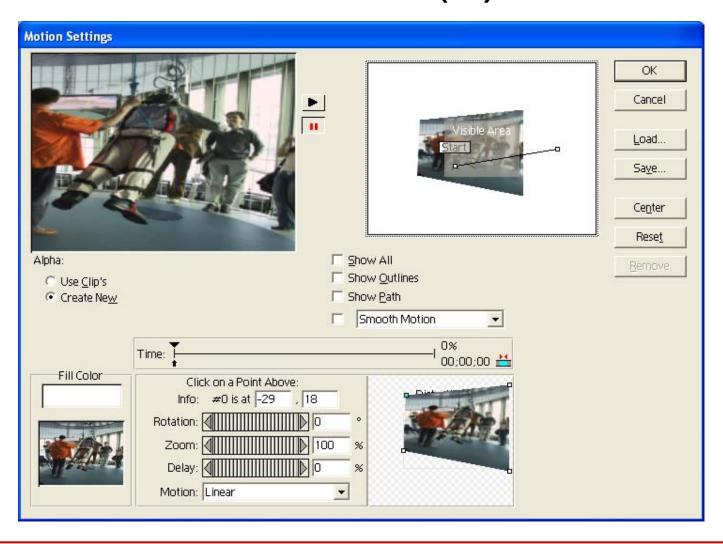Embedded Interaction Research Group
University of Munich, Germany

MMI 2005/2006

Transitions – How-To

Zoom and Motion

- Use zoom and motion to guide the user to look at the "right place"
- Make transitions that support the effect

Albrecht Schmidt
Embedded Interaction Research Group
University of Munich, Germany

MMI 2005/2006

Motion How-To (1)

Motion How-To (2)

Tools

- **Hardware**
  - Computer
  - Digital camera
  - (Headset)

- **Software**
  - Audio recorder software or text2speech (e.g. http://www.naturalvoices.att.com/demos/)
  - Image manipulation program
  - Video editing program (e.g. Premiere)
  - … or standard tools on Windows or MacOS will do