Prototyping

Content

- Representing designs
- Why prototype?
- Types of prototypes

What is design?

"Design is both
the *process of envisioning a solution to a problem under constraints*

and

the *representations of the product* that are produced during the design process, i.e. the physical process of capturing design ideas for evaluation, communication and storage."

(Preece et al.)

Who are you making a representation for?

- Self
- Colleagues in design team
- Programmers/implementers
- Graphic designers
- Sponsors/clients
- End users/customers

And why?

What is a prototype?

- “working” model of look and functionality of envisaged product.
- a mock-up, model or actual working version of a technological device or process.
- a model suitable for evaluation of design, performance, and production potential

Why prototype?

- Team members can communicate effectively with each other and stakeholders
- Stakeholders can see, hold, interact with a prototype more easily than a document or a drawing
- Evaluation and feedback are central to interaction design
- You can test out ideas for yourself
- It encourages reflection: very important aspect of design
- Prototypes answer questions, and support designers in choosing between alternatives

What to prototype?

- Technical issues
- Work flow, task design
- Screen layouts and information display
- Difficult, controversial, critical areas

Prototyping choices

- Fidelity (or realism)
- Horizontal / vertical
- Evolutionary / throwaway

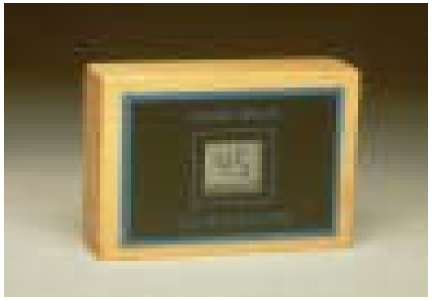
Possibilities

In interaction design it can be (among other things):

- Series of screen sketches
- Storyboard, maybe a cartoon-like series of scenes
- Powerpoint slide show
- Video simulating the use of a system
- Physical model, eg. a piece of wood/polystyrene/clay
- Cardboard mock-up
- Piece of software with limited functionality written in the target language or another language

Example: Palm Pilot prototype

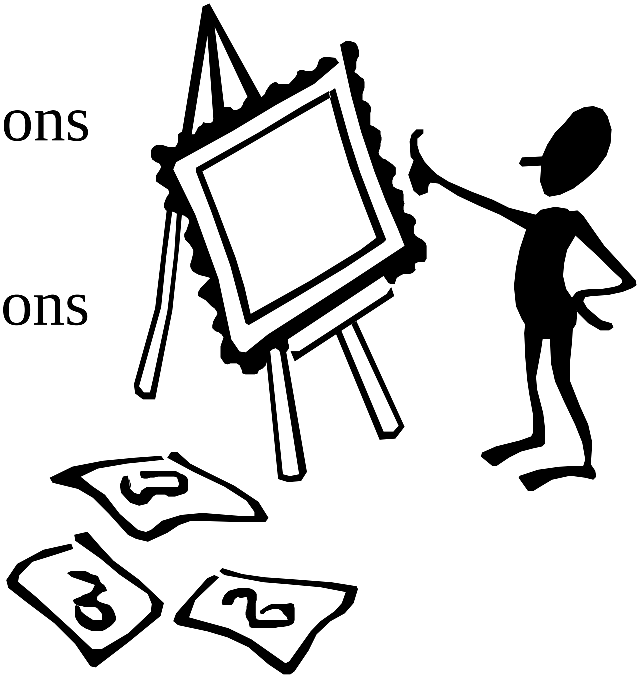
- Founder (Jeff Hawkins) carved a block of wood and carried it around with him...



Low fidelity prototypes

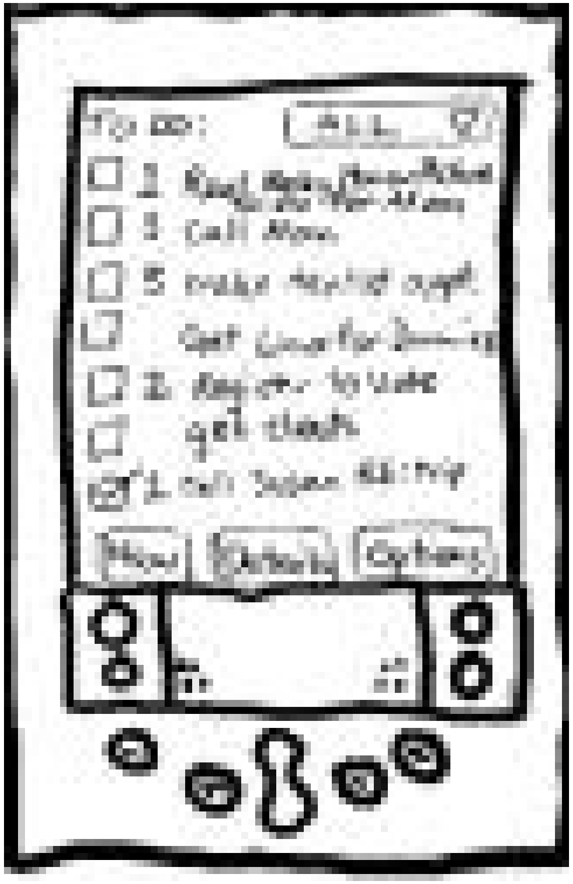
- Paper-based prototypes
  - a paper mock-up of the interface look, feel, functionality
  - "quick and cheap" to prepare and modify

- Purpose
  - brainstorm competing representations
  - elicit user reactions
  - elicit user modifications / suggestions

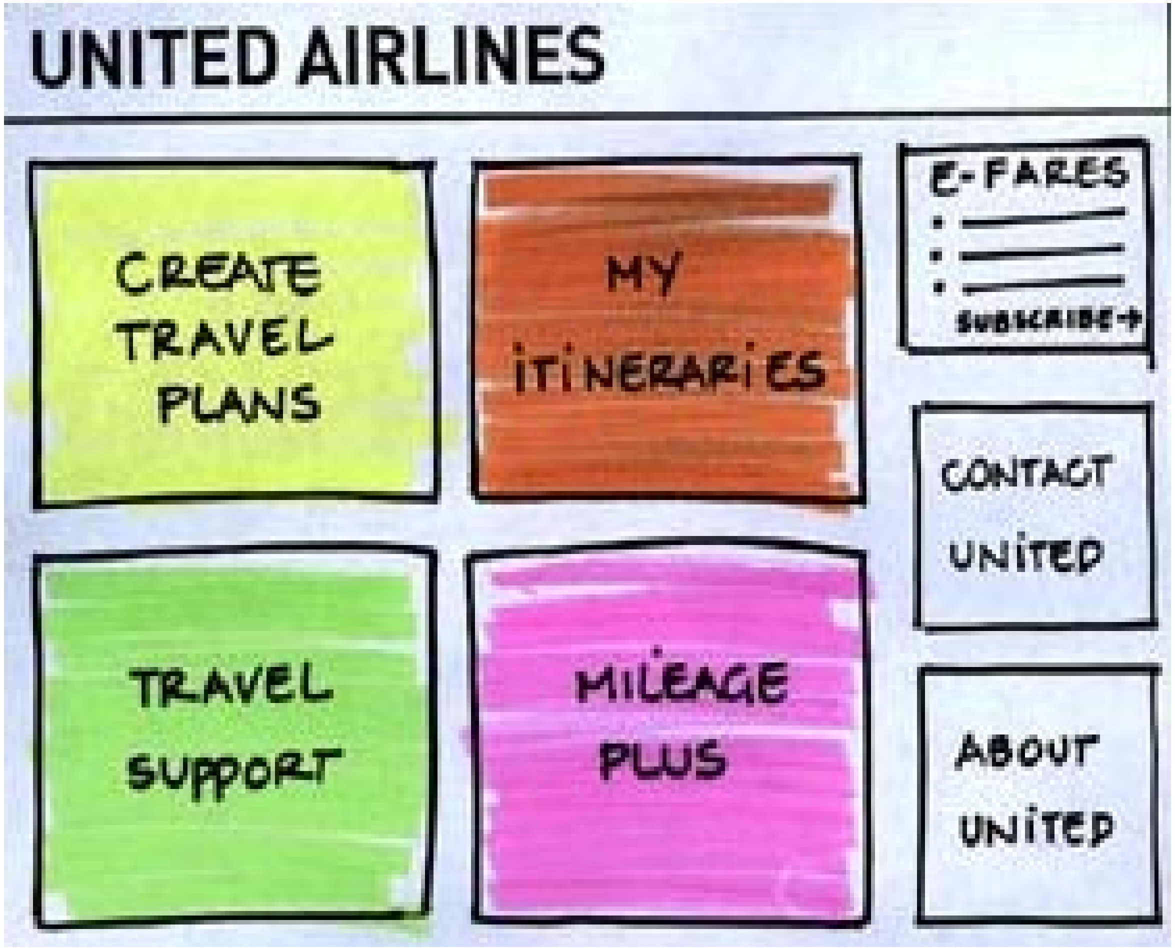


Low fidelity prototypes

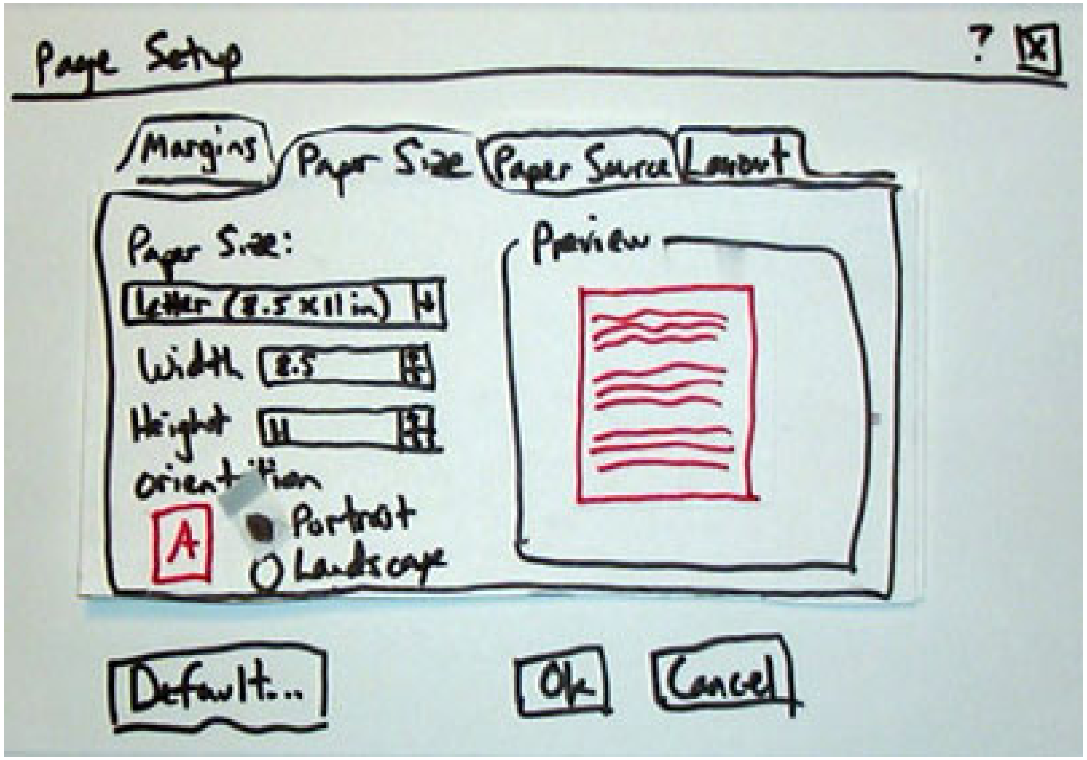
- Sketches
  - drawing of the outward appearance of the intended system
  - crudity means people concentrate on high level concepts
  - but hard to envision a dialog’s progression



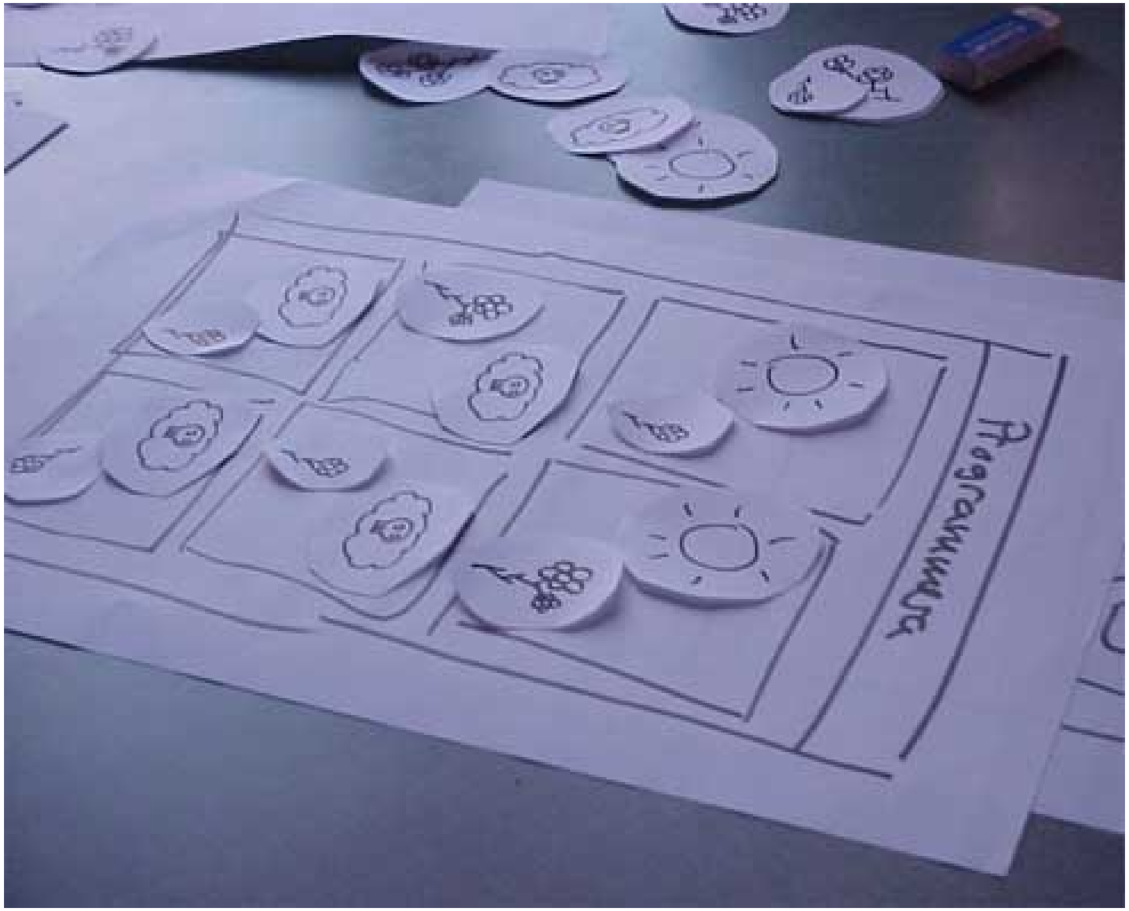
Sketches Example



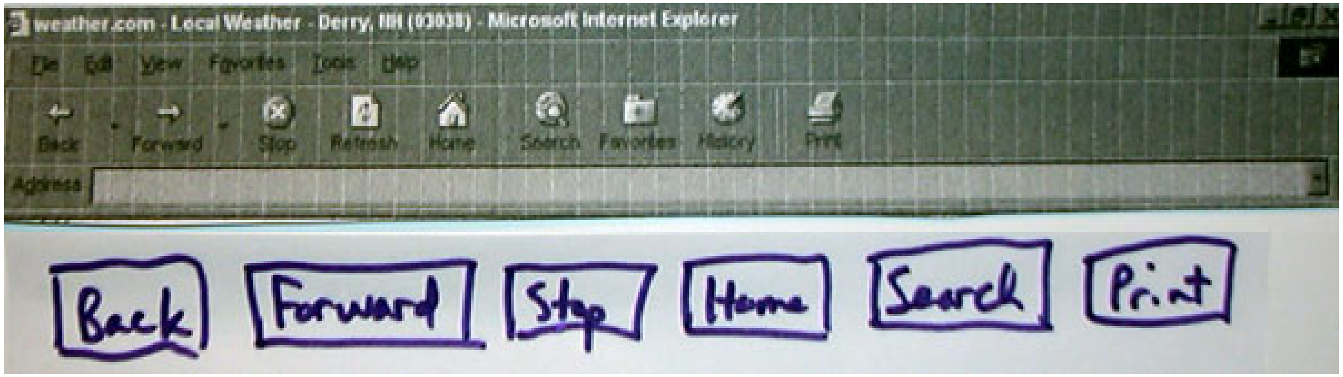
Sketches Example



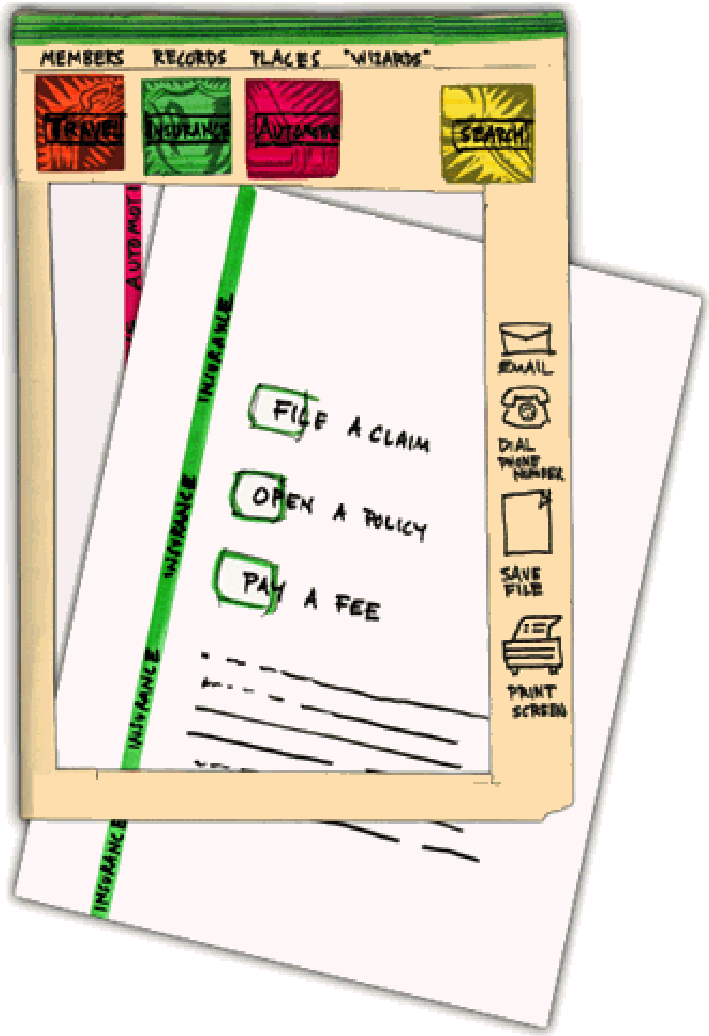
Sketches Example



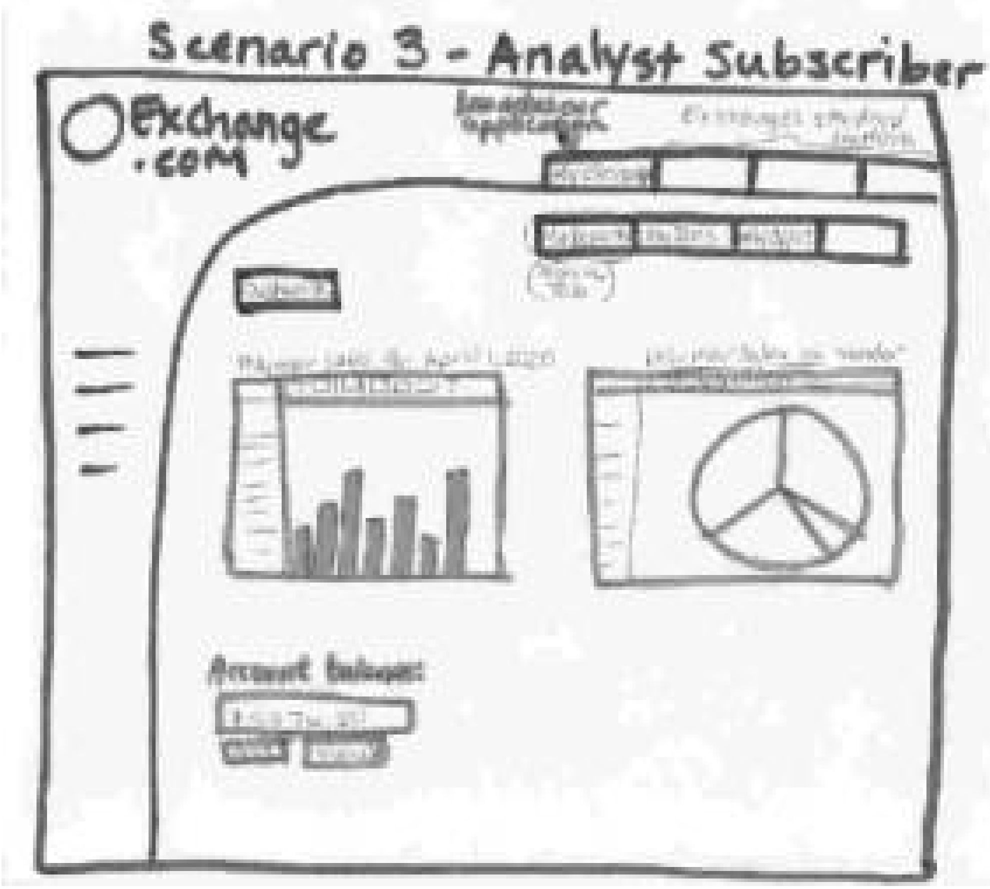
Sketches Example

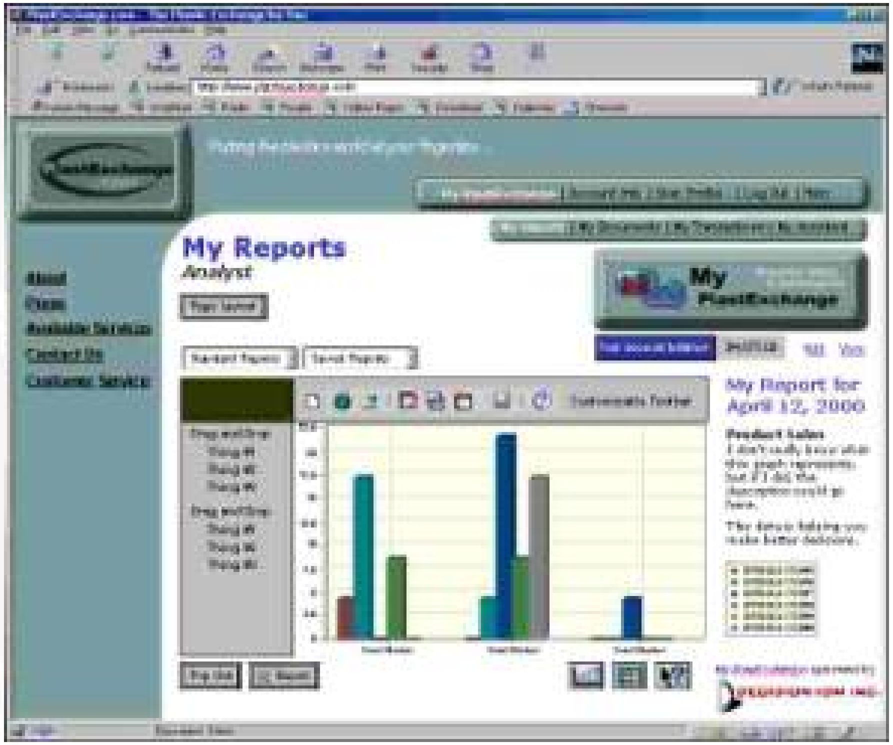


Sketches Example



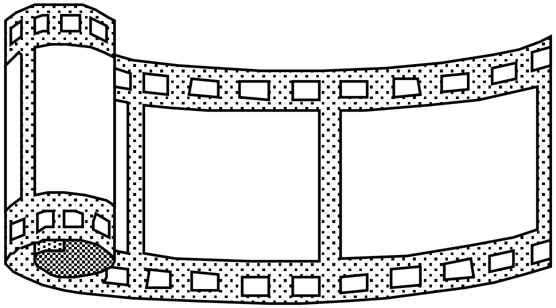
Sketches Example





Low fidelity prototypes

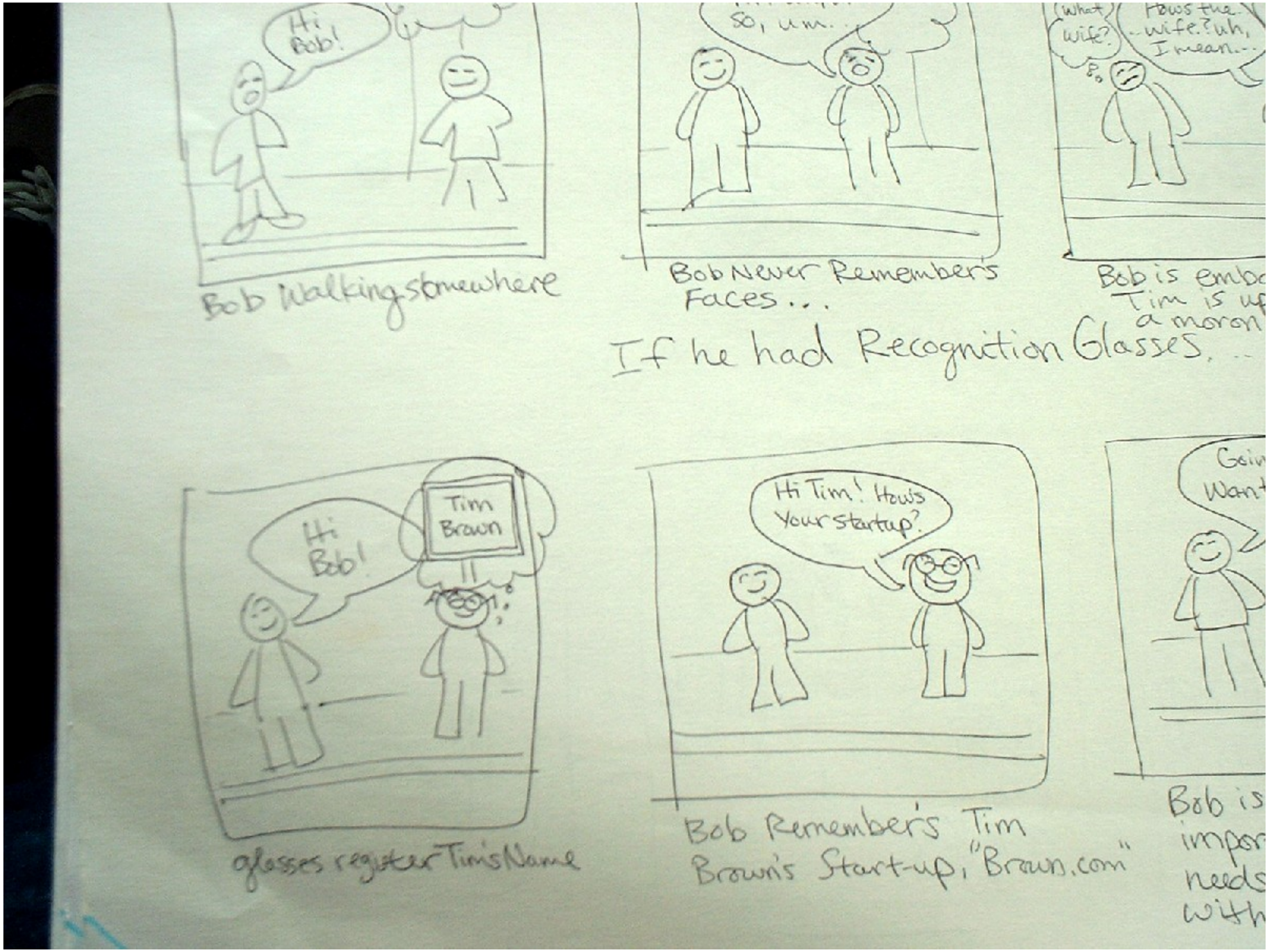
- Storyboarding
  - a series of key frames
    - originally from film; used to get the idea of a scene
    - snapshots of the interface at particular points in the interaction
  - users can evaluate quickly the direction the interface is heading



Storyboards

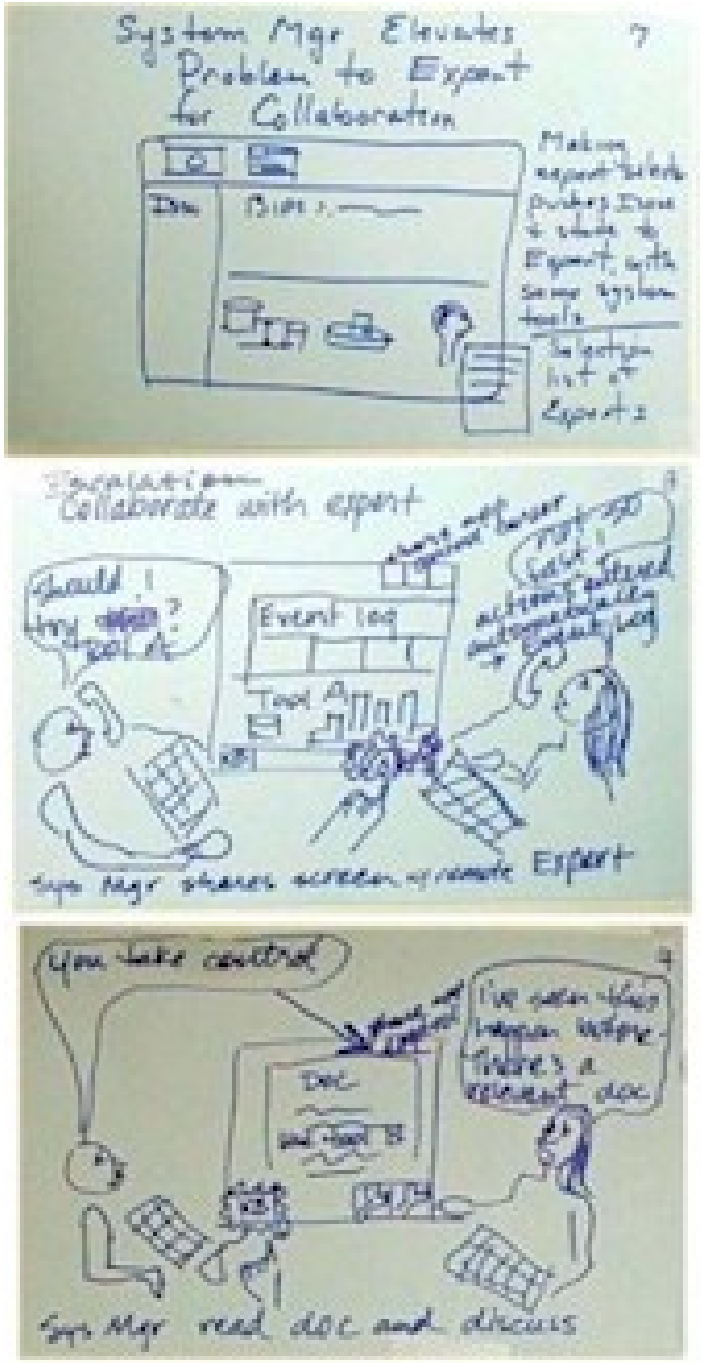
- A series of sketches showing how a user might progress through a task using the device
- Often used with scenarios, bringing more detail, and a chance to role play
- Used early in design - important part of paper prototype approach

Storyboard Example: ‘recognition glasses’

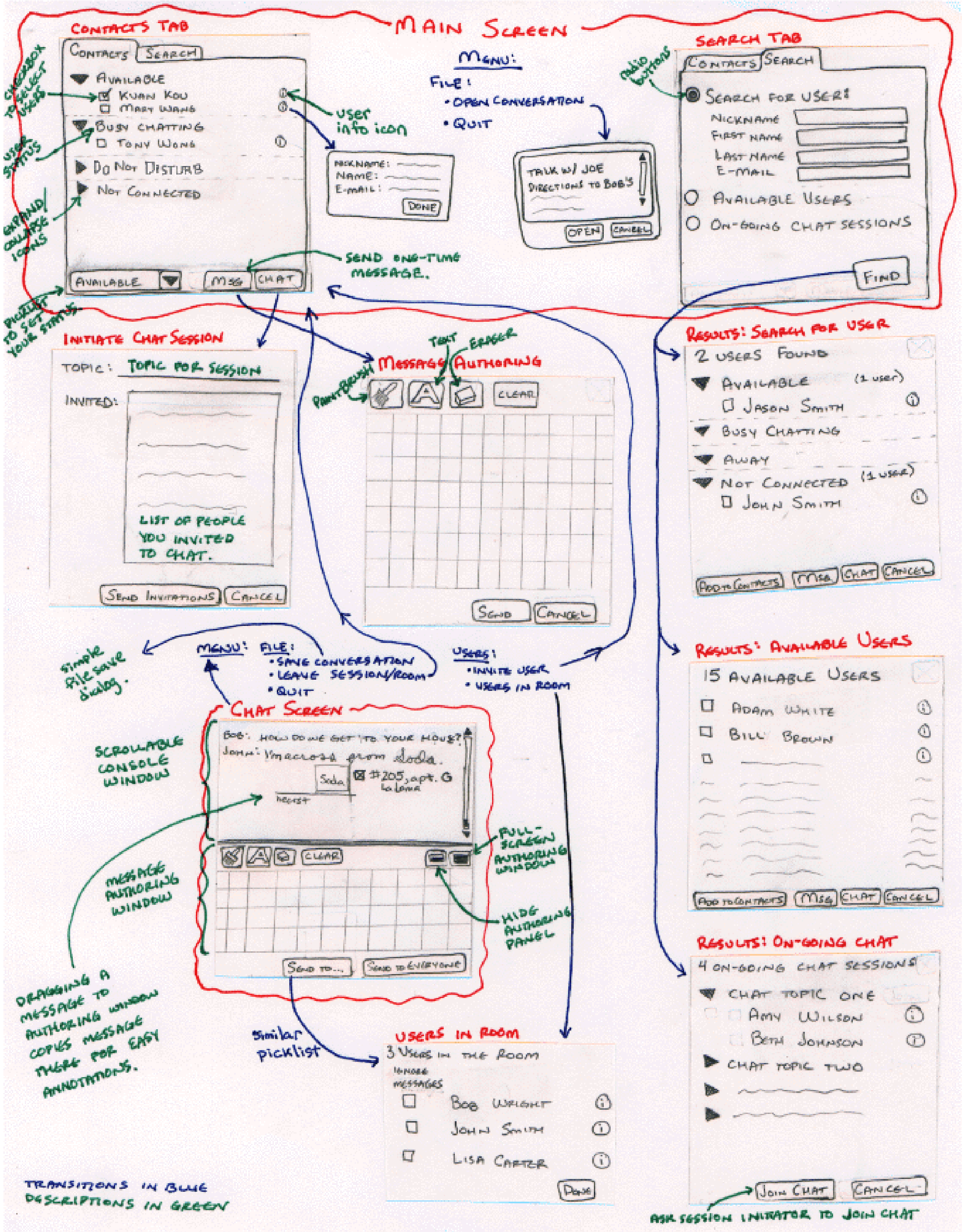


Hi Bob!
Bob Walking somewhere
So, um...
Bob Never Remember's Faces...
What wife?
Hows the wife.? uh, I mean...
Bob is emba
Tim is up
a moron
If he had Recognition Glasses...
Hi Bob!
Tim Brown
glasses register Tim's Name
Hi Tim! How's Your startup?
Bob Remember's Tim Brown's Start-up, "Brown.com"
Goin
Want
Bob is
impor
needs
with

Storyboard Example: collaborative work


System Mgr Elevates Problem to Expert for Collaboration
7
Making expert which pushes Issue to where the Expert with same system tools
Selecting list of Experts
Collaborate with expert
Should I try ?
Event log
Tool A
Expert
Sys Mgr shares screen w/ remote Expert
You take control
I've seen this happen before. There's a relevant doc
Doc
Sys Mgr read doc and discuss

Storyboard Example

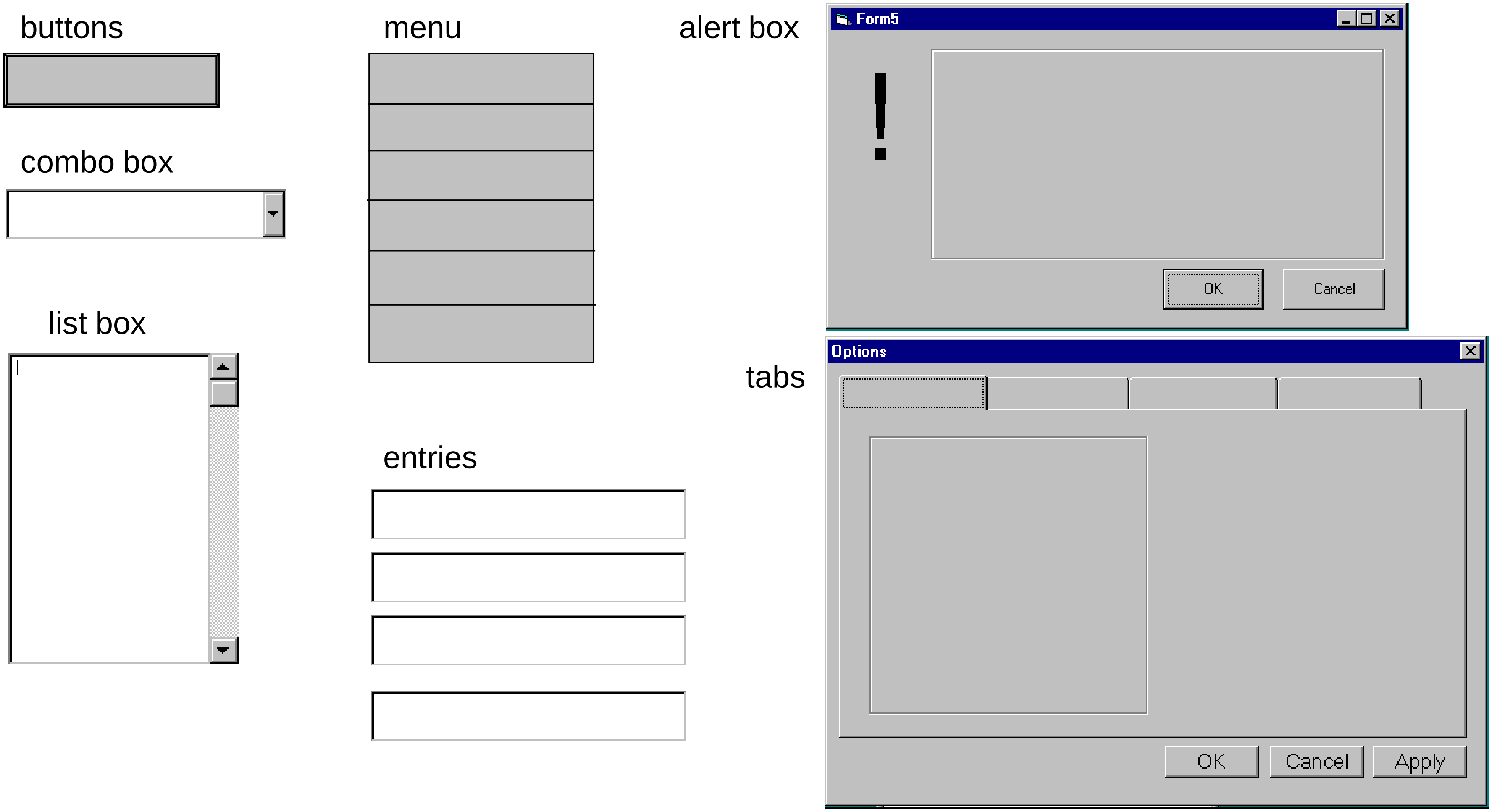


Low fidelity prototypes

- Pictive
  - “plastic interface for collaborative technology initiatives through video exploration”
  - design is multiple layers of sticky notes and plastic overlays
    - different sized stickies represent icons, menus, windows etc.
  - interaction demonstrated by manipulating notes
    - contents changed quickly by user/designer with pen and note repositioning
  - session is videotaped for later analysis
    - usually end up with mess of paper and plastic!

Low fidelity prototypes

- Pictive
  - can create pre-made interface components on paper
  - eg, these empty widgets were created in visual basic and printed out:



buttons

menu

alert box

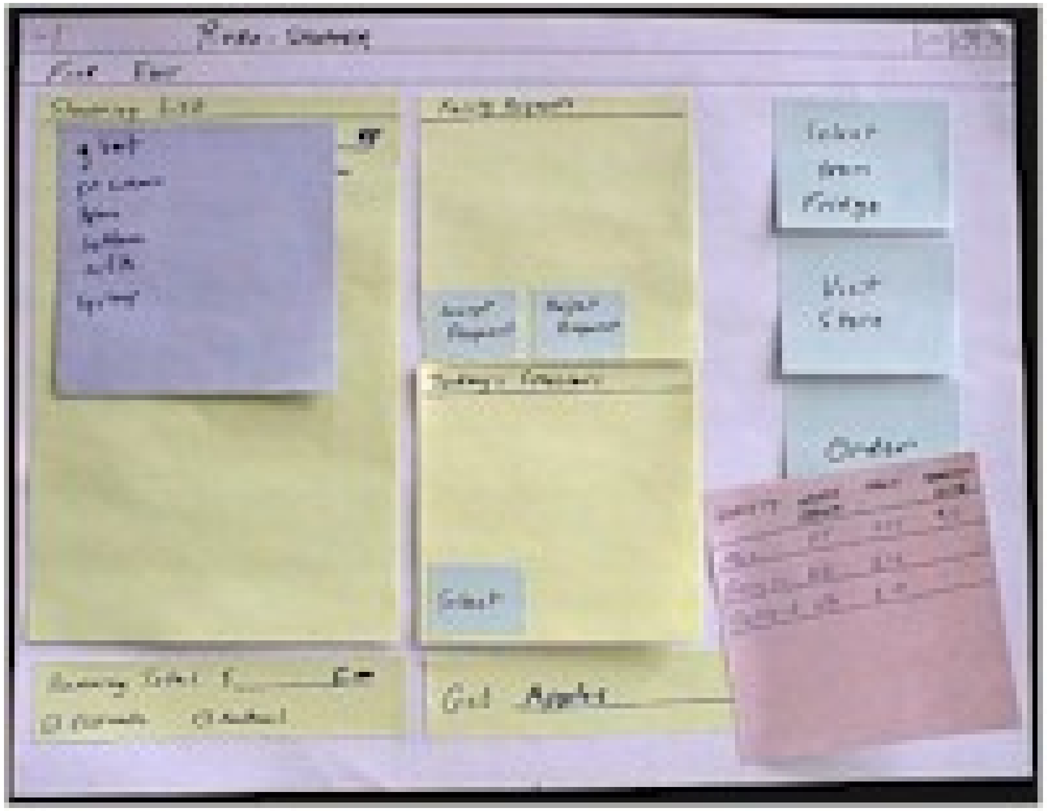
combo box

list box

entries

tabs

Using paper, post-its, index cards...



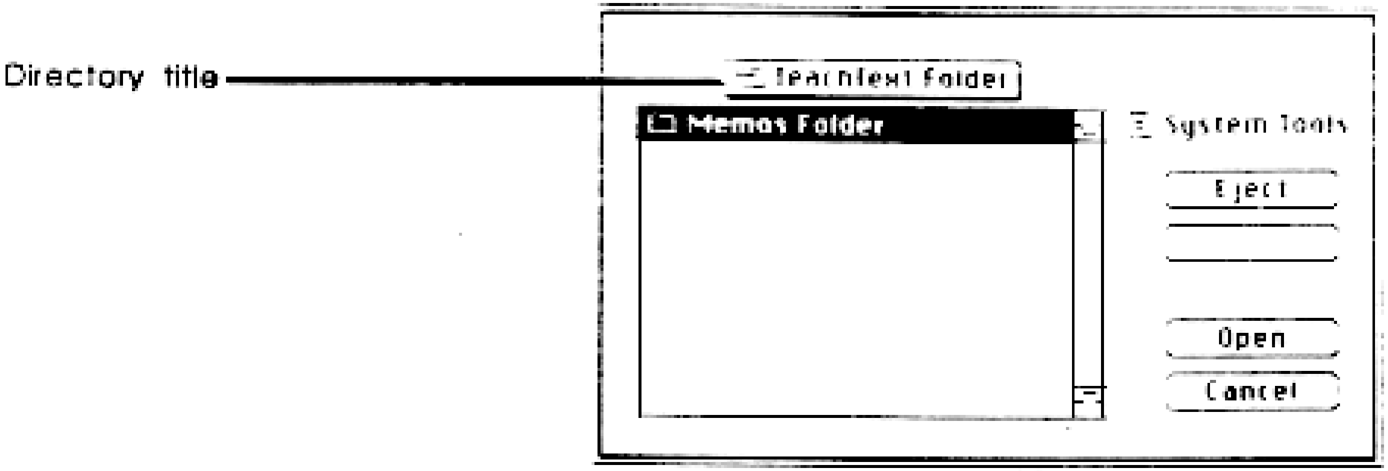
- Here, to mock up interface menus

Low-fidelity Prototyping

Low fidelity prototypes

- Tutorials and manuals
  - write them in advance of the system
  - what are they?
    - tutorial for step by step description of an interaction
      - an interface “walk-through” with directions
    - manual for reference of key concepts
      - in-depth technical description
  - if highly visual, then storyboard is set within textual explanations
  - does this work?
    - people often read manuals of competing products to check:
      - interface
      - functionality
      - match to task

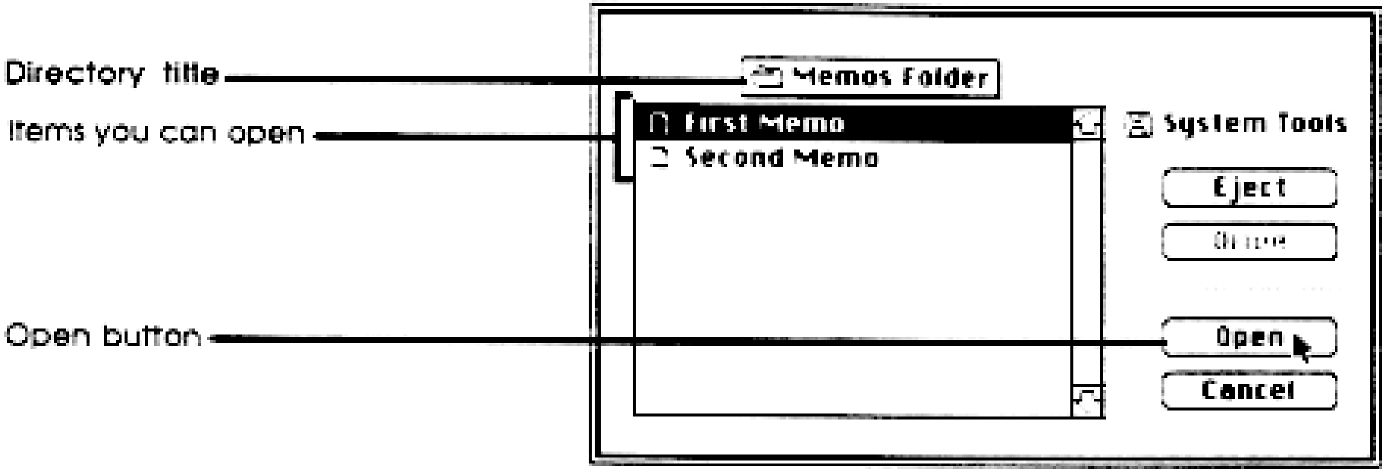
You see this dialog box:



Directory title

A directory title shows you the name of the folder you're presently working in—in this case, the TeachText Folder. The box beneath it shows you all the other items in the TeachText Folder that you can open with this application—in this case, only the Memos Folder.

- **To open the Memos Folder, click the Open button.**



As you open the Memos Folder, you move down through the hierarchy. The directory title changes to remind you where you are in the hierarchy, and the box shows you what's on the new level you just moved to—in this case, the two documents in the Memos Folder. The selected document is the one that will open when you click the Open button. If you want to open the other document, click anywhere on the other document's name to highlight it, and then click the Open button.

Why use low-fidelity prototyping

- Traditional methods take too long
  - – sketches -> prototype -> evaluate -> iterate
- Can simulate the prototype
  - – sketches -> evaluate -> iterate
  - – sketches act as prototypes
    - designer “plays computer”
    - other design team members observe & record
- Kindergarten implementation skills
  - – allows non-programmers to participate

Why use low fidelity prototyping (2)

- Cheap
- Easy/fast to create
- Easy/fast to change
- Can stay ambiguous
- Can be changed by user
- Can reproduce any platform

Medium fidelity prototypes

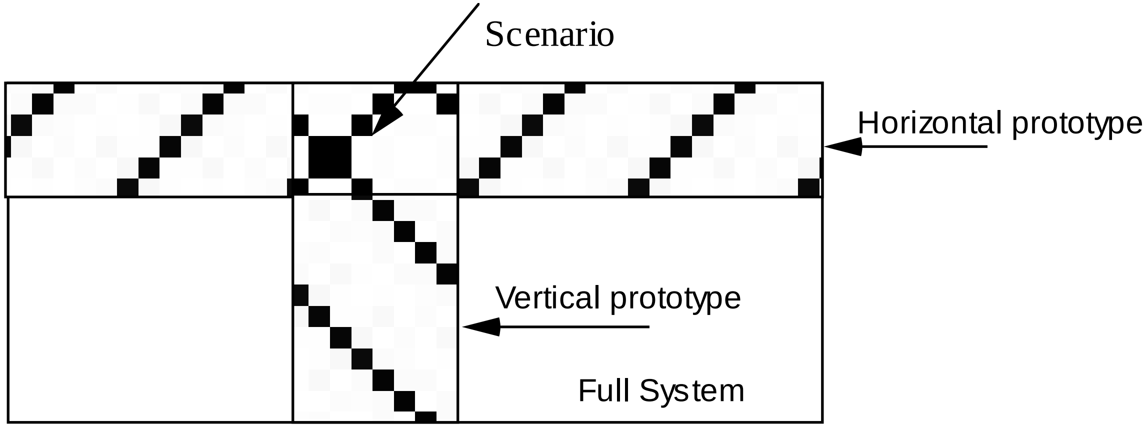
- Prototyping with a computer
  - simulate or animate some but not all features of the intended system
    - engaging for end users

- Purpose
  - provides a sophisticated but limited scenario to the user to try out
  - provides a development path (from crude screens to functional system)
  - can test more subtle design issues

- Danger
  - user’s reactions are usually “in the small”
    - blinds people to major representational flaws
  - users reluctant to challenge / change the design itself
    - designs are too “pretty”, egos…
  - management may think its real!

Medium fidelity prototypes

- Approaches to limiting prototype functionality
  - vertical prototypes
    - includes in-depth functionality for only a few selected features
    - common design ideas can be tested in depth
  - horizontal prototypes
    - surface layers includes the entire user interface with no underlying functionality
    - a simulation; no real work can be performed
  - scenario
    - scripts of particular fixed uses of the system; no deviation allowed

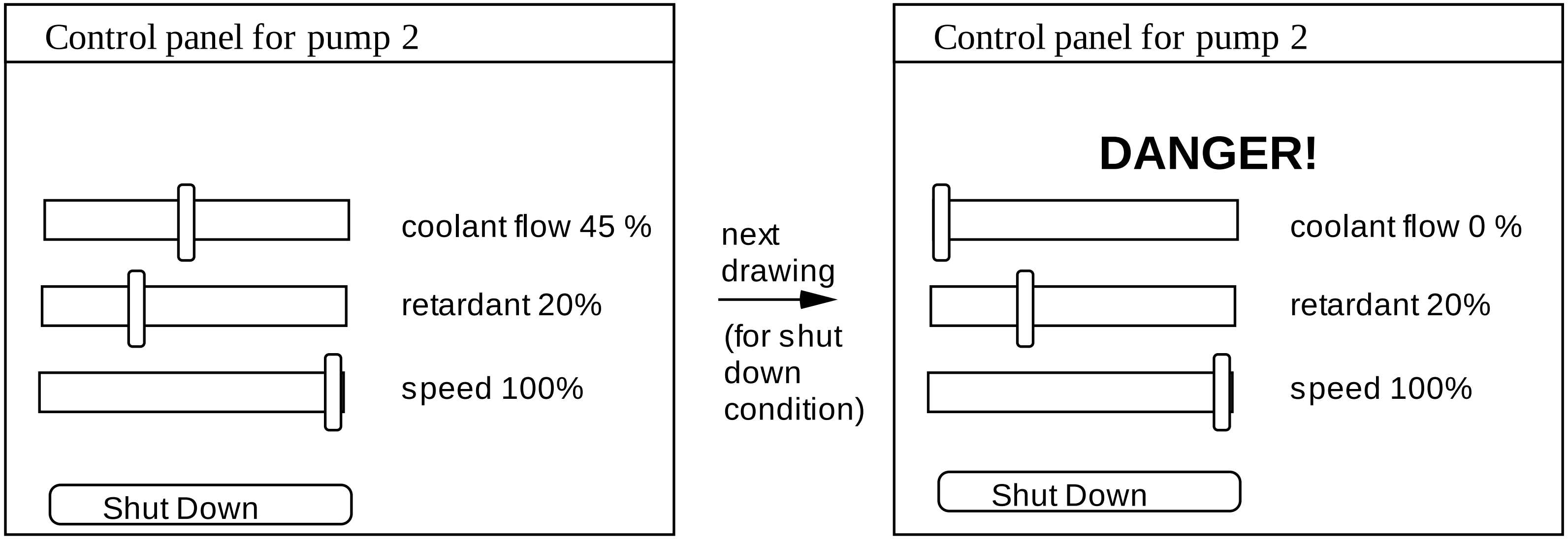


Medium fidelity prototypes

- Approaches to integrating prototypes and product:
  - Throw-away
    - prototype only serves to elicit user reaction
    - creating prototype must be rapid, otherwise too expensive
  - Incremental
    - product built as separate components (modules)
    - each component prototyped and tested, then added to the final system
  - Evolutionary
    - prototype altered to incorporate design changes
    - eventually becomes the final product

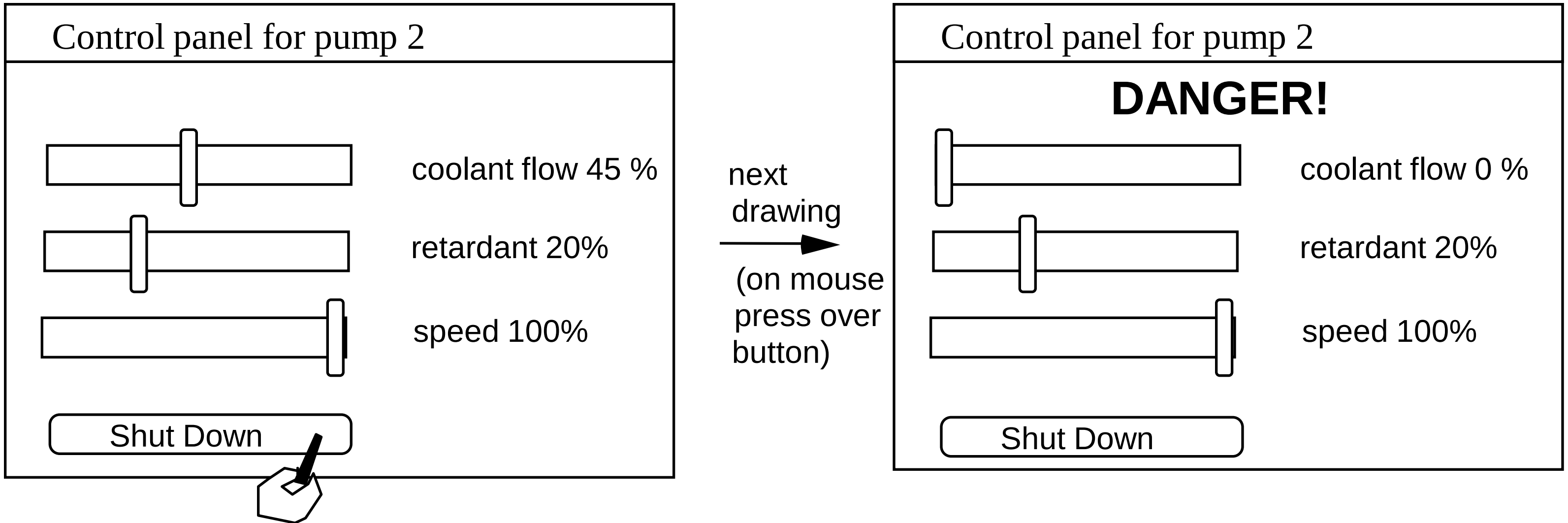
Medium fidelity prototypes

- Painting/drawing packages
  - draw each storyboard scene on computer
    - neater/easier (?) to change on the fly than paper
  - a very thin horizontal prototype
  - does not capture the interaction “feel”



Medium fidelity prototypes

- Scripted simulations and slide shows
  - encode the storyboard on the computer
    - created with media tools
    - scene transition activated by simple user inputs
    - a simple horizontal and vertical prototype
  - user given a very tight script/task to follow
    - appears to behave as a real system
    - but script deviations blows the simulation



Control panel for pump 2

coolant flow 45 %

retardant 20%

speed 100%

Shut Down

next drawing

(on mouse press over button)

Control panel for pump 2

DANGER!

coolant flow 0 %

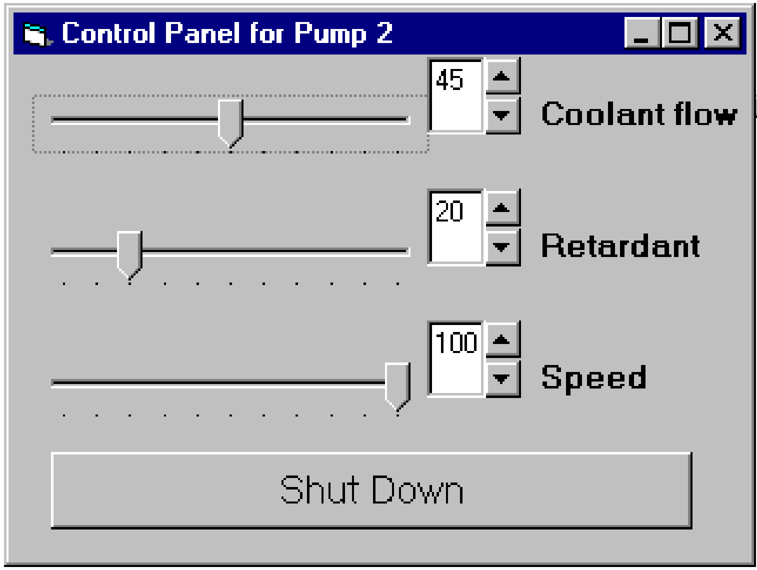
retardant 20%

speed 100%

Shut Down

Medium fidelity prototypes

- Interface builders
  - tools for letting a designer lay out the common widgets
  - construct mode
    - change attributes of objects
  - test mode:
    - objects behave as they would under real situations
  - excellent for showing look and feel
    - a broader horizontal prototype
    - but constrained to widget library
  - vertical functionality added selectively
    - through programming



Control Panel for Pump 2

Coolant flow: 45

Retardant: 20

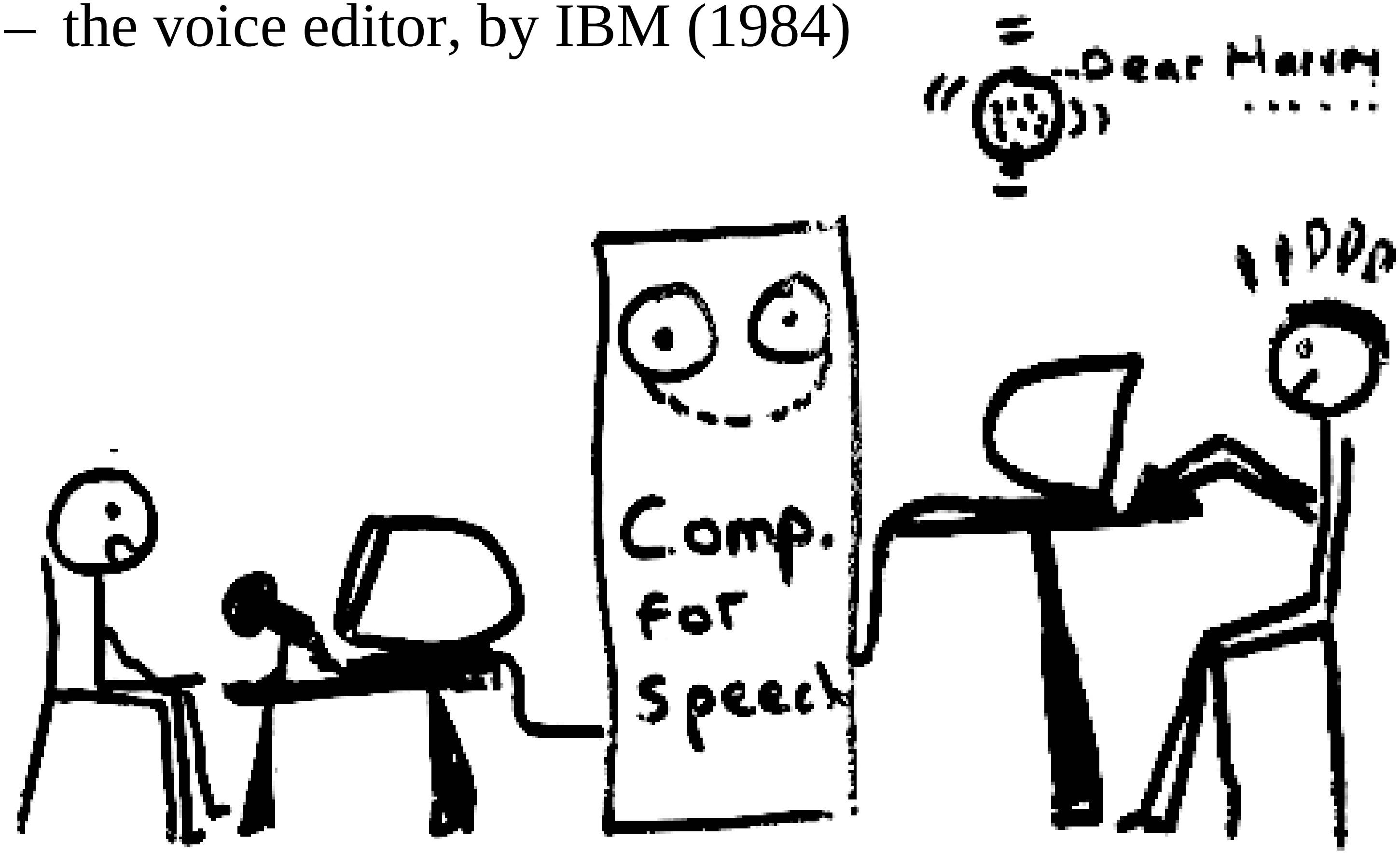
Speed: 100

Medium fidelity prototypes

- Wizard of Oz
  - Human simulates the system’s intelligence and interacts with user
  - Uses real or mock interface
    - “Pay no attention to the man behind the curtain!”
  - User uses computer as expected
  - “Wizard” (sometimes hidden):
    - Interprets subjects input according to an algorithm
    - Has computer/screen behave in appropriate manner
  - Good for:
    - Adding simulated and complex vertical functionality
    - Testing futuristic ideas

Wizard of Oz

- A method of testing a system that does not exist
  - the voice editor, by IBM (1984)



What the user sees

The Wizard

‘Wizard of Oz’ Examples

- IBM: an imperfect listening typewriter using continuous speech recognition
  - secretary trained to:
    - understand key words as “commands”
    - to type responses on screen as the system would
    - manipulating graphic images through gesture and speech

- Intelligent Agents / Programming by demonstration
  - person trained to mimic “learning agent”
    - user provides examples of task they are trying to do
    - computer learns from them
  - shows how people specify their tasks

- In both cases, system very hard to implement, even harder to change!

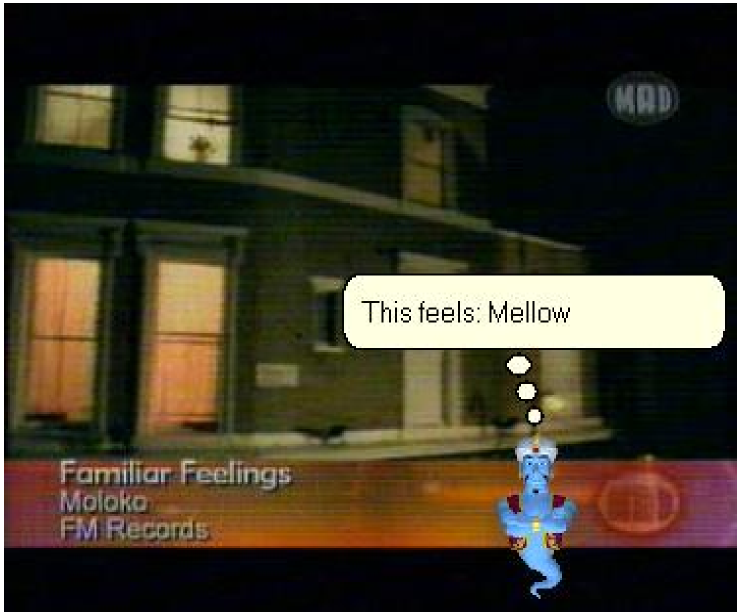
‘Wizard-of-Oz’ Example

Vista project at City University

High-fidelity prototyping

- Uses materials that you would expect to be in the final product
- Prototype looks more like the final system than a low-fidelity version
- For a high-fidelity software prototype, common environments include Balsamiq, OmniGraffle, Moqups, Proto.io
- Danger that users think they have a full system

High-fidelity prototyping



Why use high fidelity prototyping

- Can look realistic
- Can reproduce appropriate sort of interaction
- Impressive to clients
- Can show complete design
- Can show detail…

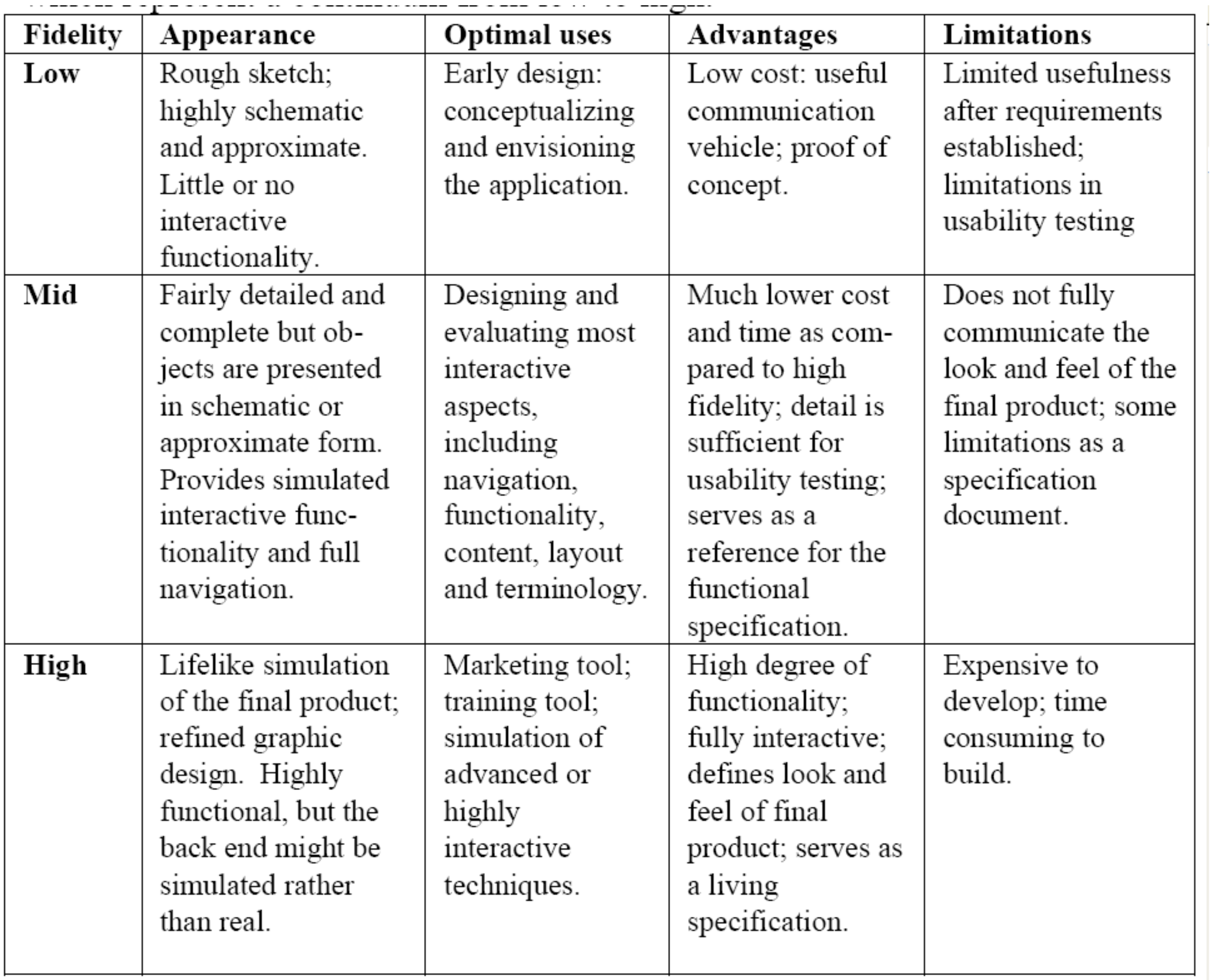
Mid-fi and hi-fi prototypes

Mid-fi prototype	**Hi-fi prototype**
Schematic. A simple model of the final product	Detailed. A more complete model of the final product
Simulated functionality often based on screen mockups	Actual functionality (but not everything)
Uses materials that may differ from final product	Uses materials you’d expect to find in the final product

Why lo-fi is often better than hi-fi

- Hi-fi prototypes can be problematic
  - users can often think it’s the real thing
  - users tend to focus on small details (e.g. font size) rather than the bigger picture
  - developers get over-attached having done the programming
- Lo-fi prototypes avoid these issues...
  - easy to change
  - users concentrate on big picture (e.g. structure and function)
  - it’s disposable
- So before investing in hi-fi, we need to get lo-fi versions right

Prototype comparisons

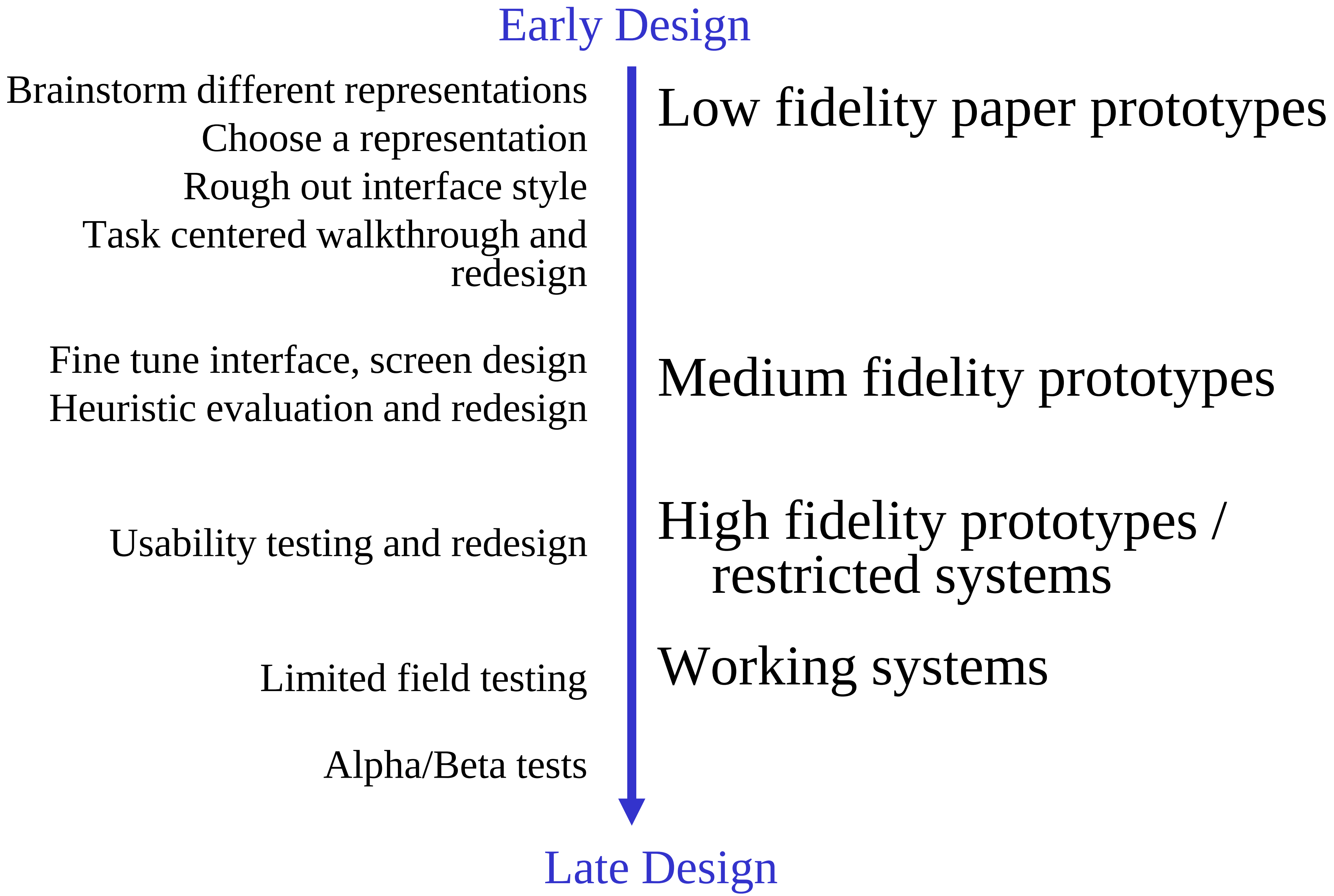


Fidelity	Appearance	Optimal uses	Advantages	Limitations
Low	Rough sketch; highly schematic and approximate. Little or no interactive functionality.	Early design: conceptualizing and envisioning the application.	Low cost: useful communication vehicle; proof of concept.	Limited usefulness after requirements established; limitations in usability testing
Mid	Fairly detailed and complete but objects are presented in schematic or approximate form. Provides simulated interactive functionality and full navigation.	Designing and evaluating most interactive aspects, including navigation, functionality, content, layout and terminology.	Much lower cost and time as compared to high fidelity; detail is sufficient for usability testing; serves as a reference for the functional specification.	Does not fully communicate the look and feel of the final product; some limitations as a specification document.
High	Lifelike simulation of the final product; refined graphic design. Highly functional, but the back end might be simulated rather than real.	Marketing tool; training tool; simulation of advanced or highly interactive techniques.	High degree of functionality; fully interactive; defines look and feel of final product; serves as a living specification.	Expensive to develop; time consuming to build.

Table 1: Comparison of different levels of prototype fidelity

http://www.ipo.tue.nl/homepages/mrauterb/lecturenotes/MFP-Prototypying.PDF

Prototyping



Early Design

Brainstorm different representations

Choose a representation

Rough out interface style

Task centered walkthrough and redesign

Fine tune interface, screen design

Heuristic evaluation and redesign

Usability testing and redesign

Limited field testing

Alpha/Beta tests

Low fidelity paper prototypes

Medium fidelity prototypes

High fidelity prototypes / restricted systems

Working systems

Late Design

Conclusions

- Prototyping
  - allows users to react to the design and suggest changes
  - low-fidelity prototypes best for brainstorming and choosing representations
  - medium-fidelity prototypes best for fine-tuning the design
- Prototyping methods
  - vertical, horizontal and scenario prototyping
  - storyboarding
  - Pictive
  - scripted simulations
  - Wizard of Oz