

## PV182 Human-Computer Interaction

### Lecture 4 Prototyping

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## User Centered Design and Prototyping

### Why user-centered design is important Prototyping and user centered design Prototyping methods

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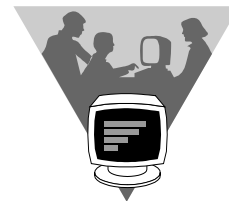
## System Centered Design



E-Mail: SCOTTADAMS@AOL.COM ©1994 United Feature Syndicate

## System Centered Design

- What can I easily build on this platform?
- What can I create from the available tools?
- What do I as a programmer find interesting?



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## User Centered System Design

- Design is based upon a user's
  - Abilities and real needs
  - Context
  - Work
  - Tasks
  - Need for usable and useful product



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## User Centered System Design .

- ... is based on understanding the domain of work or play in which people are engaged and in which they interact with computers...

Golden rule of interface design:

**Know The User**

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## User Centered System Design ..

- Assumptions
  - The result of a good design is a satisfied customer
  - The process of design is a collaboration between designers and customers
    - The design evolves and adapts to their changing concerns, and the process produces a specification as an important by product
  - The customer and designer are in constant communication during the entire process

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## Participatory Design

- Problem
  - Intuitions wrong
  - Interviews etc. not precise
  - Designer cannot know the user sufficiently well to answer all issues that come up during the design
- Solution
  - Designers should have access to representative users
  - END users, not their managers or union reps!



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## Participatory Design .

- Users are 1st class members in the design process
  - Active collaborators vs passive participants
- Users considered subject matter experts
  - Know all about the work context
- Design is iterative process
  - All design stages subject to revision



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## Participatory Design ..

- Up side
  - Users are excellent at reacting to suggested system designs
    - Designs must be concrete and visible
  - Users bring in important “folk” knowledge of work context
    - Knowledge may be otherwise inaccessible to design team
  - Greater buy-in for the system often results

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## Participatory Design ...

- Down side
  - Hard to get a good pool of end users
    - Expensive, reluctance ...
  - Users are not expert designers
    - Don't expect them to come up with design ideas from scratch
  - The user is not always right
    - Don't expect them to know what they want

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## Methods for Involving the User

- At the very least, talk to users
  - Surprising how many designers don't!
- Contextual interviews + site visits
  - Interview users in their workplace, as they are doing their job
  - Discover user's culture, requirements, expectations,...



## Methods for Involving the User .

- Explain designs
  - Describe what you're going to do
  - Get input at all design stages
    - All designs subject to revision
- Important to have visuals and/or demos
  - People react far differently with verbal explanations
  - This is why prototypes are critical

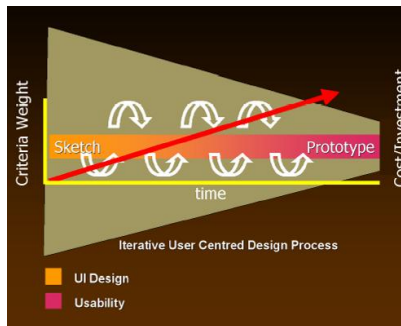


## Sketching and Prototyping

- Sketches / low / medium / high fidelity prototypes
  - As investment in design increases (red arrow), so does the formality of the criteria whereby concepts are reviewed or accepted
    - See next slide!
- From design to evaluation
  - Similarly, interface design (idea generation) progresses to usability testing (idea debugging and refinement)

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## Sketching and Prototyping .



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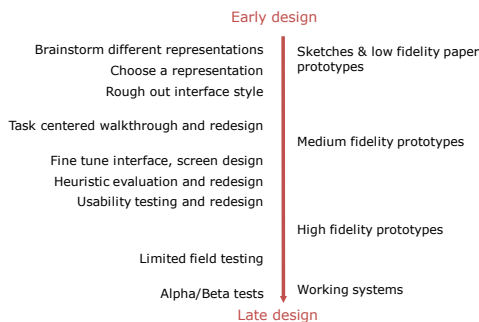


## Sketching vs Prototyping

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>• Sketches                             <ul style="list-style-type: none"> <li>– Invite</li> <li>– Suggest</li> <li>– Explore</li> <li>– Question</li> <li>– Propose</li> <li>– Provoke</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• Prototype                             <ul style="list-style-type: none"> <li>– Attend</li> <li>– Describe</li> <li>– Refine</li> <li>– Answer</li> <li>– Test</li> <li>– Resolve</li> </ul> </li> </ul> |
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## Sketching and Prototyping Designs



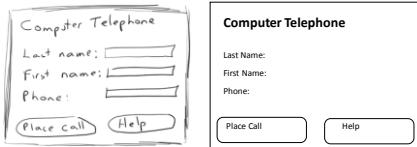
## Sketches & Low Fidelity Prototypes

- 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

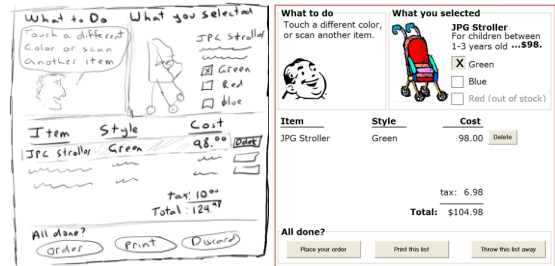


## Sketches

- 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



## Another Sketch Example



## The Attributes of Sketches

- Quick
  - To make
- Timely
  - Provided when needed
- Disposable
  - Investment in the concept, not the execution
- Plentiful
  - They make sense in a collection or series of ideas
- Clear vocabulary
  - Rendering & style indicates it's a sketch, not an implementation

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## The Attributes of Sketches .

- Constrained resolution
  - Doesn't inhibit concept exploration
- Consistency with state
  - Refinement of rendering matches the actual state of development of the concept
- Suggest & explore rather than confirm
  - Value lies in suggesting and provoking what could be
    - i.e., they are the catalyst to conversation and interaction

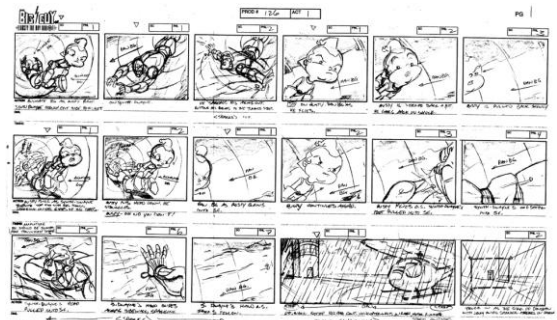
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## Storyboarding

- A series of key frames as sketches
  - 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

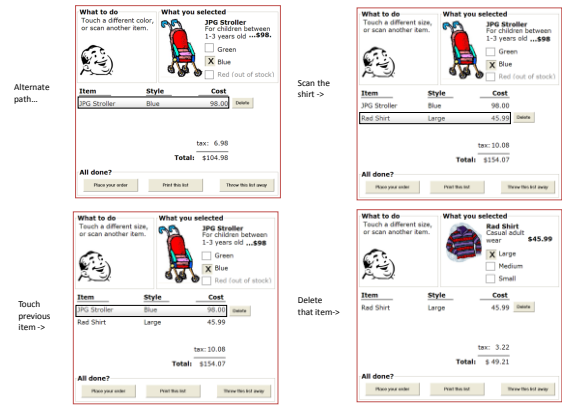
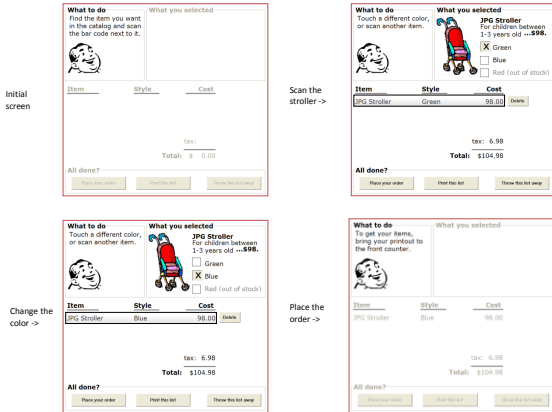


Excerpts from Disney's Robin Hood storyboard, www.animapart.com/Cellar/disneyart/90robin%20storyboard.jpg.html



*note how each scene in this storyboard is annotated*

From www.michaelborkowski.com/storyboards/images/big\_biggy1.gif



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## Storyboarding .

- **Spotlight:** an interactive foam core and paper sketch/storyboard Credit



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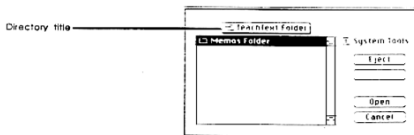
## Tutorials as Storyboards

- A step by step storyboard walkthrough with detailed explanations
- Written in advance of the system implementation
- Also serves as an interface specification for programmers

Apple's Tutorial Guide to the Macintosh Finder

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## Tutorials as Storyboards .



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.

Apple's Tutorial Guide to the Macintosh Finder

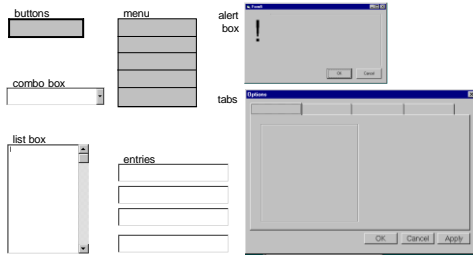
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## Pictive

- Pictive means "plastic interface for collaborative technology initiatives through video exploration"
- Designing with office supplies
  - Multiple layers of sticky notes and plastic overlays
  - Different sized stickies represent icons, menus, windows etc.
- Interaction demonstrated by manipulating notes
  - New interfaces built on the fly
- Session videotaped for later analysis
  - Usually end up with mess of paper and plastic!

## Pictive .

- Can pre-make paper interface components

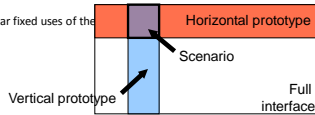


## Medium Fidelity Prototypes

- Prototyping with a computer
  - Simulate some but not all features of the interface
  - Engaging for end users
- Purpose
  - Provides sophisticated but limited scenario for the user to try
  - Can test more subtle design issues
- Dangers
  - User's reactions often "in the small"
  - Users reluctant to challenge designer
  - Users reluctant to touch the design
  - Management may think its real!

## 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
  - the entire surface interface with no underlying functionality
  - a simulation; no real work can be performed
- scenario
  - scripts of particular fixed uses of the



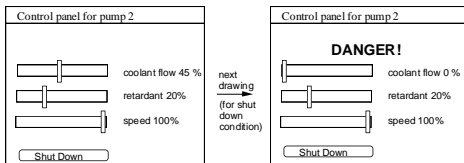
Nielsen, J. (1993) Usability Engineering, p93-101, Academic Press.

## Integrating prototypes and products

- 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 & tested, then added to the final system
- Evolutionary
  - prototype altered to incorporate design changes
  - eventually becomes the final product

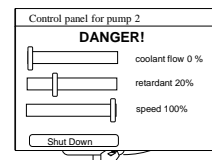
## Painting/drawing packages

- Draw each storyboard scene on computer
  - Very thin horizontal prototype
  - Does not capture the interaction "feel"



## Scripted Simulations

- Create storyboard with media tools
  - scene transition activated by simple user inputs
  - a simple vertical prototype
- User given a very tight script/task to follow
  - appears to behave as a real system
  - script deviations blow the simulation





**What to do**  
Find the item you want in the catalog and scan the bar code next to it.

**What you selected**

Item	Style	Cost

tax: \_\_\_\_\_  
**Total: \$ 0.00**

**All done?**

Place your order    Print this list    Throw this list away



**What to do**  
Touch a different color, or scan another item.

**What you selected**  
**JPG Stroller**  
For children between 1-3 years old ...\$98.

Green  
 Blue  
 Red (out of stock)

Item	Style	Cost
JPG Stroller	Green	98.00 <input type="button" value="Delete"/>

tax: 6.98  
**Total: \$104.98**

**All done?**

Place your order    Print this list    Throw this list away

**What to do**  
Touch a different color, or scan another item.

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tax: 6.98  
**Total: \$104.98**

**All done?**

Place your order    Print this list    Throw this list away



**What to do**  
To get your items, bring your printout to the front counter.

**What you selected**

Item	Style	Cost
JPG Stroller	Green	98.00

tax: 6.98  
**Total: \$104.98**

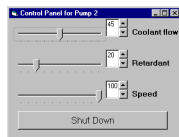
**All done?**

Place your order    Print this list    Throw this list away

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## Interface Builders

- Design tools for laying out common widgets
- Excellent for showing look and feel
  - a broader horizontal prototype
  - but constrained to widget library
- Vertical functionality added selectively
  - Through programming



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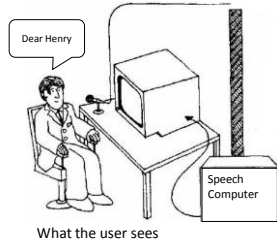
## Wizard of Oz

- Human 'wizard' simulates system response
  - Interprets user input according to an algorithm
  - Controls computer to simulate appropriate output
  - Uses real or mock interface
  - Wizard sometimes visible, sometimes hidden
  - "Pay no attention to the man behind the curtain!"
- Good for:
  - Adding simulated and complex vertical functionality
  - Testing futuristic ideas



## Wizard of Oz

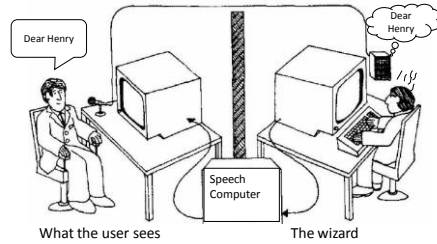
- A method of testing a system that does not exist
  - the listening typewriter, IBM 1984



From Gould, Conti & Hovanec, Comm ACM 26(4) 1983.

## Wizard of Oz

- A method of testing a system that does not exist
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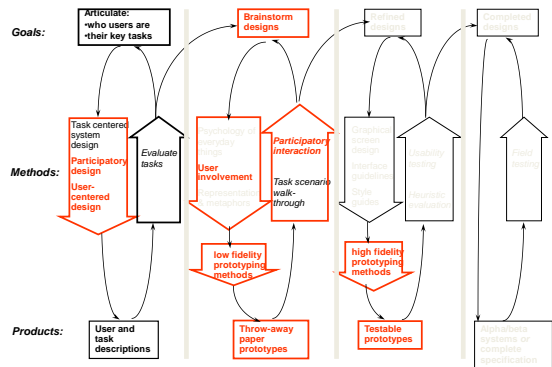
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## What you Now Know

- User centered + participatory design
  - Based upon a user's real needs, tasks, and work context
  - Bring end-user in as a first class citizen into the design process
- Prototyping
  - Allows users to react to the design and suggest changes
  - Sketching / low-fidelity vs medium-fidelity
- Prototyping methods
  - Vertical, horizontal and scenario prototyping
  - Sketches, storyboarding, pictive
  - Scripted simulations, Wizard of Oz

### Interface Design and Usability Engineering



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## Questions



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## Acknowledgements

- Special Thanks to Prof. Jiri Sochor