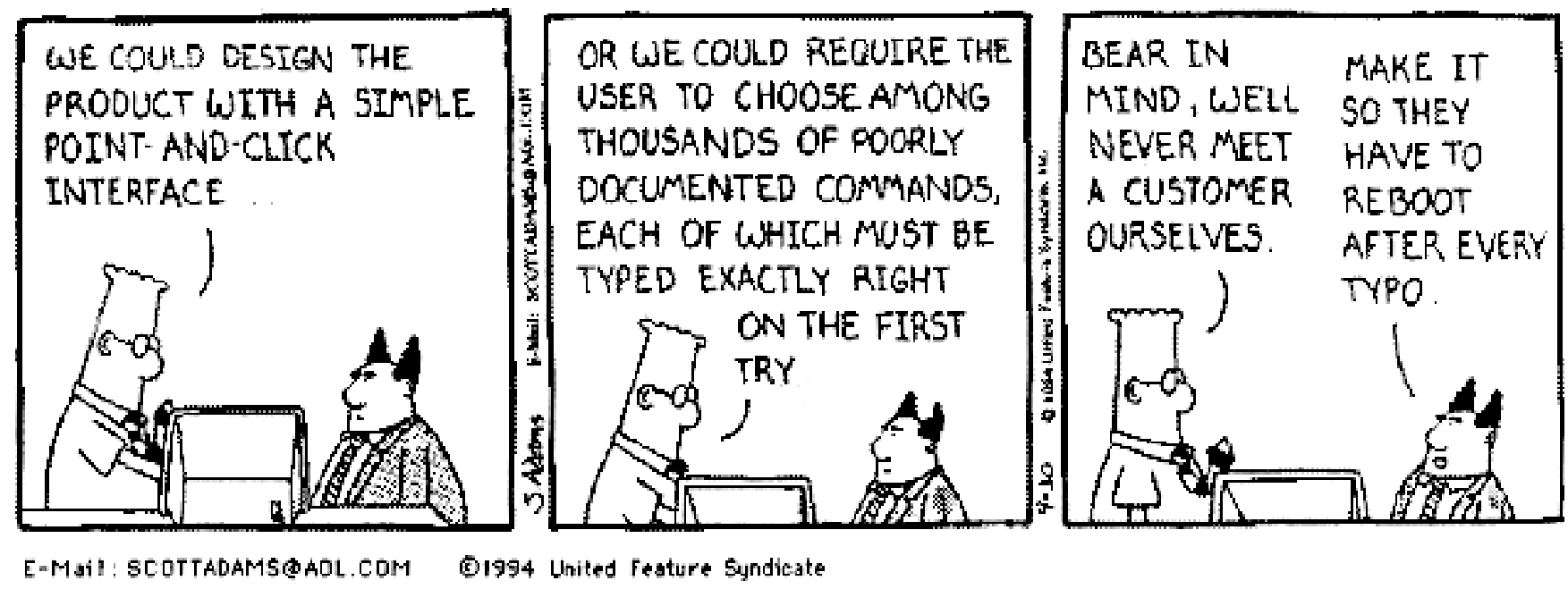
User Centered Design and Prototyping

Why user-centered design is important

Prototyping and user centered design

Prototyping methods

System Centered Design



System Centered Design

What can I easily build on this platform?

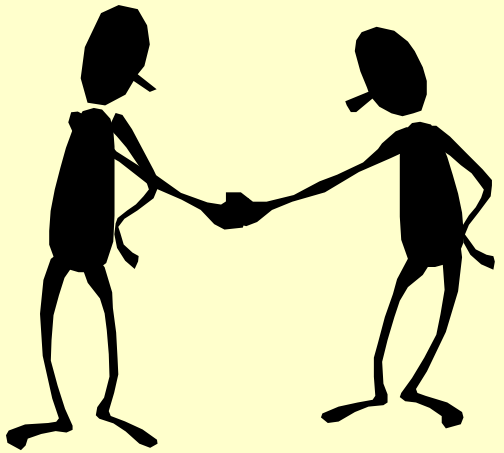
What can I create from the available tools?

What do I as a programmer find interesting?

User Centered System Design

Design is based upon a user's

- abilities and real needs
- context
- work
- tasks
- need for usable and useful product



Golden rule of interface design: ***Know The User***

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…

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 byproduct
- The customer and designer are in *constant communication* during the entire process

Denning and Dargan, 1996

From Denning and Dargan, p111 in Winograd, Ed., Bringing Design to Software, Addison Wesley

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!

Participatory Design

Users are 1st class members in the design process

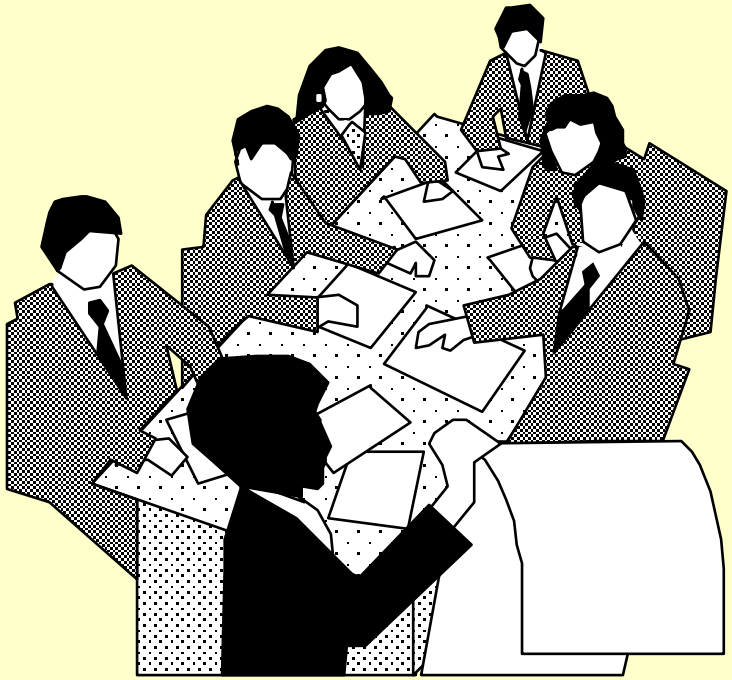
- active collaborators *vs* passive participants

Users considered subject matter experts

- know all about the work context

Iterative process

- all design stages subject to revision



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

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

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

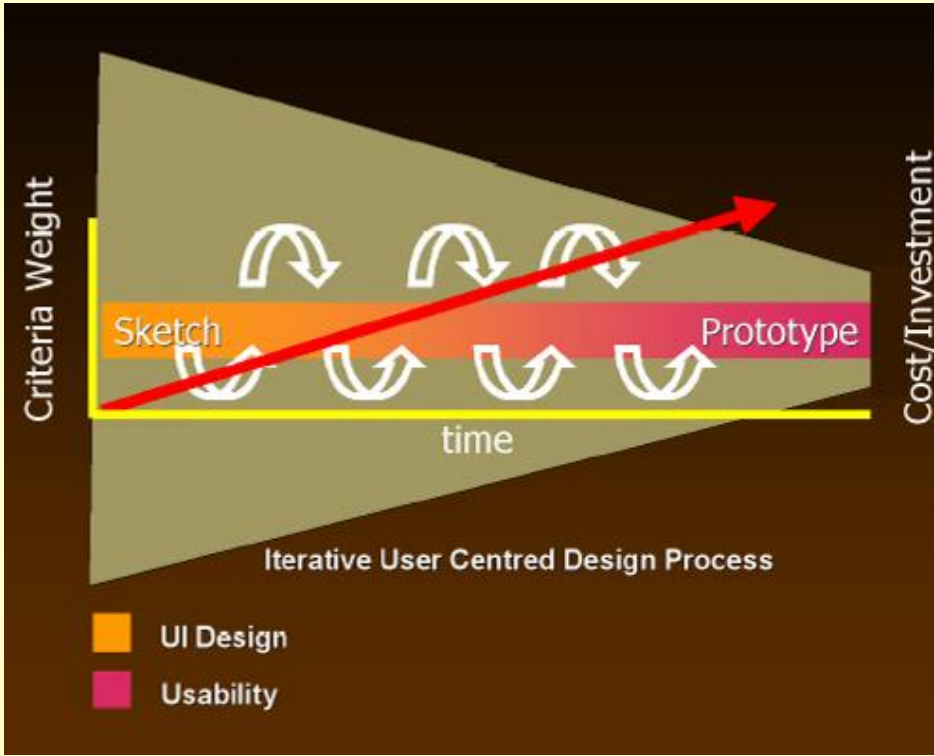
Sketching and Prototyping

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

From design to evaluation

- similarly, interface design (idea generation) progresses to usability testing (idea debugging and refinement)



From Design for the Wild, Bill Buxton (in press) with permission

Sketching vs Prototyping

Sketches

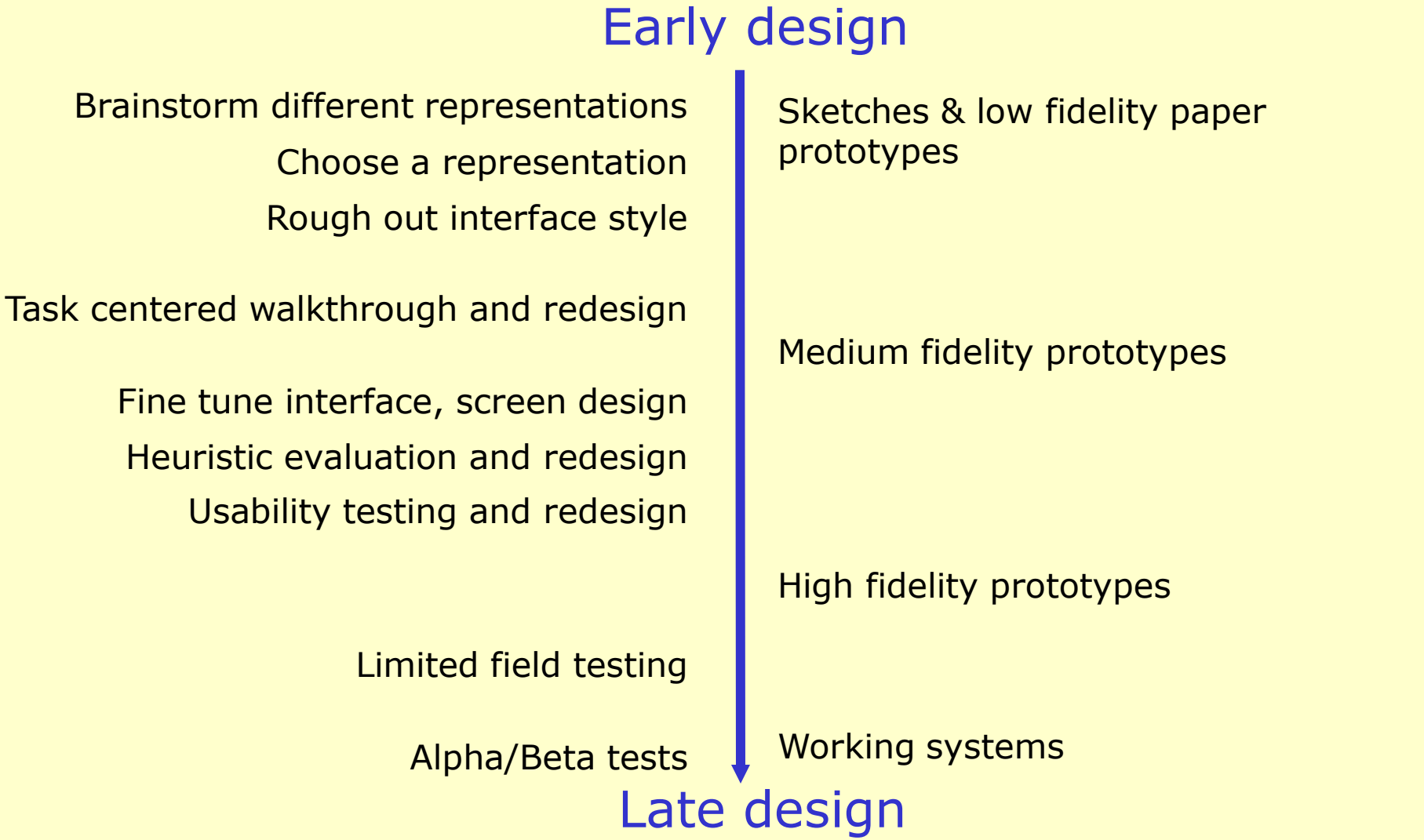
- Invite
- Suggest
- Explore
- Question
- Propose
- Provoke

Prototype

- Attend
- Describe
- Refine
- Answer
- Test
- Resolve

From Design for the Wild, Bill Buxton (in press) with permission

Sketching and Prototyping



Sketches & Low Fidelity Prototypes

Paper mock-up of the interface look, feel, functionality

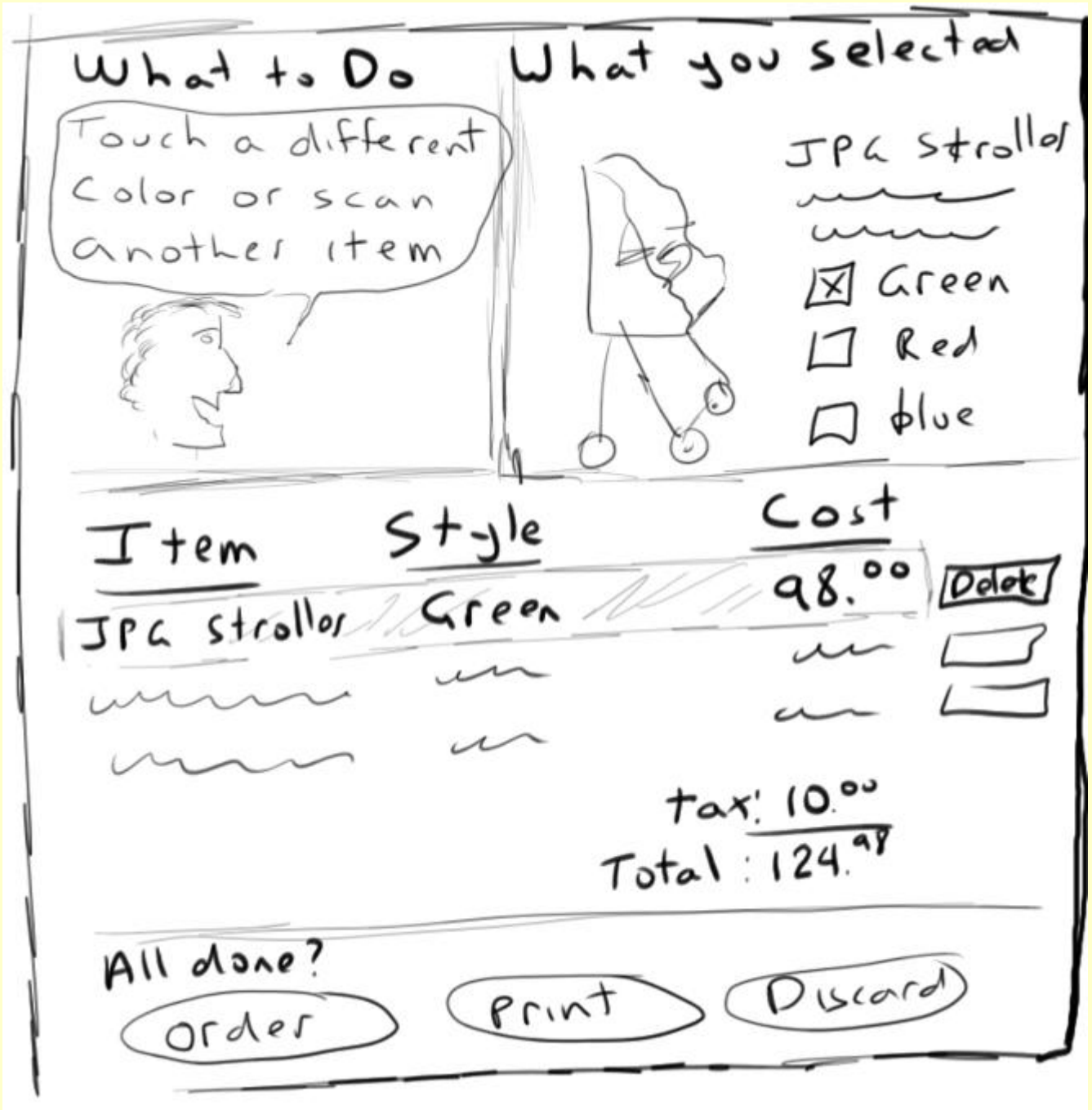
- quick and cheap to prepare and modify

Purpose

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

Sketches

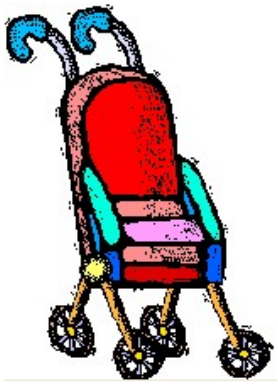
- drawing of the outward appearance of the intended system
- crudity means people concentrate on high level concepts
- but hard to envision a dialog's progression


What to Do
What you selected
Touch a different color or scan another item
JPG Stroller
Green
Red
Blue
Item
Style
Cost
JPG Stroller
Green
98.00
Delete
tax: 10.00
Total: 124.98
All done?
Order
Print
Discard

What to do

Touch a different color, or scan another item.

What you selected



JPG Stroller
For children between 1-3 years old **...$98.**

- [X] Green
- [ ] Blue
- [ ] Red (out of stock)

Item	Style	Cost	
JPG Stroller	Green	98.00	Delete

tax: 6.98

Total: $104.98

All done?

Place your order | Print this list | Throw this list away

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

Constrained resolution
- doesn't inhibit concept exploration

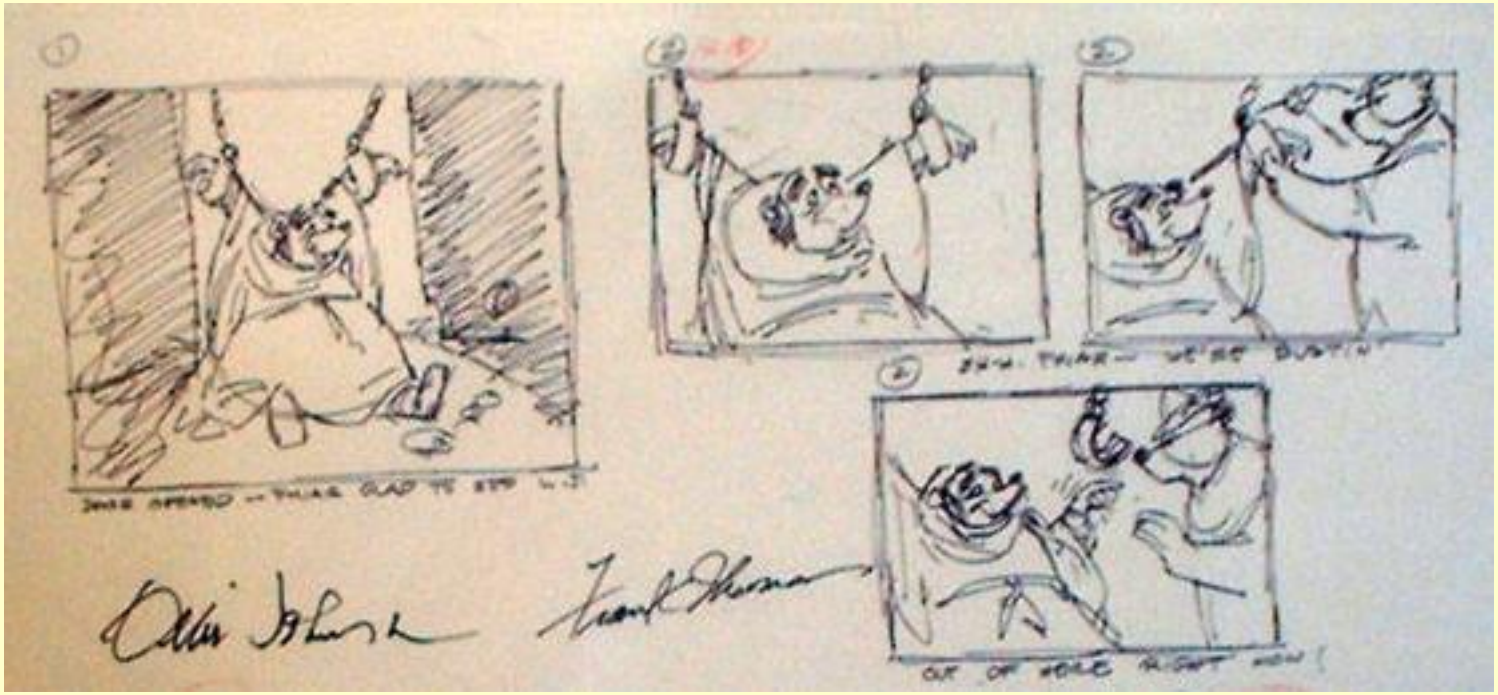
Consistency with state
- refinement of rendering matches the actual state of development of the concept

Suggest & explore rather than confirm
- value lies in suggesting and provoking what could be i.e., they are the catalyst to conversation and interaction

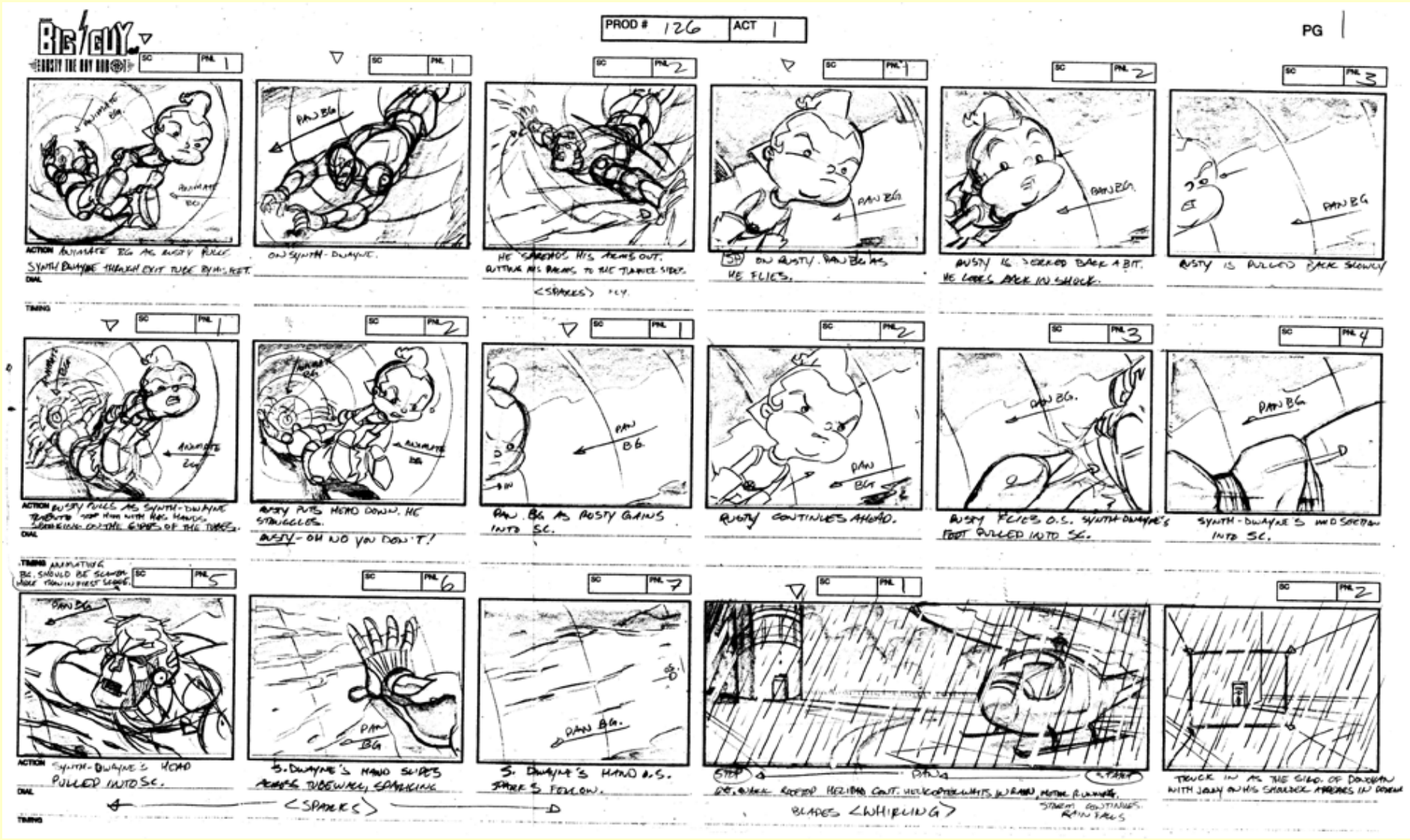
From Design for the Wild, Bill Buxton (in press) with permission

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.animaart.com/Cellar/disneyart/90robin%20storyboard.jpg.html



note how each scene in this storyboard is annotated

From www.michaelborkowski.com/storyboards/images/big_bigguy1.gif

Initial screen

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

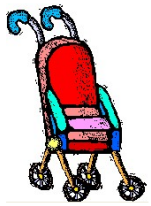
tax:
Total: $ 0.00

All done?
Place your order | Print this list | Throw this list away

Scan the stroller ->

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

What you selected



JPG Stroller
For children between 1-3 years old **...$98.**

[X] Green
[ ] Blue
[ ] Red (out of stock)

Item	Style	Cost	
JPG Stroller	Green	98.00	Delete

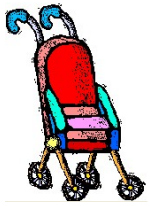
tax: 6.98
Total: $104.98

All done?
Place your order | Print this list | Throw this list away

Change the color ->

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
[X] Blue
[ ] Red (out of stock)

Item	Style	Cost	
JPG Stroller	Blue	98.00	Delete

tax: 6.98
Total: $104.98

All done?
Place your order | Print this list | Throw this list away

Place the order ->

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

What you selected

Item	Style	Cost
JPG Stroller	Blue	98.00

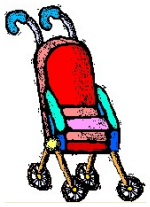
tax: 6.98
Total: $104.98

All done?
Place your order | Print this list | Throw this list away

Alternate path…

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
- [X] Blue
- [ ] Red (out of stock)

Item	Style	Cost
JPG Stroller	Blue	98.00

Delete

tax: 6.98

Total: $104.98

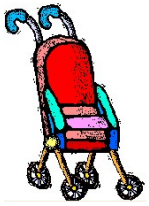
All done?

Place your order | Print this list | Throw this list away

Scan the shirt ->

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

What you selected



JPG Stroller
For children between 1-3 years old **...$98**

- [ ] Green
- [X] Blue
- [ ] Red (out of stock)

Item	Style	Cost
JPG Stroller	Blue	98.00
Rad Shirt	Large	45.99

Delete

tax: 10.08

Total: $154.07

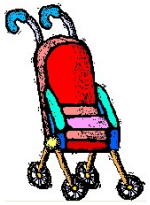
All done?

Place your order | Print this list | Throw this list away

Touch previous item ->

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

What you selected



JPG Stroller
For children between 1-3 years old **...$98**

- [ ] Green
- [X] Blue
- [ ] Red (out of stock)

Item	Style	Cost
JPG Stroller	Blue	98.00
Rad Shirt	Large	45.99

Delete

tax: 10.08

Total: $154.07

All done?

Place your order | Print this list | Throw this list away

Delete that item->

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

What you selected

Rad Shirt
Casual adult wear **$45.99**

- [X] Large
- [ ] Medium
- [ ] Small

Item	Style	Cost
Rad Shirt	Large	45.99

Delete

tax: 3.22

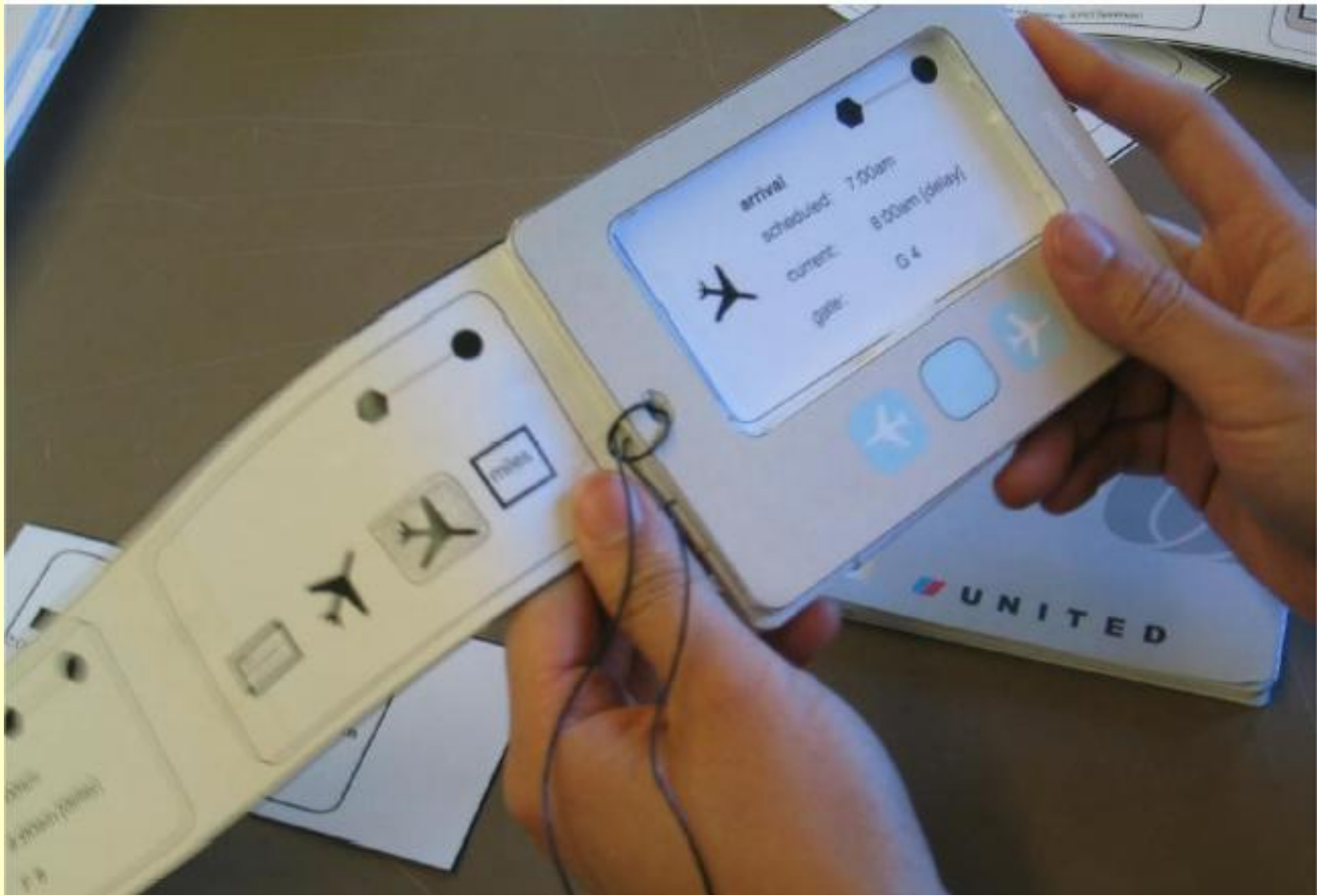
Total: $ 49.21

All done?

Place your order | Print this list | Throw this list away

Storyboarding

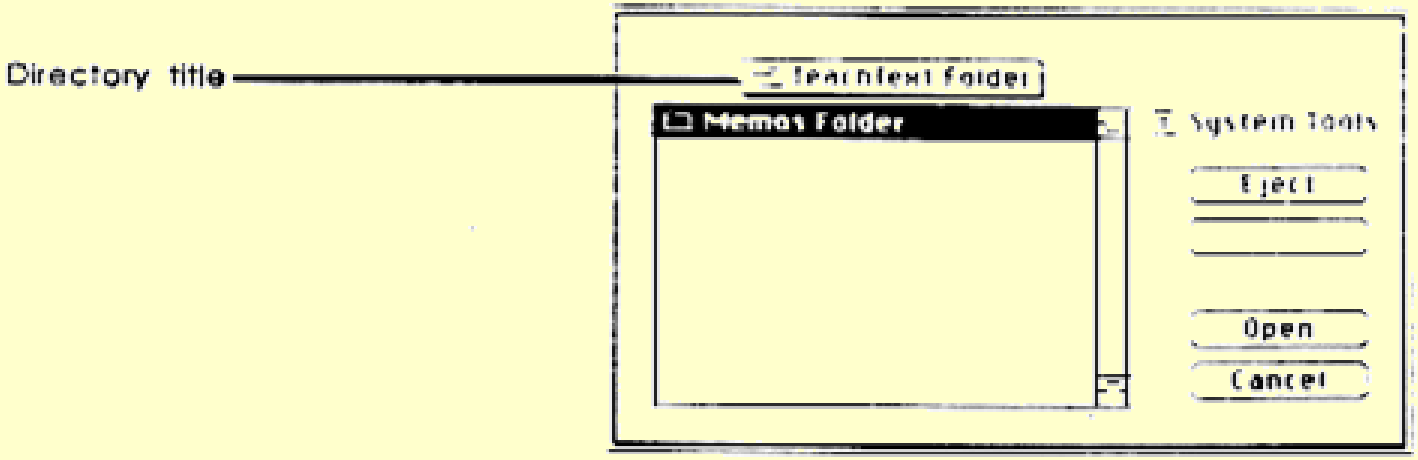
Spotlight: an interactive foam core and paper sketch/storyboard Credit: Sue-Tze Tan, Dept Industrial Design, University of Washington



From Design for the Wild, Bill Buxton (in press) with permission

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



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

Pictive **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!

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

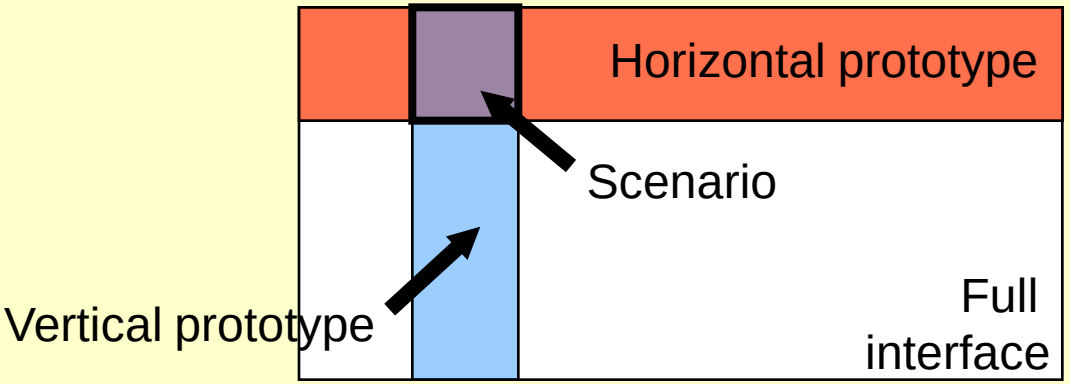
- includes in-depth functionality for only a few selected features
- common design ideas can be tested in depth

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 system; no deviation allowed



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

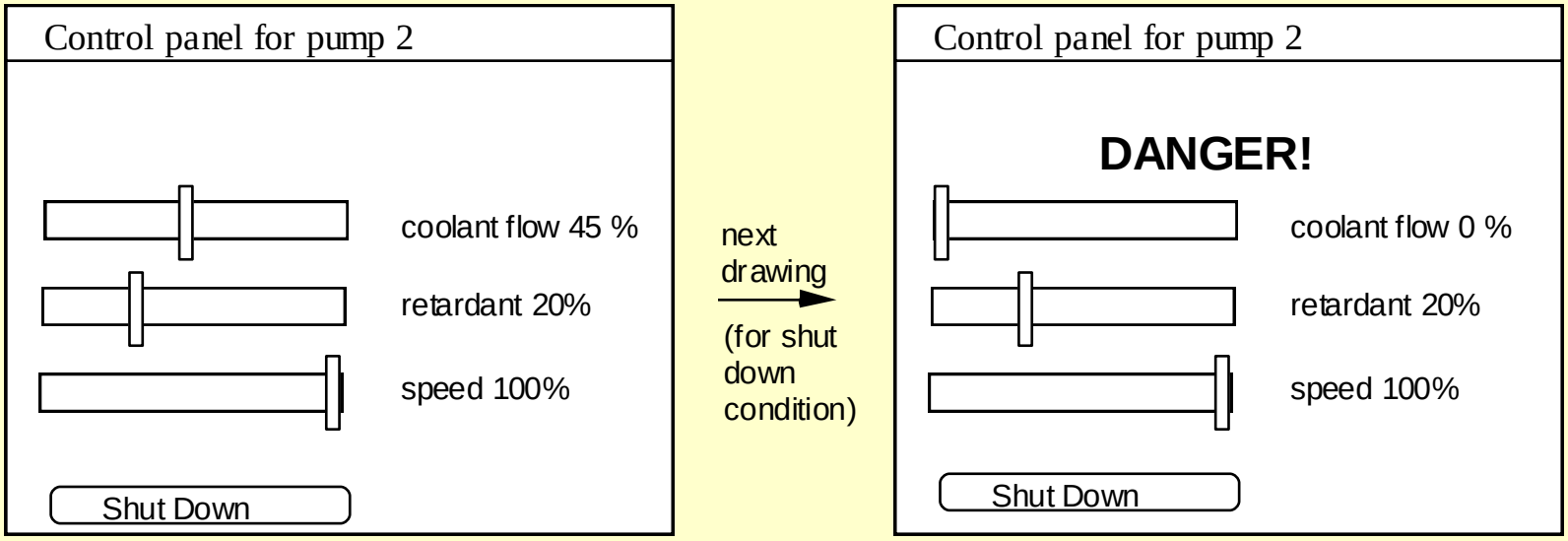
evolutionary

- 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"



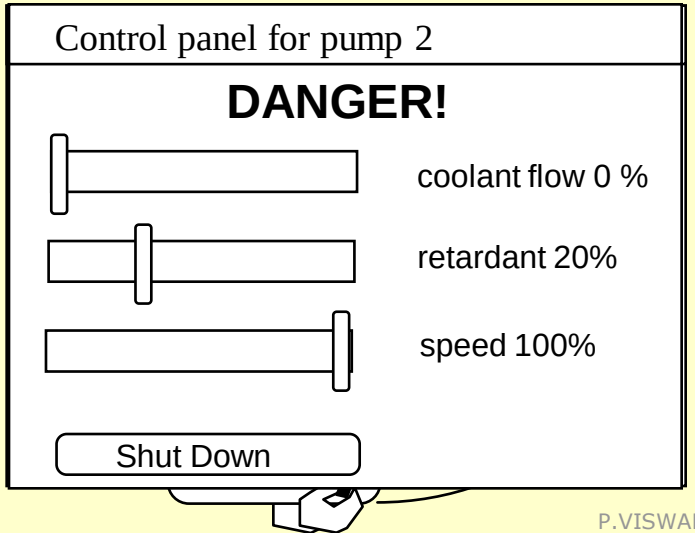
Scripted simulations

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



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What you selected

Item	Style	Cost

tax:

Total: $ 0.00

All done?

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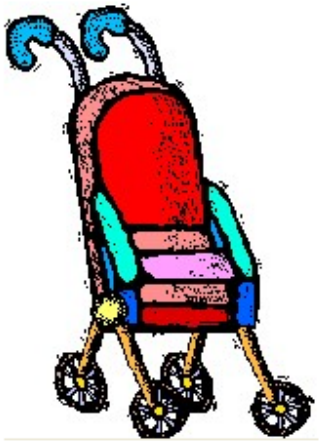
Touch a different color, or scan another item.

What you selected



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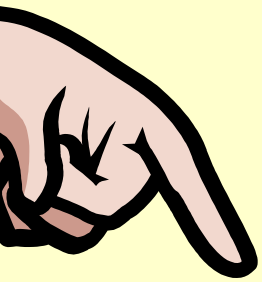
Item	Style	Cost	
JPG Stroller	Green	98.00	Delete

tax: 6.98

Total: $104.98



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What to do

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or scan another item

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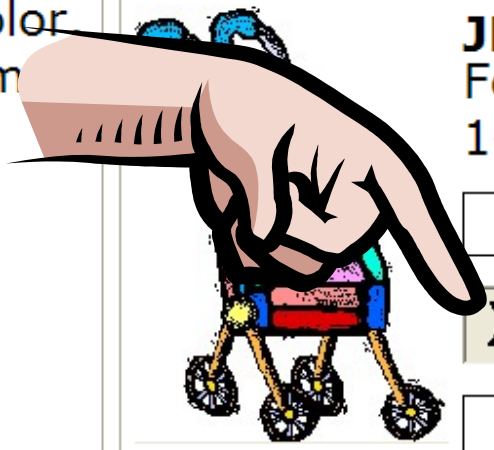

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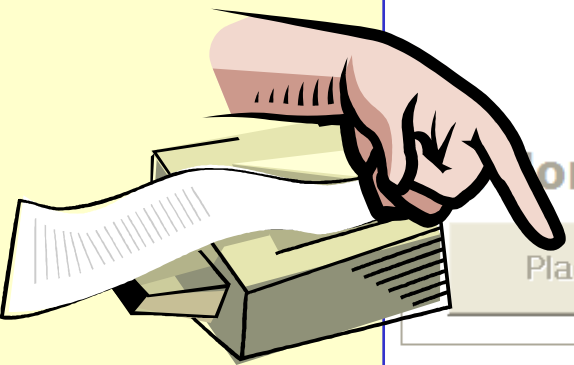


one?

Place your order | Print this list | Throw this list away

Interface builders

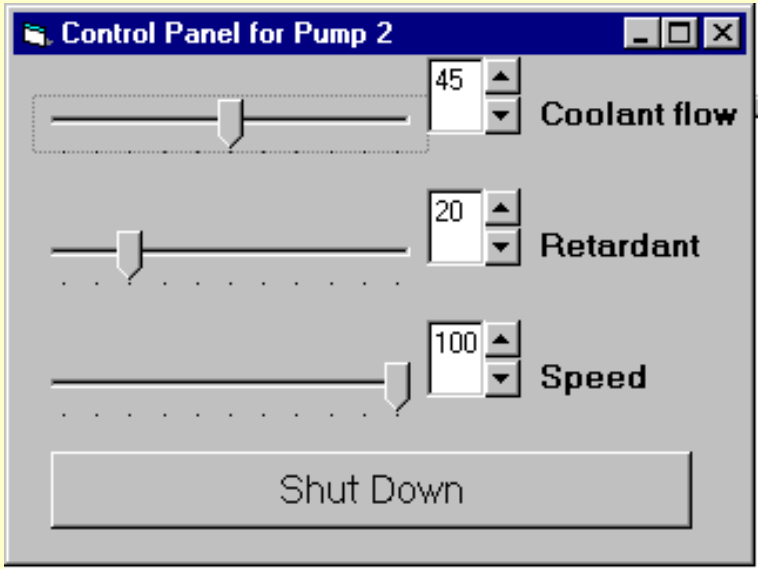
Design tools for laying out common widgets

excellent for showing look and feel

- a broader horizontal prototype
- but constrained to widget library

vertical functionality added selectively

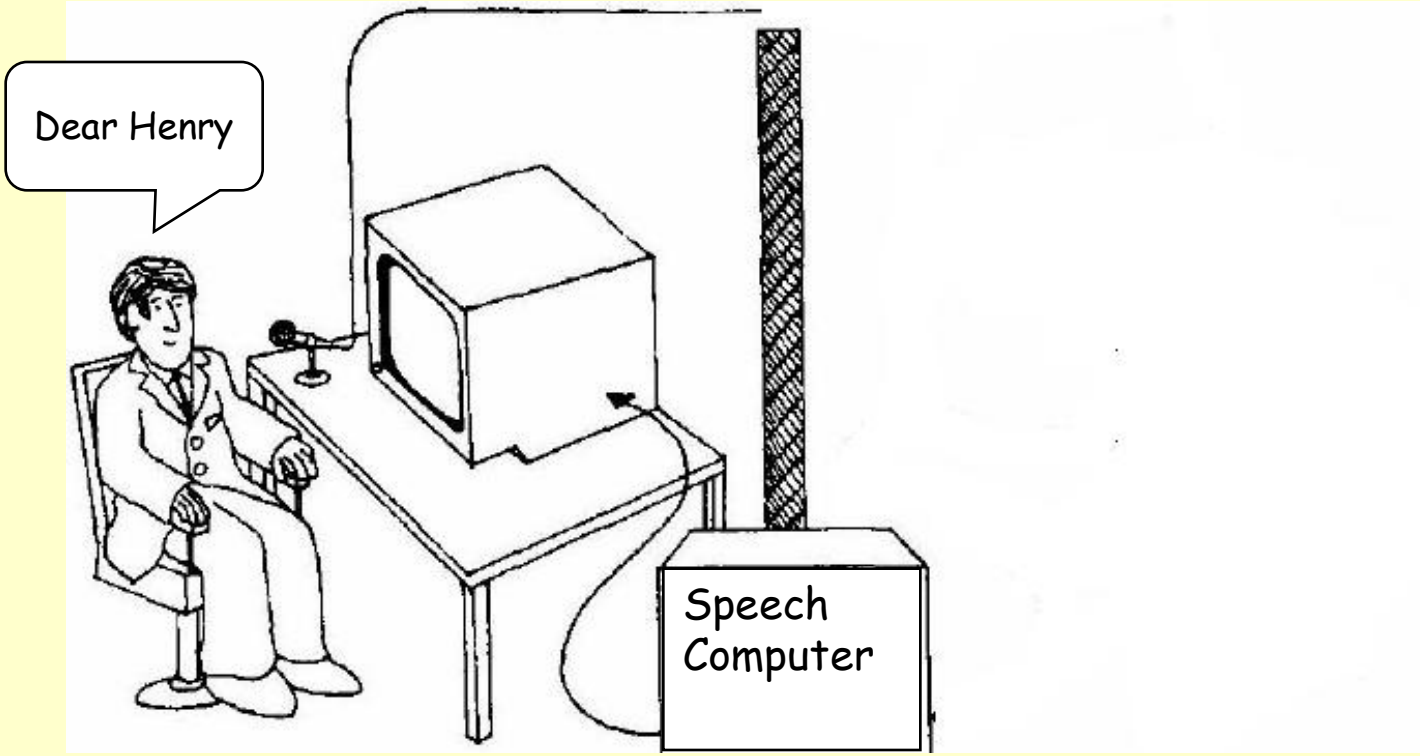
- through programming



Wizard of Oz

A method of testing a system that does not exist

- the listening typewriter, IBM 1984



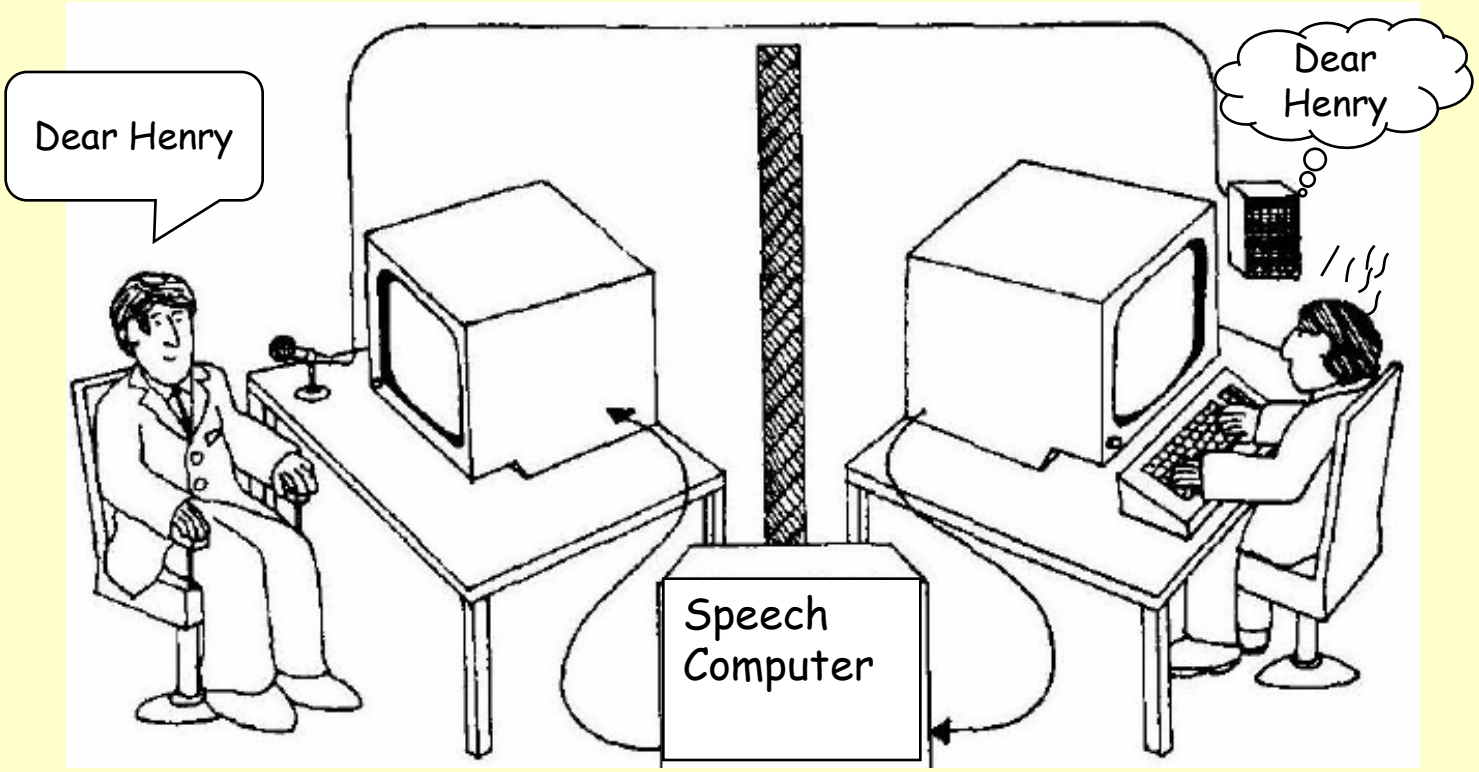
What the user sees

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

Wizard of Oz

A method of testing a system that does not exist

- the listening typewriter, IBM 1984



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

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

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