

User Centered Design And Prototyping

Why User Centered Design is important

Approaches to User Centered Design

Rapid prototype techniques

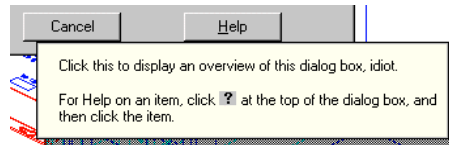
James Tam

The Design Of Well Crafted Tools



James Tam

The All Too Common Approach In The Design Of Software



AutoCAD Mechanical

James Tam

System Centered Design

- What can be built easily on this platform?



- What can I create from the available tools?



- What do I as a programmer find interesting to work on?



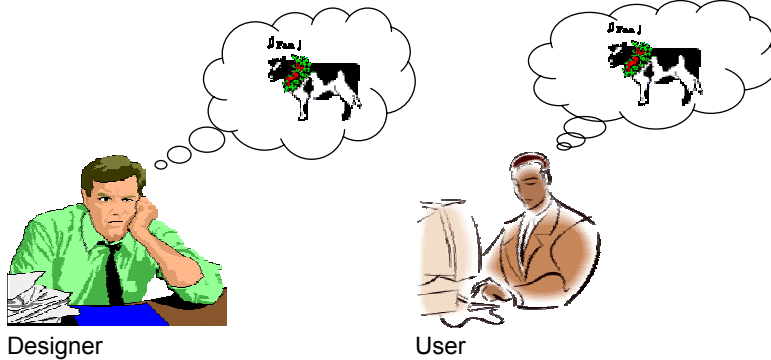
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User Centered System Design

Design is based upon a user's:

- abilities and real needs,
- context,
- work,
- tasks,

...know the person you are designing for.



James Tam

User Centered System Design

Three assumptions¹

- A good design will satisfy the needs of the user group
- Collaborative
- Constant communication

¹ From Denning and Dargan, p111 in Winograd, Ed., *Bringing Design to Software*, Addison Wesley

James Tam

Participatory Design

Problem

- Intuitions wrong
- Traditional methods (e.g., interviews) suffers from a number of weaknesses
- Designer cannot know the user sufficiently well to answer all issues that come up during the design



The user
is just
like me

Solution

- Designers should have access to a pool of representative users
 - ACTUAL end users, not their managers or union reps!

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Participatory Design

Make the user a member of your design team

- Users become actual participating members in the design process
- Users considered subject matter experts
- Design becomes an iterative process



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Participatory Design (Up Side)

- Users are excellent at reacting to actual designs (prototypes).
- Users can bring in important “folk knowledge” of their work context.
- Often results in greater acceptance of the final system



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Participatory Design (Down side)

- Hard to get a good pool of end users.
- Users are not expert designers.
- The user is not always right.



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Methods For Involving The User (2)

3) Create prototypes

- It's hard to comment on something that doesn't yet exist



- Users are good at giving feedback for something that is even partially built



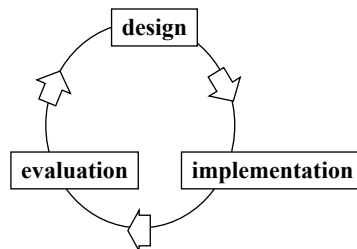
Beavis and Butthead is the intellectual property of Paramount Pictures and the MTV Television Network

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Methods For Involving The User (3)

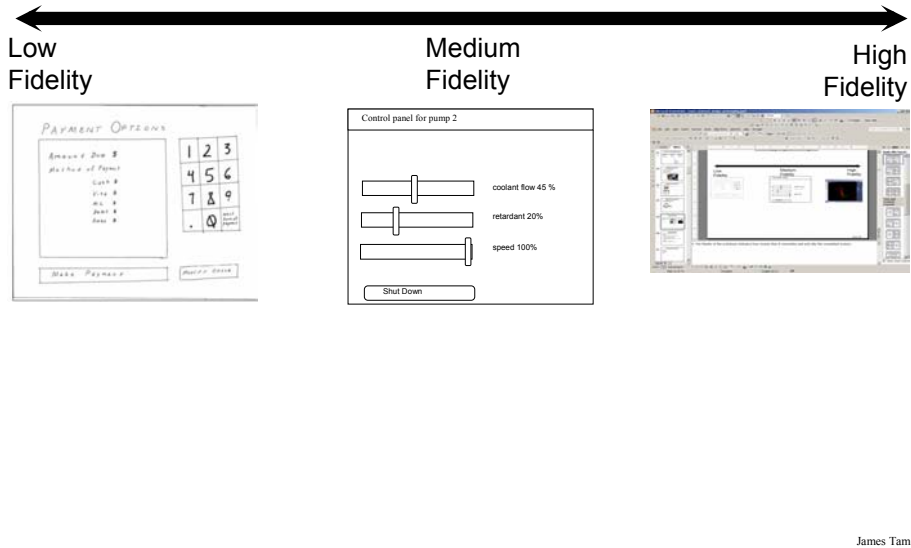
3) Create prototypes (continued)

- Get input at all design stages
All designs subject to revision



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Prototyping Techniques



Low Fidelity Prototypes

Hand drawn mockups of some design ideas

Focus on:

- Brainstorming as many ideas as possible (discount usability)
- Making it clear enough to be understandable

But don't focus on making it "pretty"

- They are not computer generated images (*don't* use drawing programs to generate them)

May be used to elicit feedback from the user

Types Of Low Fidelity Prototypes

•Consist of hand drawn prototypes:

- Sketches
- Storyboards
- Pictive

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Low Fidelity Prototypes

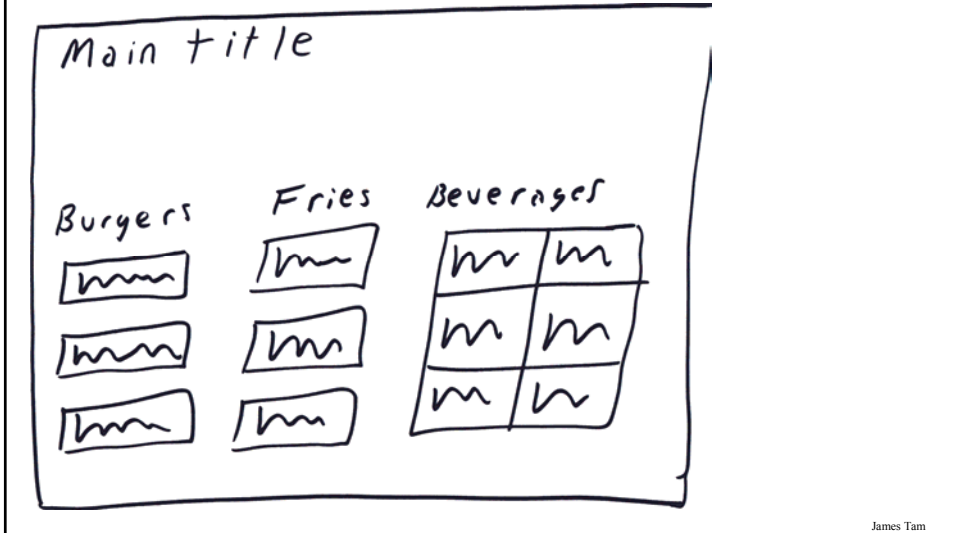
Sketches:

- A drawing of the high-level appearance of the intended system
- The crudity of the prototype means people concentrate on high level concepts
- It may be hard to envision the progression of a dialog

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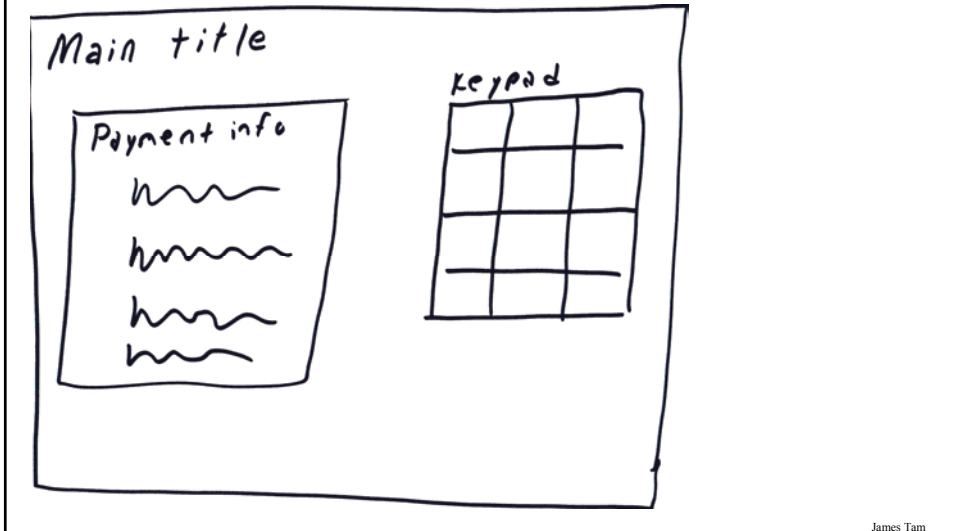
Sketches

Screen 1: Initial order screen



Sketches (2)

Screen 2: Payment screen



Low Fidelity Prototypes

Storyboarding

- It's 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



- For interfaces it allows users to quickly evaluate the direction of the design

James Tam

Storyboarding

THE HAPPY DUDE MENU
(PUSH BUTTON TO PLACE ORDER)

BURGERS		FRIES	BEVERAGES		
			LITTLE GIGGLE STEED	MEDIUM COUGH STEED	GREAT GUFFAW STEED
BASIC MERRY BURGER <small>No. ORDERED \$1.50 EACH</small>	SMIRKING SMALL FRIES <small>No. ORDERED \$0.75 EACH</small>	POP	PUSH TO ORDER <small>No. ORDERED \$0.50 EACH</small>	PUSH TO ORDER <small>No. ORDERED \$1.00 EACH</small>	PUSH TO ORDER <small>No. ORDERED \$1.75 EACH</small>
THE JOLLY BURGER <small>No. ORDERED \$2.25 EACH</small>	MEDIUM GEMMER FRIES <small>No. ORDERED \$1.00 EACH</small>	JUICE	PUSH TO ORDER <small>No. ORDERED \$1.00 EACH</small>	PUSH TO ORDER <small>No. ORDERED \$1.50 EACH</small>	PUSH TO ORDER <small>No. ORDERED \$1.75 EACH</small>
CLASSIC HAPPY BURGER <small>No. ORDERED \$2.75 EACH</small>	LARGE SMIRKY FRIES <small>No. ORDERED \$1.50 EACH</small>	COFFEE	PUSH TO ORDER <small>No. ORDERED \$0.75 EACH</small>	PUSH TO ORDER <small>No. ORDERED \$1.00 EACH</small>	PUSH TO ORDER <small>No. ORDERED \$1.25 EACH</small>
THE ECSTASY BURGER <small>No. ORDERED \$3.50 EACH</small>	SUPER LARGE SMIRKY FRIES <small>No. ORDERED \$1.75 EACH</small>	TEA	PUSH TO ORDER <small>No. ORDERED \$0.75 EACH</small>	PUSH TO ORDER <small>No. ORDERED \$1.00 EACH</small>	PUSH TO ORDER <small>No. ORDERED \$1.25 EACH</small>

Initial order screen

James Tam

Storyboarding (2)

THE HAPPY DUDE MENU
(PUSH BUTTON TO PLACE ORDER)

BURGERS		FRIES	BEVERAGES		
			LEFTY SINGLE STEAK	MEDIUM CHICKEN STEAK	GRAND GOFFAW/STEAK
BASIC MERRY BURGER No. ORDERED \$1.50 EACH	SMIRKING SMALL FRIES No. ORDERED \$0.75 EACH	POP	PUSH TO ORDER No. ORDERED \$0.50 EACH	PUSH TO ORDER No. ORDERED \$1.00 EACH	PUSH TO ORDER No. ORDERED \$1.75 EACH
THE JOLLY BURGER No. ORDERED \$2.25 EACH	MEDIUM GETAWAY FRIES No. ORDERED \$1.00 EACH	JUICE	PUSH TO ORDER No. ORDERED \$1.00 EACH	PUSH TO ORDER No. ORDERED \$1.50 EACH	PUSH TO ORDER No. ORDERED \$1.75 EACH
CLASSIC HAPPY BURGER No. ORDERED \$2.75 EACH	LARGE SMILEY FRIES No. ORDERED \$1.50 EACH	COFFEE	PUSH TO ORDER No. ORDERED \$0.75 EACH	PUSH TO ORDER No. ORDERED \$2.00 EACH	PUSH TO ORDER No. ORDERED \$1.25 EACH
THE ECSTATIC BURGER No. ORDERED \$3.50 EACH	SUPER LARGE SMILEY FRIES No. ORDERED \$1.75 EACH	TEA	PUSH TO ORDER No. ORDERED \$0.75 EACH	PUSH TO ORDER No. ORDERED \$2.00 EACH	PUSH TO ORDER No. ORDERED \$1.25 EACH

Person orders an "Ecstatic Burger"

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Storyboarding (3)

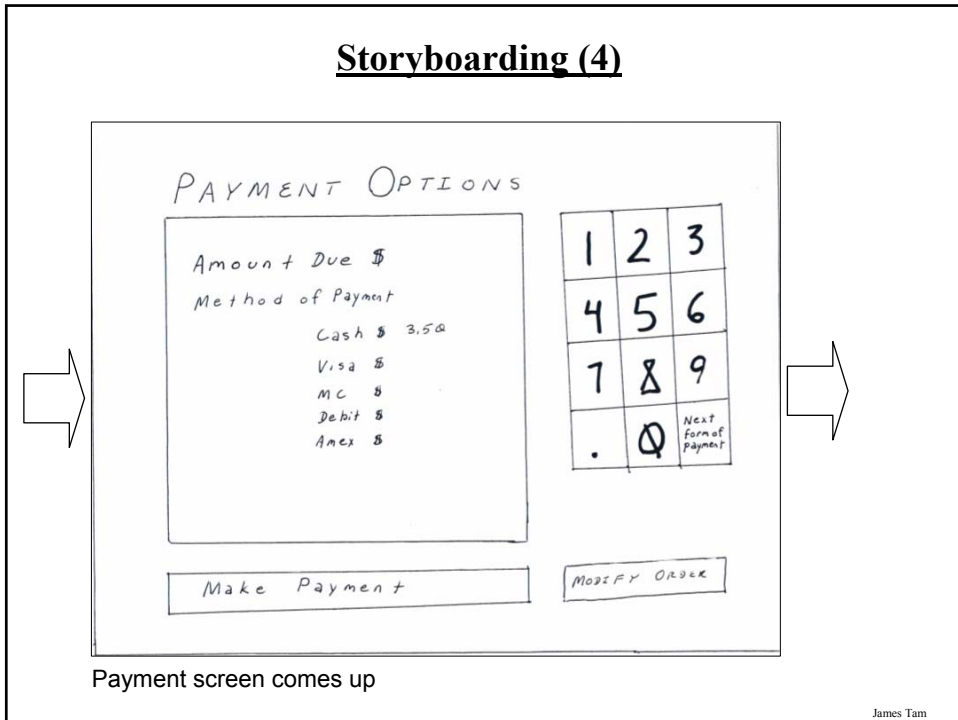
THE HAPPY DUDE MENU
(PUSH BUTTON TO PLACE ORDER)

BURGERS		FRIES	BEVERAGES		
			LEFTY SINGLE STEAK	MEDIUM CHICKEN STEAK	GRAND GOFFAW/STEAK
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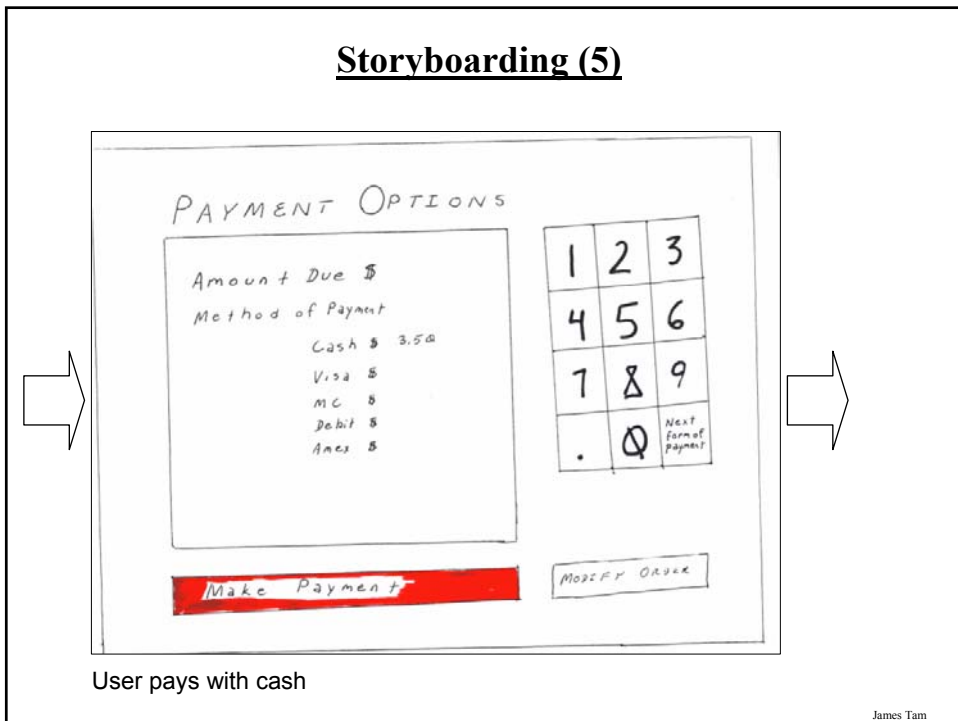
Order is placed

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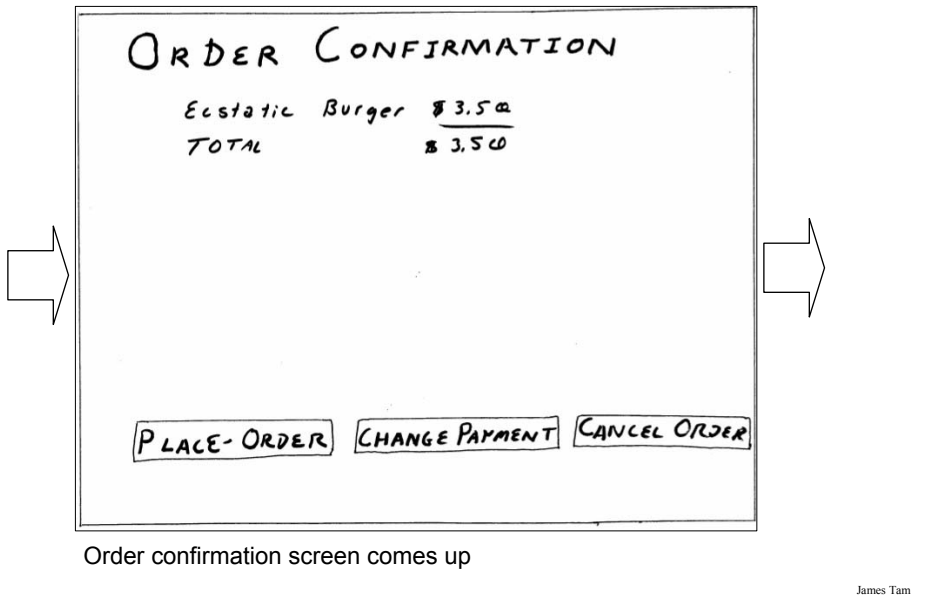
Storyboarding (4)



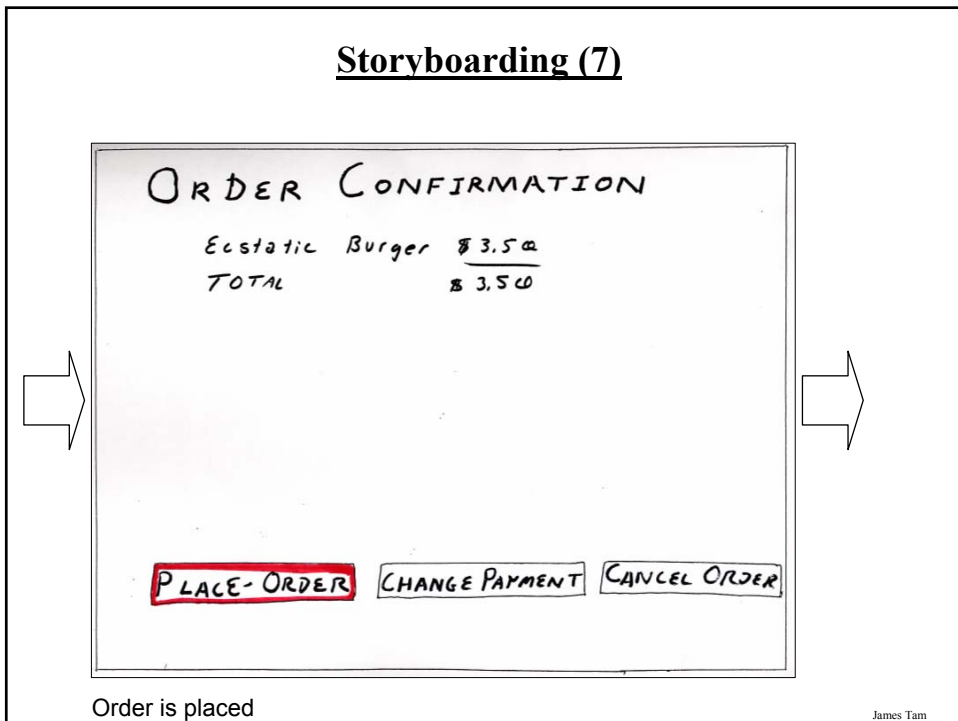
Storyboarding (5)



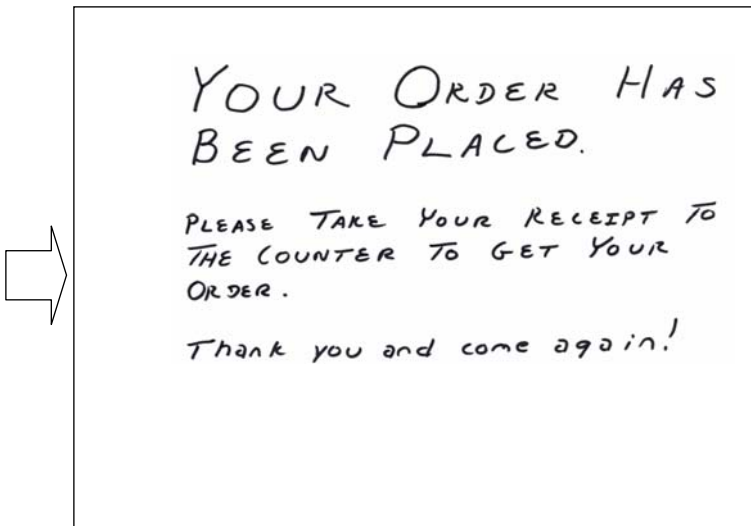
Storyboarding (6)



Storyboarding (7)



Storyboarding (8)



Order confirmation is shown

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Storyboarding (9)

- **Showing key points in the interaction makes it easy to figure out how the system works.**
- **Showing an alternative interaction requires a whole new series of panels to be made.**

James Tam

Low Fidelity Prototypes

Pictive

- “Plastic interface for collaborative technology initiatives through video exploration”
- Key points:
 - Design consists of multiple layers of sticky notes and transparent plastic overlays
 - Interaction is demonstrated by manipulating the notes or transparencies
- Session is videotaped for later analysis
 - Usually end up with mess of paper and plastic!
 - “How does it work again?”



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Pictive

PAYMENT OPTIONS

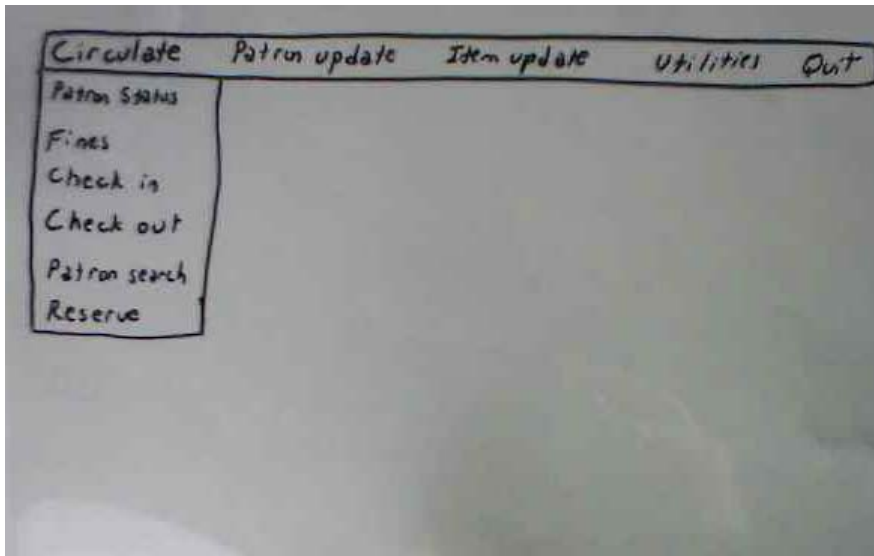
Amount Due \$	3.50
Method of Payment	3.50
Cash \$	
Visa \$	
MC \$	
Debit \$	
Amex \$	

1	2	3
4	5	6
7	8	9
.	0	Next form of payment

Make Payment Modify Order

James Tam

Pictive



James Tam

Medium Fidelity Prototypes

Many different types

- Range from simple computer drawn images to partially working systems

They may take longer to generate and change than simple low fidelity representations

Benefits

- It seems more like the completed system so it provides a clearer idea of how it works
- May be used to elicit feedback from the user when low-fidelity approaches cannot be used
- Depending upon the type of medium fidelity prototype it may allow for some user testing.

Pitfalls

- User's reactions are usually "in the small"
 - Blinds people to major representational flaws because of a tendency to focus on more minor details
- Users reluctant to challenge/change the design itself
 - Designs are too "pretty", egos...
- Management may think its real!

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Medium 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 of the different parts of the system
(a list of features)
- If highly visual, then a storyboard is set within textual explanations
- Does this work?
 - People often read manuals of competing products to check:
interface,
functionality,
and match to task.
 - Acts as a design tool



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Tutorials



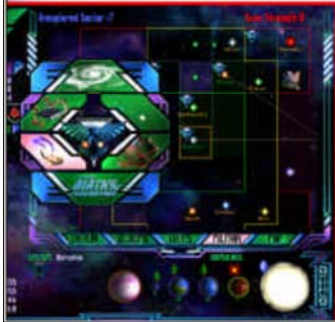
Star Trek: The Birth of the Federation is the property of Atari: <http://www.atari.com/>

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Tutorials

DIPLOMACY

The Pakleds have offered you a Friendship treaty. To read and respond to their proposal, right-click to call up the Marker window. Click the bottom left button to bring up the Diplomacy screen.



Since you just received this proposal, you are automatically in Event mode. This mode is used to view diplomatic messages you have received. The buttons at the left side of the screen are used to change modes: Active lists active treaties involving your empire, Propose is used to propose new treaties, and Race Info is used to view reference material on races you have encountered. For now, stay in Event mode.

The proposed Friendship treaty is of indefinite length and will allow you to establish trade with the Pakleds.



Star Trek: The Birth of the Federation is the property of Atari: <http://www.atari.com/>

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Tutorials

There are three things you can do with this proposal:

1. You can accept it by clicking the Accept button.
2. You can reject it by clicking the Reject button.
3. You can ignore it by leaving this screen.

Your decision will be final when you end this turn. Click the Accept button and then right-click to call up the Marker window. Click the top button to return to the Main Galactic screen. Click the Turn button to send your diplomatic response to the Pakleds.

THE SUMMARY WINDOW

Since you accepted the Pakled proposal and clicked the Turn button, the Summary window will appear which tells you what happened during your turn. This window will appear whenever anything happens to a race you have encountered. Click the Summary button in the top left corner of the screen to bring up the Summary window at any time.

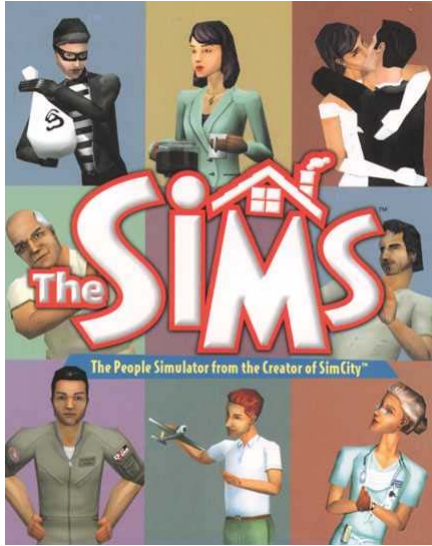
The Summary window has three modes: Events (provides up-to-date information on events), Relationships (shows current treaties) and Systems (shows vital statistics of systems you control). When you're finished, click the Close button to close the Summary window.



Star Trek: The Birth of the Federation is the property of Atari: <http://www.atari.com/>

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Manuals



"The Sims" is the property of Maxis: <http://thesims.ea.com/>

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Manuals

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"The Sims" is the property of Maxis: <http://thesims.ea.com/>

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Manuals

MOVING IN

Getting other folks to move in might seem like an invitation to more lost socks in the laundry, but it really can enhance your household and move your game forward. The Moving In proposition is very similar to the marriage proposal, except that the preconditions are less restrictive, and it's available only for same-sex friends. Opposite-sex friends never have Move In available as a pie menu choice. Characters who move in to another household lose their last name and take on the names of the new household.

Here are the basics for mixing the Neighborhood nuts—we mean Sims—together. First of all, and pretty obviously, a neighbor has to be in a Sim's house for it all to happen. Both Sims must be the same sex, and they've both got to be in pretty good moods. Once that's cooking, the household Sim finds "Move In" is a pie menu choice when the visiting Sim is clicked on. So if you've got a situation where a couple of opposite-sex Sims are living together and you're looking for a neighbor to move in, you need to have the Sim that's the same sex as the neighbor be the one that extends the invitation.

The plot thickens: If the two Sims' relationship is good enough, the visitor accepts. Bingo instant housemate! If the conditions aren't ripe, the visitor declines, and so do both parties' Relationship points. The person moving in doesn't require a specific amount of household Simoleons, so watch out for moochers.

If the Sim refuses the invitation, they tell you why: "Your place isn't big enough," or "We don't know each other well enough," or "I'm in a bad mood today."



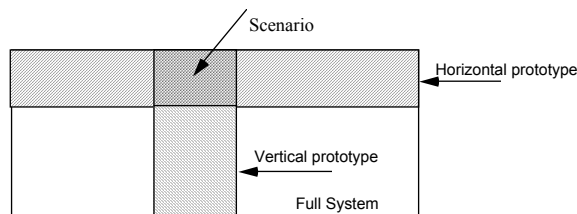
"The Sims" is the property of Maxis: <http://thesims.ea.com/>

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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



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Medium Fidelity Prototypes

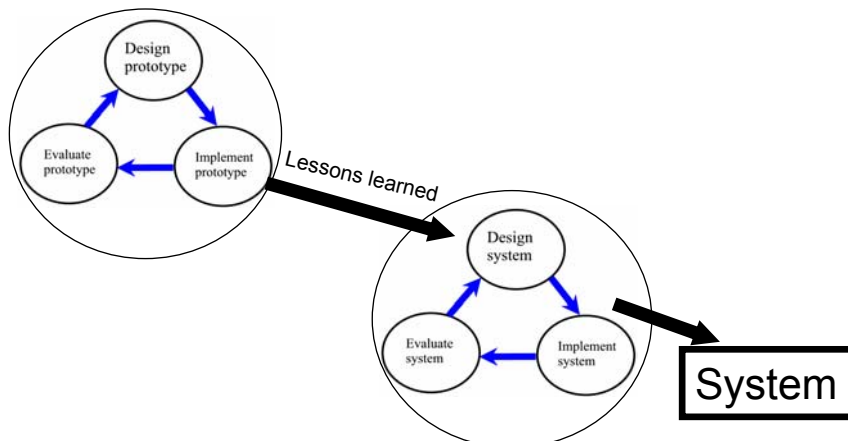
Approaches to integrating prototypes and the final product:

- Throw-away
- Incremental
- Evolutionary

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Throw-Away Approach To Prototyping

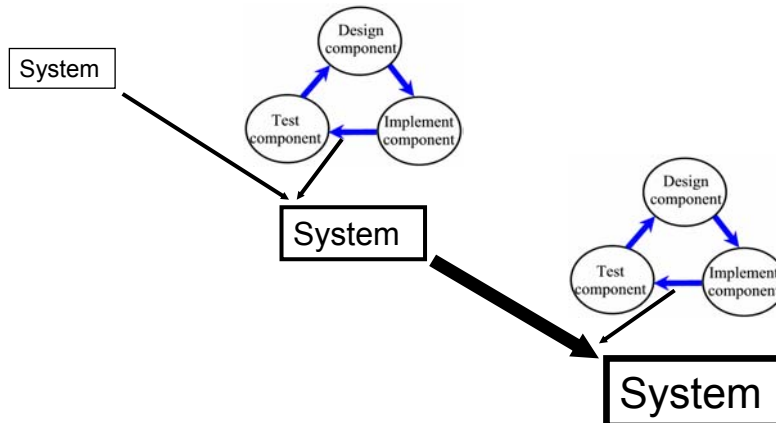
- The prototype only is used to get feedback
- The prototype is built, tested and then discarded



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Incremental Approach To Prototyping

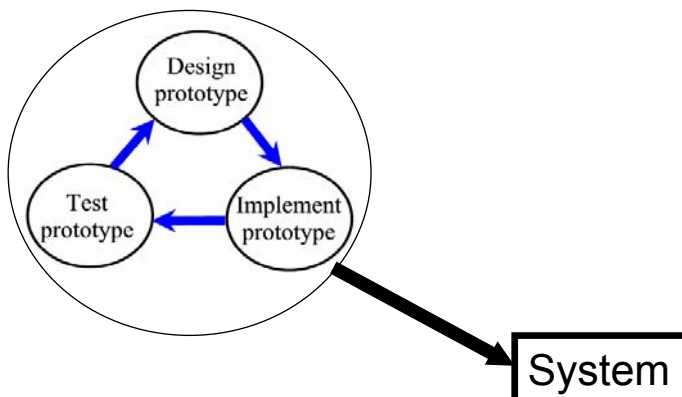
- **Build the system as separate modules (component)**
- **Each module is designed, prototyped and completed separately before being added to the final system**



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Evolutionary Approach To Prototyping

- **Change the entire prototype itself in order to incorporate changes**
- **Eventually the reworked prototype becomes the final system**

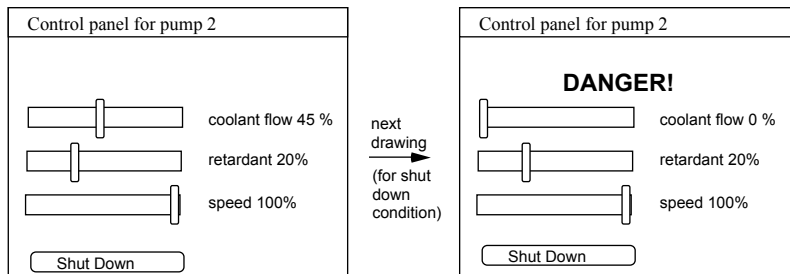


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Medium Fidelity Prototypes

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”
- NOT the approach to take for the first assignment

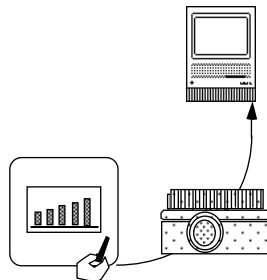


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Medium Fidelity Prototypes

Scripted simulations and slide shows

- Encode the storyboard on the computer
 - Created with media tools
 - Scene transition activated by simple user inputs
 - A simple medium fidelity prototype
- User given a very tight script/task to follow
 - Appears to behave as a real system
 - Deviations from the script blows the simulation



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Scripted Simulations


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

tax: 6.98

Total: \$104.98

All done?



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)



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Scripted Simulations


<u>Item</u>	<u>Style</u>	<u>Cost</u>
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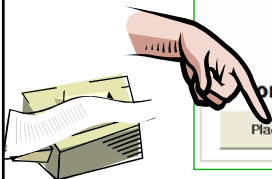

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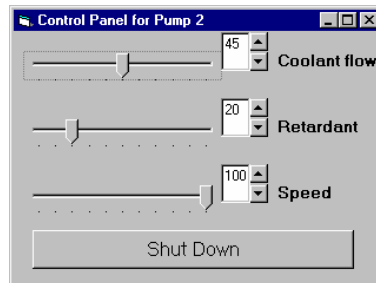


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Medium Fidelity Prototypes

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



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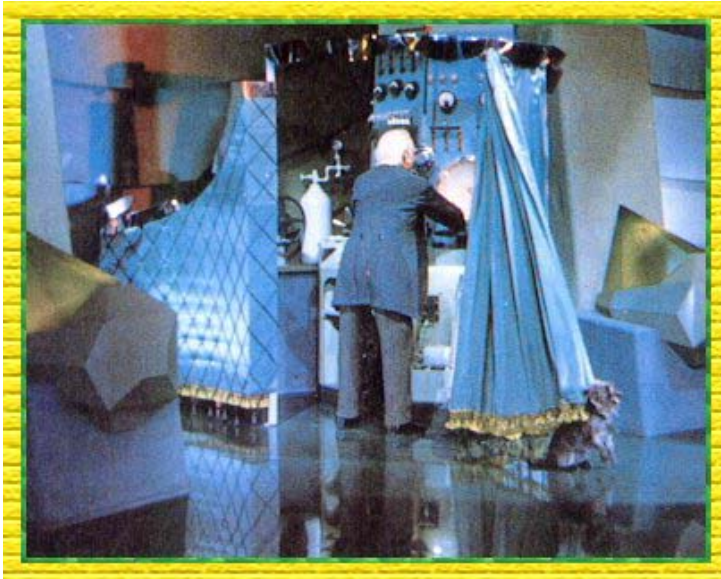
The Wizard Of OZ: The Movie



The movie "The Wizard of Oz" is the property of Time-Warner: www.warnervideo.com

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The Wizard Of Oz: The Movie



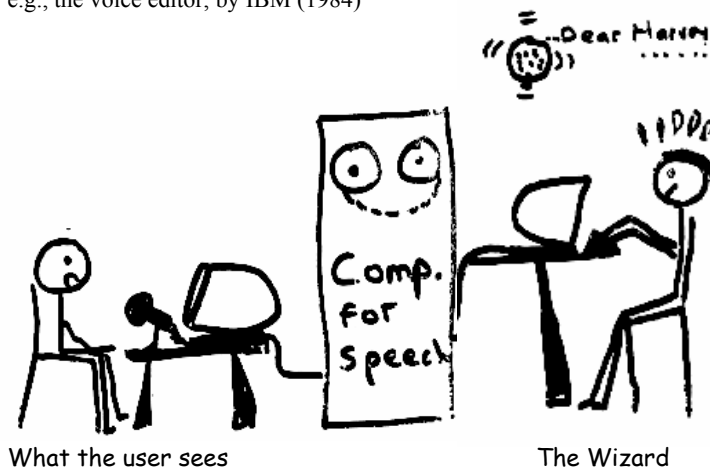
The movie "The Wizard of Oz" is the property of Time-Warner: www.warnervideo.com

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Wizard Of Oz: The Prototyping Technique

A method of testing a system that does not exist

- Human simulates the system's intelligence and interacts with user
 - e.g., the voice editor, by IBM (1984)



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Wizard Of Oz: Examples

IBM: an imperfect listening typewriter using continuous speech recognition

- Secretary trained to:
 - Understand key words as “commands”
 - Types 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!

James Tam

The Prototyping Process

Early designs

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

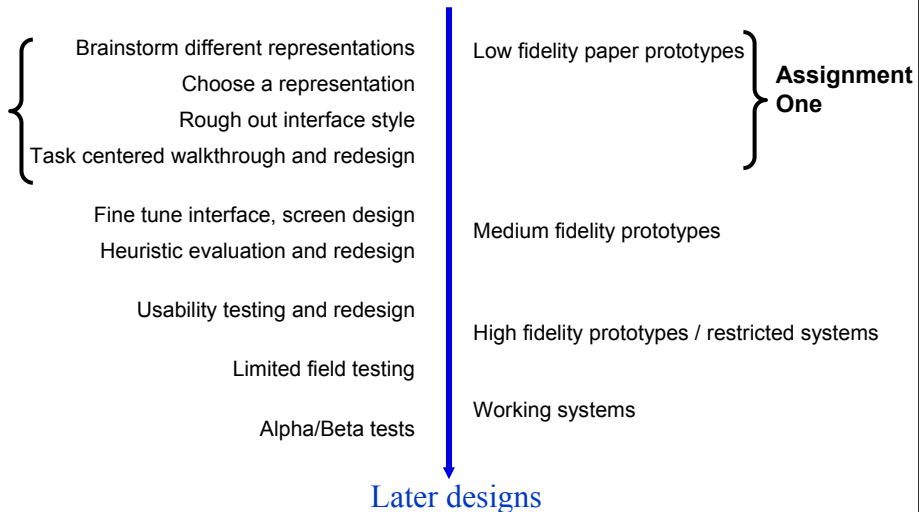
Working systems

Later designs

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The Prototyping Process

Early designs



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What You Now Know

User centered design

- The design is based upon a user's real needs, tasks, and work context

Participatory design

- Make the **end-user** a member of the design team

Prototyping

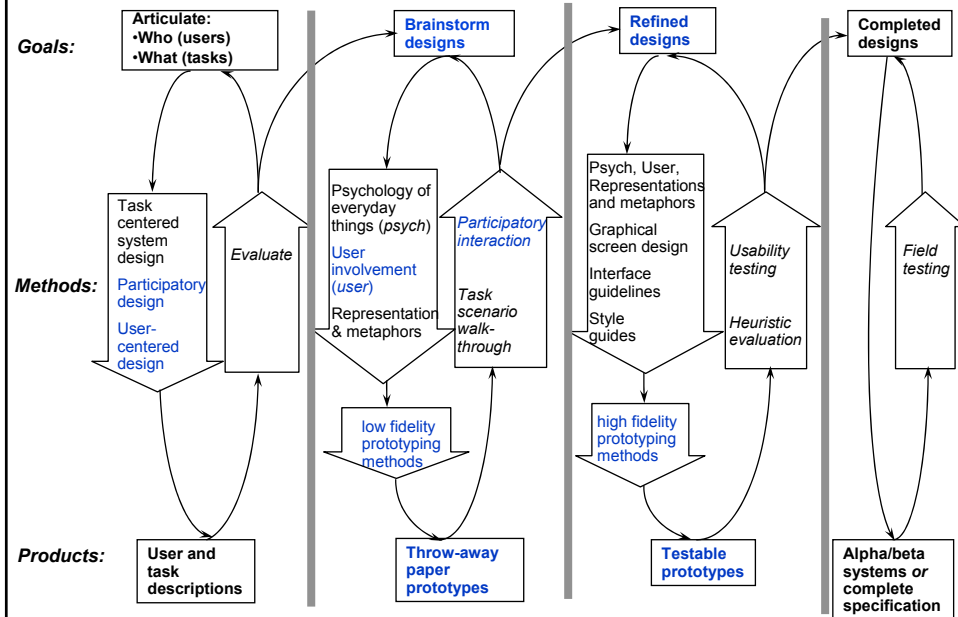
- Allows users to react to the design and suggest changes
- Low-fidelity prototypes best for brainstorming and choosing representations
- Medium-fidelity prototypes best for fine-tuning the design

Prototyping methods

- Storyboarding
- Pictive
- Vertical, horizontal and scenario prototyping
- Scripted simulations
- Wizard of Oz

James Tam

Interface Design And Usability Engineering



This diagram is a variation of the one presented by Saul Greenberg

James Tam