CSE 440: Introduction to HCI

User Interface Design, Prototyping, and Evaluation

Lecture 01:
Introduction and
Personal Informatics

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

University of Washington Computer Science & Engineering

DESIGN
USE
BUILD

Tuesday / Thursday
10:30 to 11:50

What Is This Course?

Time for a Door Quiz:

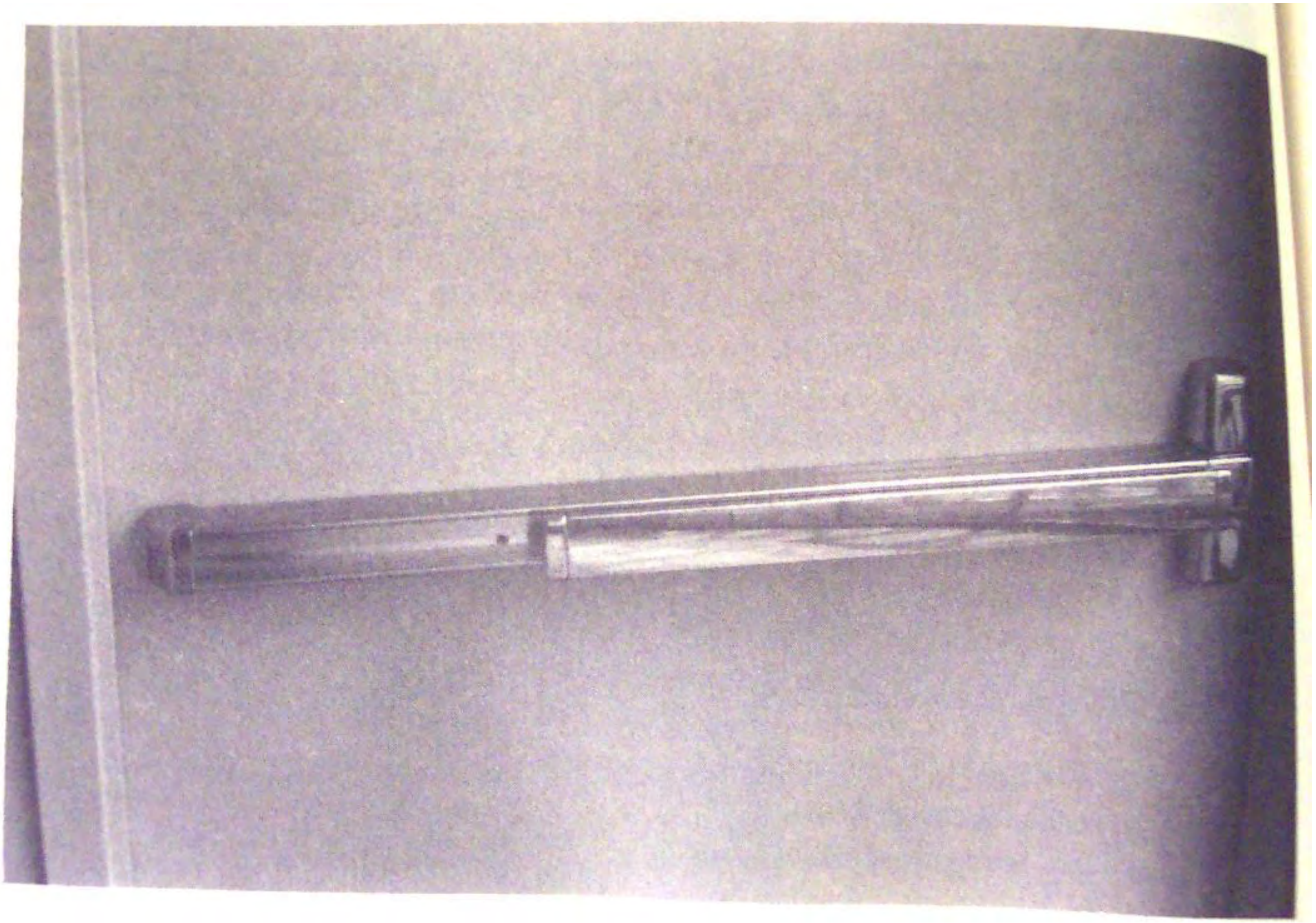
Say out loud what action you use to open the door

Push

Pull

Door Quiz

Door Quiz



Door Quiz

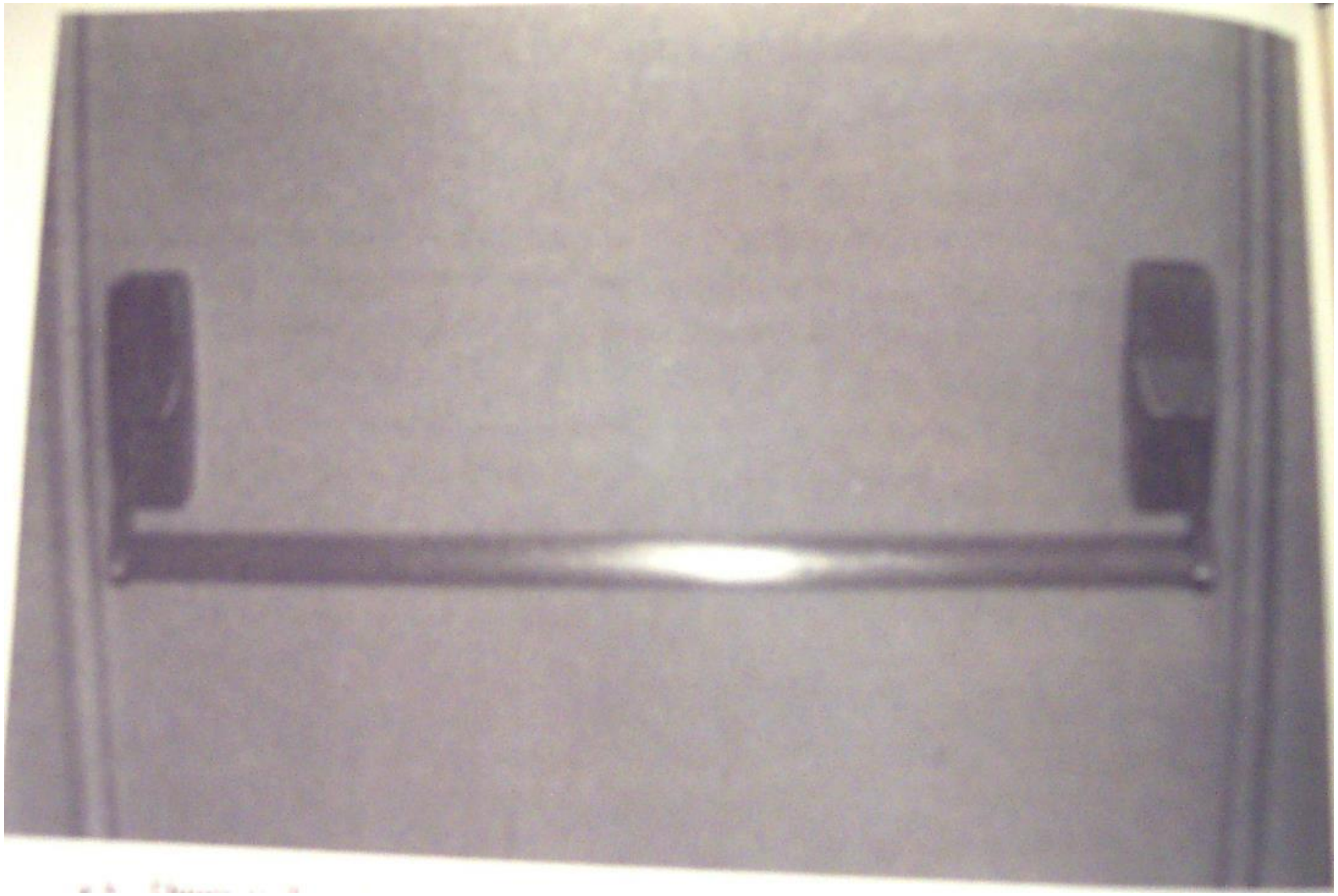
Door Quiz

Door Quiz

Door Quiz


PUSH
You can HAVE IT YOUR WAY® and pull it if you want, but this hinge is pretty stubborn.
AMERICAN EXPRESS
Pull
BURGER KING

Door Quiz



Door Quiz

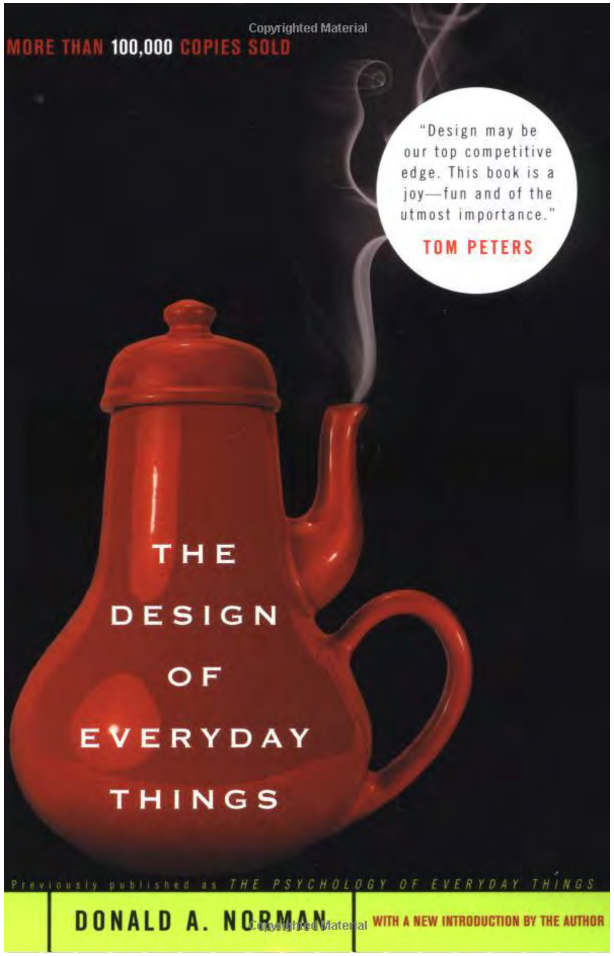
What is so Special about Computers?

Nothing! It is about good designs and bad designs

We make push/pull decisions many times per day

We all encounter doors that do this badly

We all see signs that do not change what we do



Signs Do Not Help

Signs Do Not Help

What is so Special about Computers?

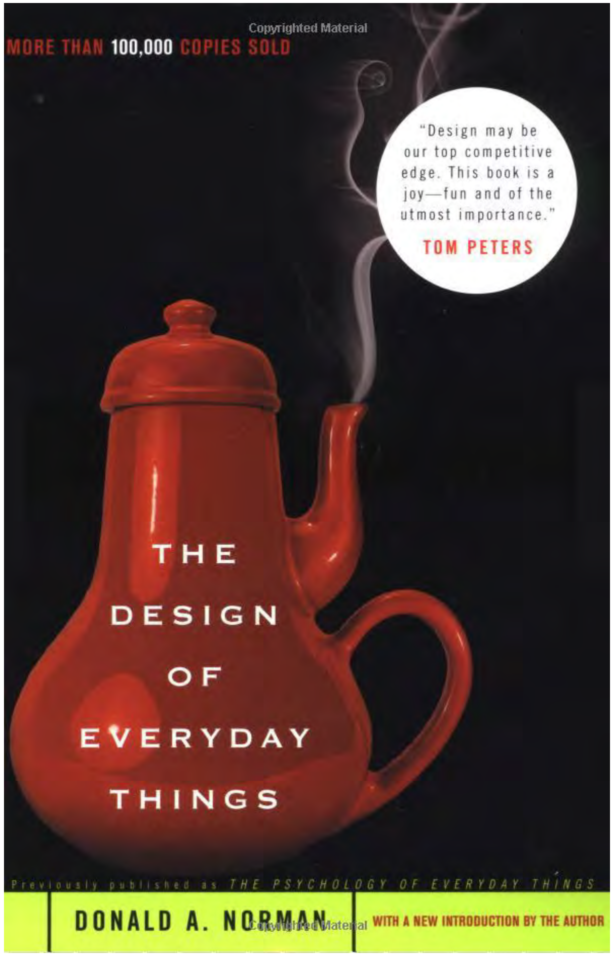
Yet we blame ourselves

Absolutely everything we encounter in the made world was designed

Too often poorly designed

Read this book

Be warned you cannot unread it, you become angry



Iterative Human-Centered Design

This is a course about process

This is not a course about ‘good’ interfaces or rules that you should follow in design

Rapid iteration and exploration is the most important and effective tool for effective design

> “Enlightened trial and error succeeds over the planning of the lone genius” – Peter Skillman, IDEO

Project Overview

The core of this course is a group project

Propose and do an intense end-to-end design

- Getting the Right Design
- Getting the Design Right
- Communicating the Design

Not an implementation course

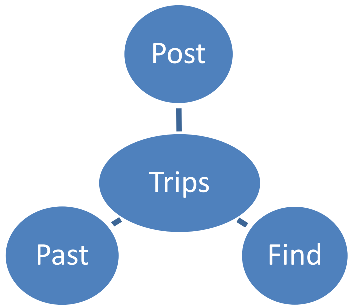
Design Research & Task Analysis

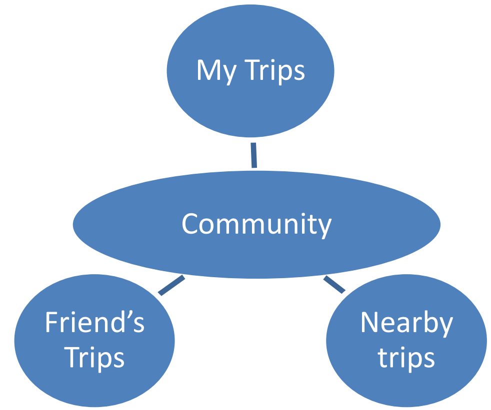
Observe practices and understand needs

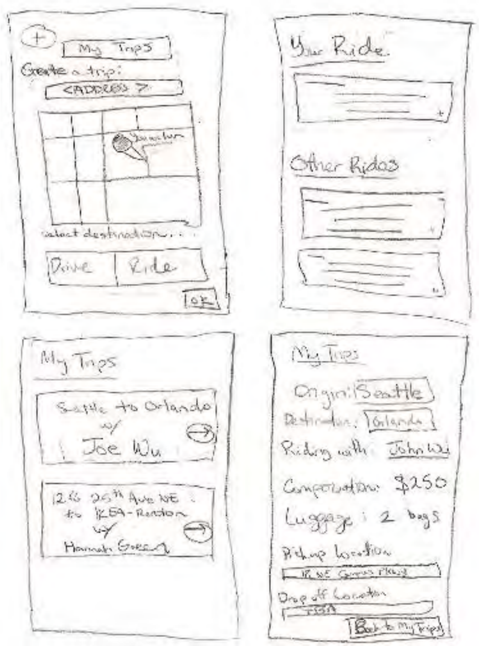
Consumester

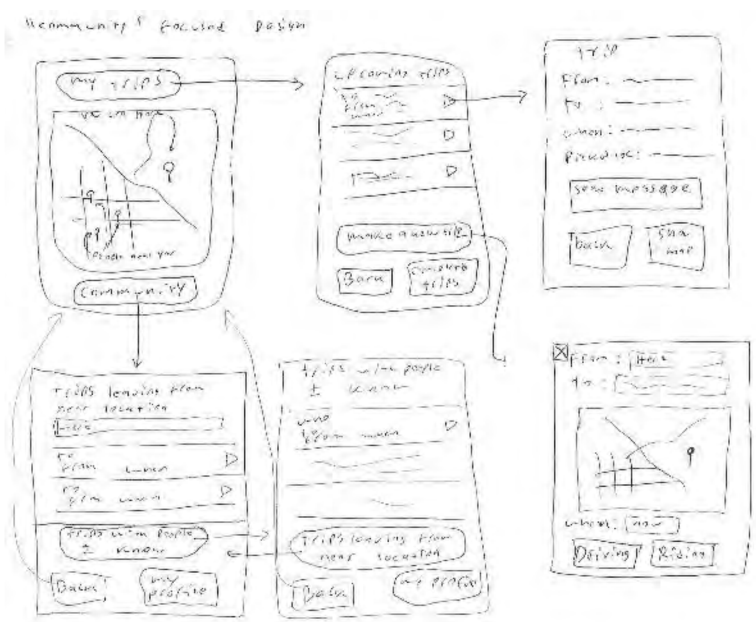
FoodWatch

Sketching & Storyboarding



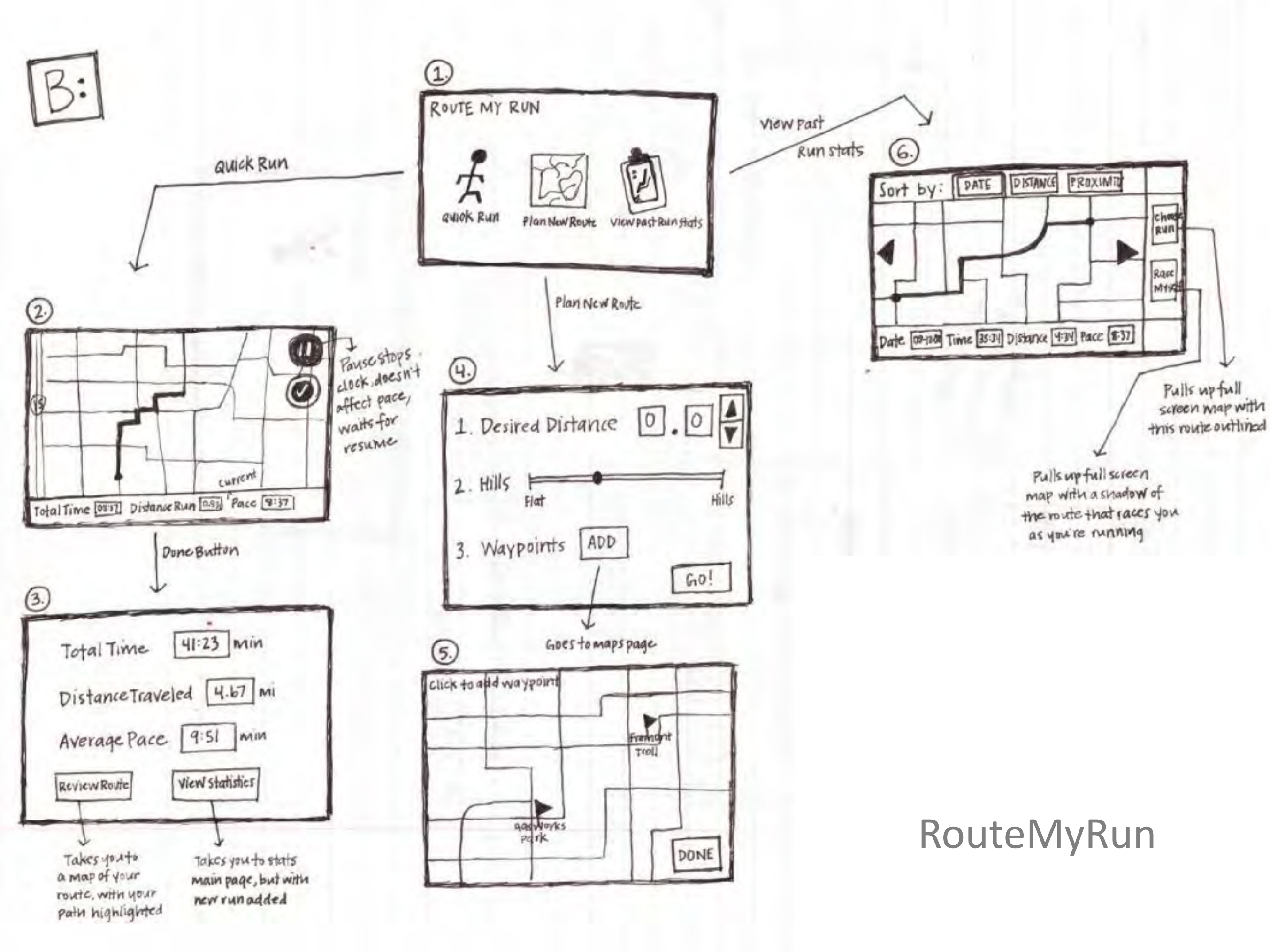






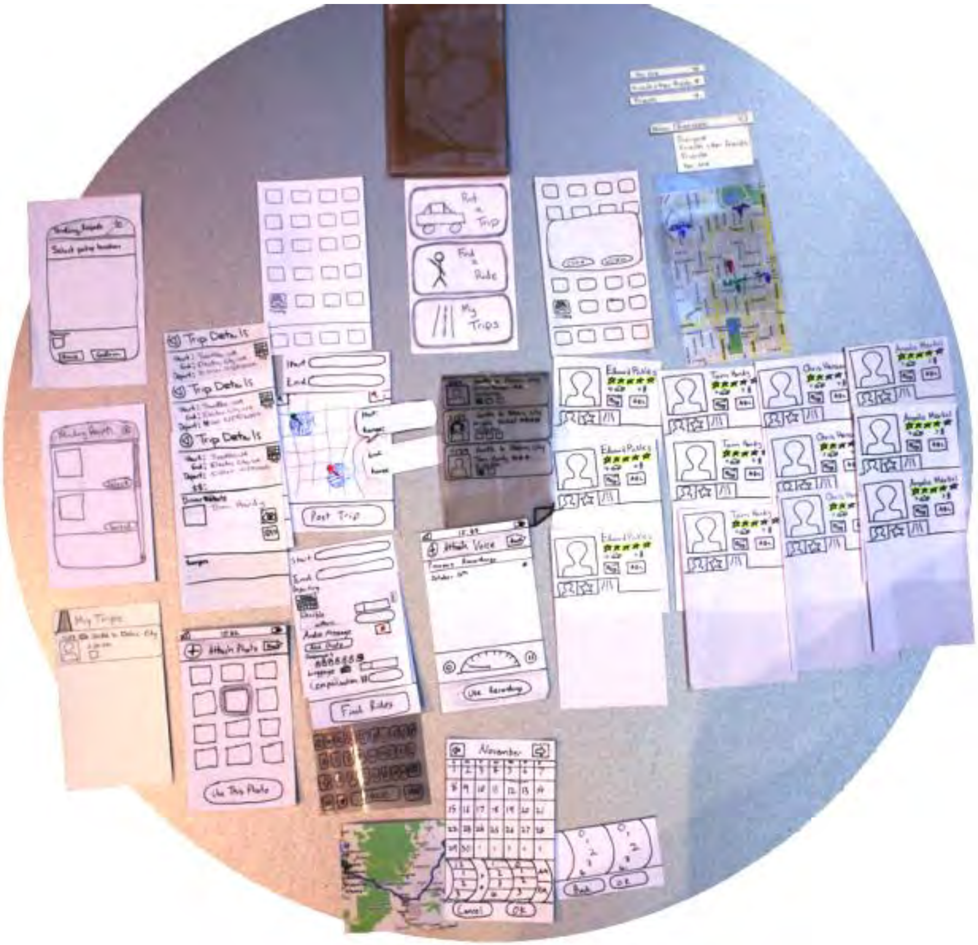
RideAlong

Sketching & Storyboarding



RouteMyRun

Low-Fidelity Prototyping & Testing



RideAlong

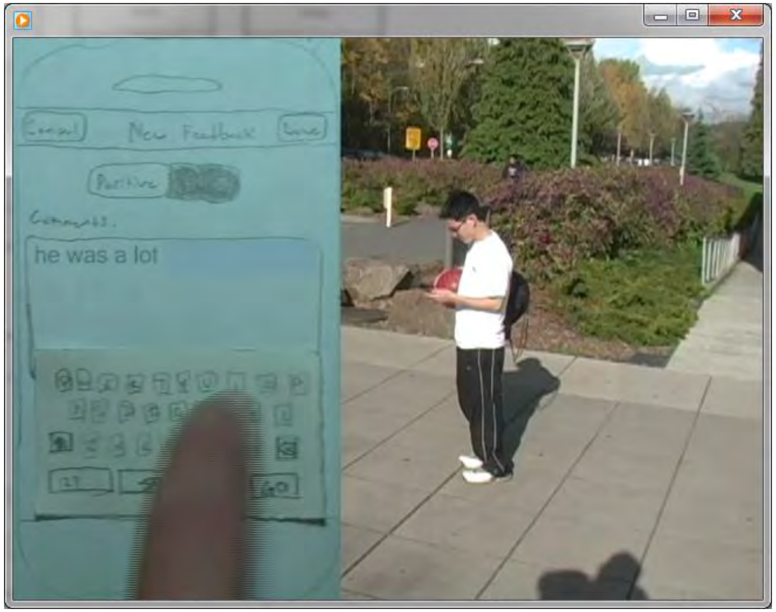
Digital Mockup

Balance

.calm

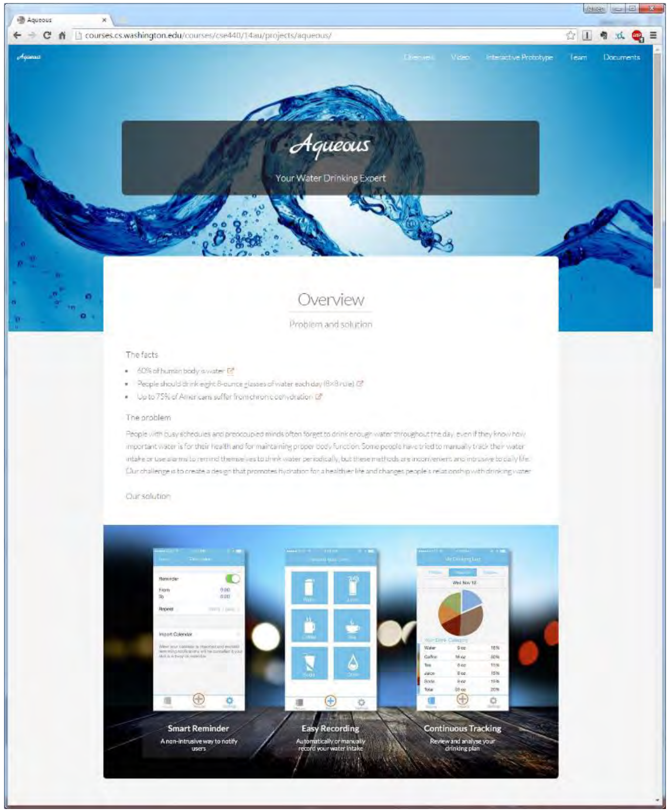
Video Prototypes

GetOut



PickUp

Learn by Example from Prior Projects



Aqueous:

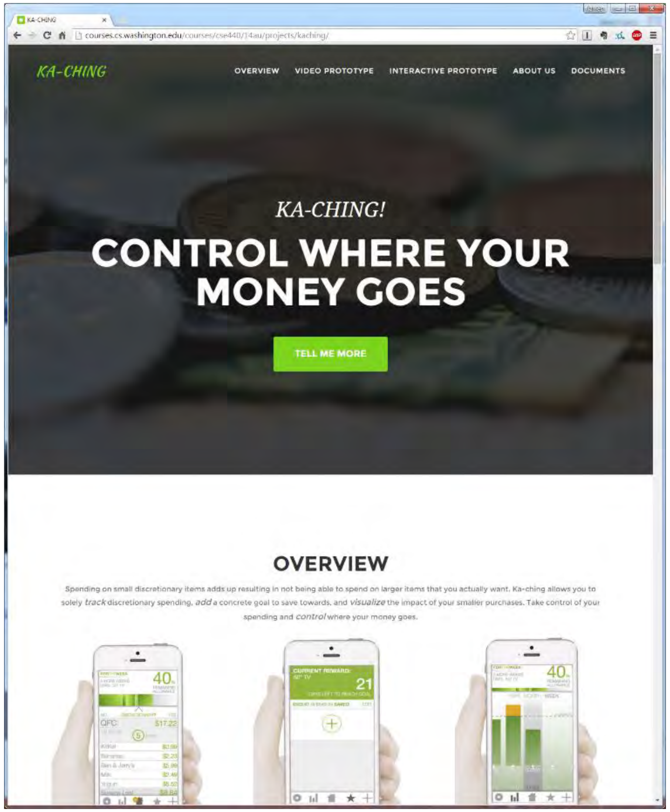
https://courses.cs.washington.edu/courses/cse440/14au/projects/aqueous/

Learn by Example from Prior Projects

IEP Connect:

https://courses.cs.washington.edu/courses/cse440/14au/projects/iepconnect/

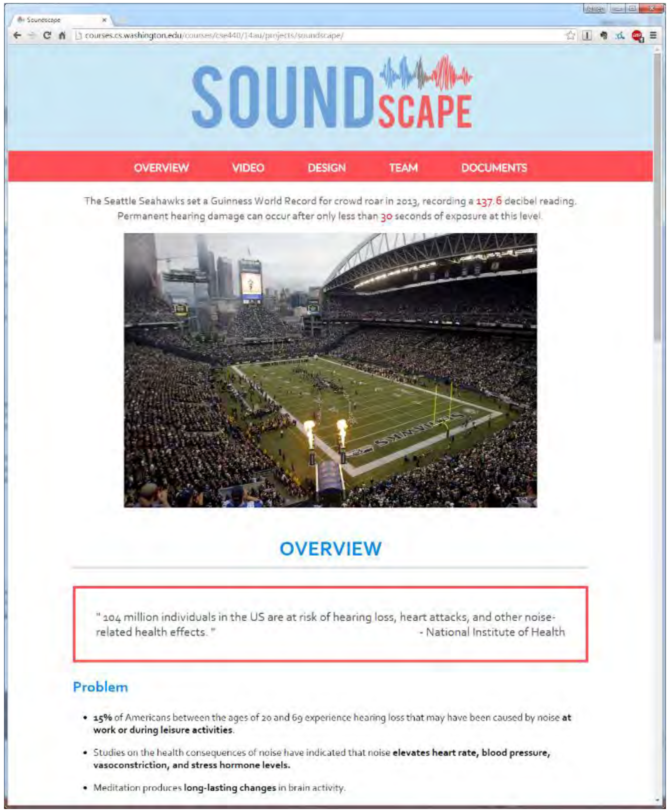
Learn by Example from Prior Projects



Ka-Ching:

https://courses.cs.washington.edu/courses/cse440/14au/projects/kaching/

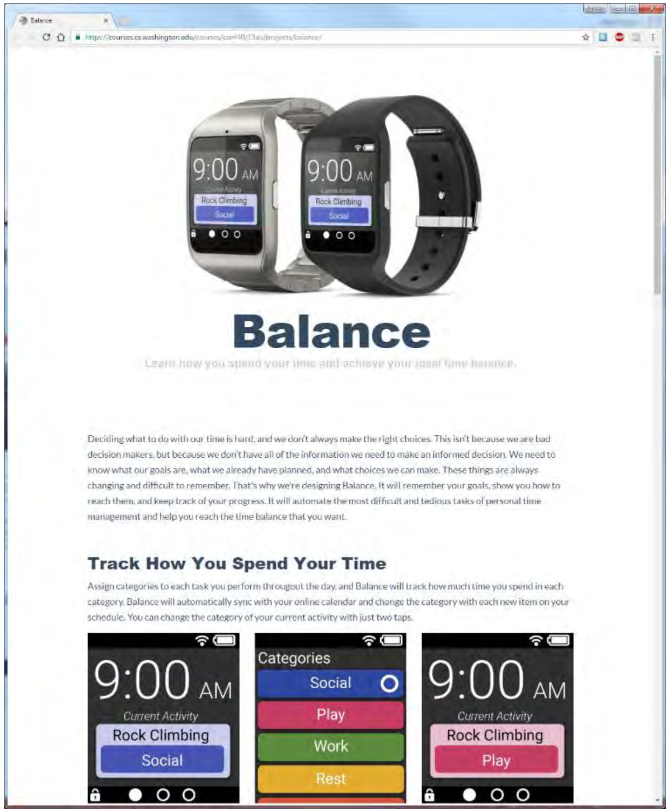
Learn by Example from Prior Projects



Soundscape:

https://courses.cs.washington.edu/courses/cse440/14au/projects/soundscape/

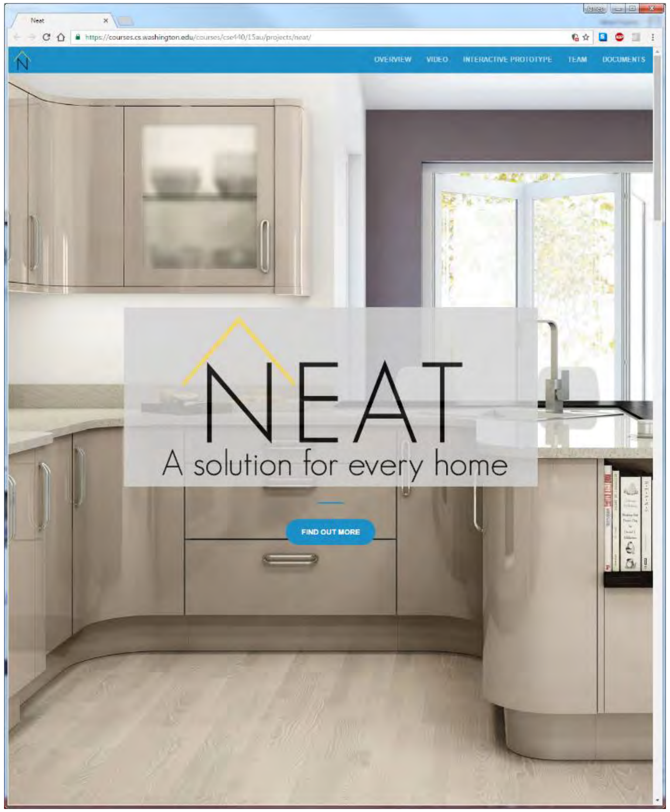
Learn by Example from Prior Projects



Balance:

https://courses.cs.washington.edu/courses/cse440/15au/projects/balance/

Learn by Example from Prior Projects



Neat:

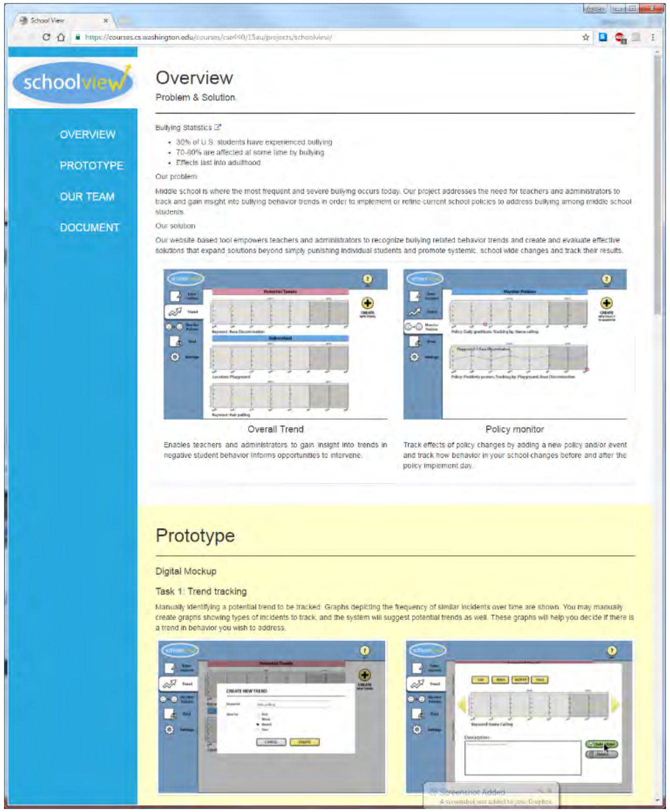
https://courses.cs.washington.edu/courses/cse440/15au/projects/neat/

Learn by Example from Prior Projects

Poliscope:

https://courses.cs.washington.edu/courses/cse440/15au/projects/poliscope/

Learn by Example from Prior Projects



School View:

https://courses.cs.washington.edu/courses/cse440/15au/projects/schoolview/

Studio Time in Section and Lecture

This course is designed around rapid feedback

Section is primarily studio time with the staff

- Groups will be formed within section
- Your team always brings a milestone to studio
- Participation is a critical component of the course

Project time on Tuesdays

- Your team always has a milestone due
- Class will often include project time or activity

Overview

HCI and the Project Sequence

Course Staff Introductions

Administrivia

Assignment 1: Project Proposal

- Assignment 1a: Due for Friday
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Some Reflection

Self-Tracking and Relevant Background

Who We Are

James Fogarty

Prefer: James / He / Him

Background

BS, Virginia Tech, 2000
PhD, Carnegie Mellon, 2006
Joined UW CSE, 2006

Brief Industrial Stints

IBM, 2000
IBM Research, 2003
Microsoft Research, 2007

Who We Are

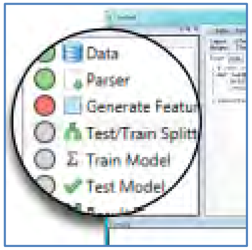
Cross-Campus HCI Efforts

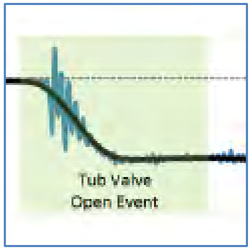
- DUB
- MHCID

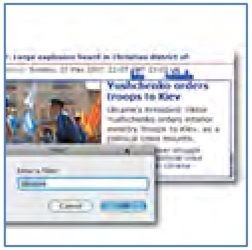
Teaching

- CSE 440: Introduction to HCI
- CSE 441: Advanced HCI
- CSE 510: Advanced Topics in HCI
- CSEP 510: Human-Computer Interaction
- CSE 332: Data Structures

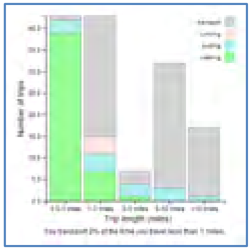
Who We Are

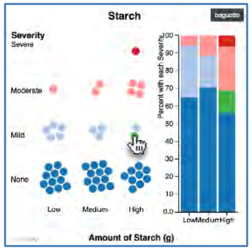

Data
Parser
Train Model
Test Model

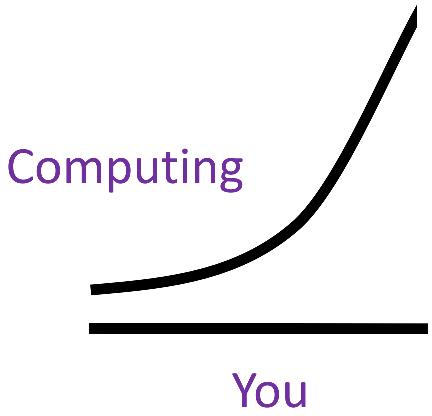

Tub Valve
Open Event




110
Drag




Starch
Severity
Severe
Moderate
Mild
None
Low
Medium
High
Amount of Starch (g)


Computing
You

Who We Are

Eunice Jun

Prefer: Eunice / She / Her

Background:

BS, Cognitive Studies &
Computer Science

Vanderbilt, 2016

Research:

Increasing engagement in multicultural online communities, including large-scale online experiments

Interests:

Hiking, learning new languages, ballet, getting lost

Who We Are

David Wang

Prefer: David / He / Him

Background:

BS, Informatics (HCI)

UC Irvine, 2013

MS, HCDE
University of Washington, 2017

Research:

Collapse informatics, ubiquitous computing

Interests:

Outdoors, travel,
making (ask me about the food truck harness)

Who We Are

Elisabeth Chin

Prefer: Elisabeth / She / Her

Background

BS, Informatics: HCI
University of Washington, 2017

Interests

Movies (watched 72 in 2016!),
making fresh noodles,
cross-cultural studies,
all sorts of rock music

Who We Are

Ravi Karkar

Prefer: Ravi / He / Him

Background

BE, Gujarat University, 2011

MS, Georgia Tech, 2012

MS, University of Washington, 2016

Research

Designing and building tools to
support people in their diagnostic self-tracking

Interests:

Sleeping, getting 404s, hunting horcruxes

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Staying in Touch

Web: http://www.cs.washington.edu/440

You are responsible for calendar

Canvas: I hate Canvas so much but we have to use it for some things

Email Us: cse440-instr [at] cs.washington.edu

Email: You are responsible for course email

Office Hours: Posted on Calendar
Also By Appointment

GitHub Repository

The website, assignments, and other materials are being run from a GitHub repository

https://github.com/uwcse440/web-cse440-wi17

You will contribute when posting your projects

You can and should contribute if you see the opportunity

Grading

- We provide a grading scale, but it is subjective
  - Design is subjective, and so is this course
  - Wow us with your work, not with complaining
- Entire project process is designed for feedback
  - Milestone grades mean you did the milestone
  - You still must act on feedback as part of continuing to refine and develop your project
  - A focus on “doing the work” and “getting feedback” means final grades are more “quality of result”

Grading

Group Project: 65%

3% Assignment 1

21% Assignment 2: Getting the Right Design

Final Report 15%, Milestones 6%

14% Assignment 3: Getting the Design Right

Final Report 10%, Milestones 4%

15% Assignment 4: Communicating the Design

Website 5%, Video Prototype 5%, Poster 5%

12% Presentations

Getting the Right Design 5%,
Getting the Design Right 5%, Individual 2%

Exam: 25%

Individual Readings: 5%

Participation: 5%

Submissions

Many assignments are due "night before class"

Canvas will operationalize this as 12:01am

A bit more slack, but definitely "before I wake up"

We need your submissions as part of
our preparation for in-class feedback

"Day of class", "just before class", or "in class"
are all unacceptable, risking zero credit

“Now” vs “When You Need It” Content

This course has both, we will try to distinguish

Several assigned readings will be posted

- Intentionally minimal but critical
- May be on exam
- Small reading report assignment

Additional resources will be made available

- If you find others you want to share, email us

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Project Proposal Schedule

- Project Brainstorm Due for Friday
  - Brainstorming in Section Friday
- Project Proposal Due Monday Night
  - Sponsored Projects Posted Tuesday
- Project Bids Due Wednesday Night
  - Groups Assigned Thursday
  - Brainstorming in Section Friday

Assignment 1a: Project Brainstorm

You have an assignment due for Friday:

http://courses.cs.washington.edu/courses/cse440/17wi/assignments/assignment1/

Propose 3 project domains, problems, goals:

- These are starting points for brainstorming

Submit online:

- This proves that you did your preparation
- Submit via email if unable to access Canvas

Bring to section Friday:

- You have a lot more brainstorming ahead of you

Assignment 1b: Project Proposal

You have an assignment due for Tuesday:

http://courses.cs.washington.edu/courses/cse440/17wi/assignments/assignment1/

One page of text:

- Problem and Motivation
- Analyze the problem or idea (e.g., a scenario)

Submit online:

- Sponsored Projects will be Posted for Bidding

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Some Reflection

This will not be an easy course

- Students have said this was their most intense course
- You have two deadlines per week, every week
- But I believe in everything that is included

This course challenges some aspects of what the CSE curriculum has taught you is important

- It will be what you make it

People Really Get It

"Very good class that every engineer should have to take. Good perspectives and made me think outside my comfort zone."

"The focus on projects and fieldwork was very well suited to my learning style. I greatly enjoyed this format. The theory and techniques taught in class were directly applicable to the projects we were doing and were usually timed very well. That is, usually the topics presented in lecture were relevant to the current deliverable or the next deliverable."

People Really Get It

“I can't believe I'm saying this, but I found the lectures a huge part of what I learned in this course. They were useful and organized, and each one had a clear message and topic. The assignments were an excellent extension of these themes.”

“Fieldwork and iterative assignments really taught me how important the design process is.”

Group Work is Hard Work

"the project placed groups in a realistic situation and forced us to work together effectively and practice relevant concepts/strategies"

"The group work was distracting because of the lack of unity and sense of purpose. We all had different priorities and purposes for taking the class and this made it really hard to be on the same page for the project which was the biggest part of this class."

Group Work is Hard Work

"Have groups do a team charter - outlining what they expect from one another as teammates. I took a project management course and when working in a group with individuals you've never worked with, the team charter may help break the ice easier when everyone can say what their expectations are."

"… I think that working effectively as a team was the most challenging part of this class …"

And it is not for Everybody

What aspects of this class detracted from your learning?

Finding strangers in malls & coffee shops was a major hurdle

What suggestions do you have for improving the class?

Don't exclude the two most available sources of people - friends & university students

Adding and Dropping

Attempting to Add

- Say something to me after class
- Will email today, attempt to finalize quickly
- Must enforce a hard enrollment cap

Considering Dropping

- Do so before we assign teams, and tell us

Section switch availability

- We may need help in balancing sections

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Thousands of Health Monitoring Apps

Activity and Medical Sensing Devices

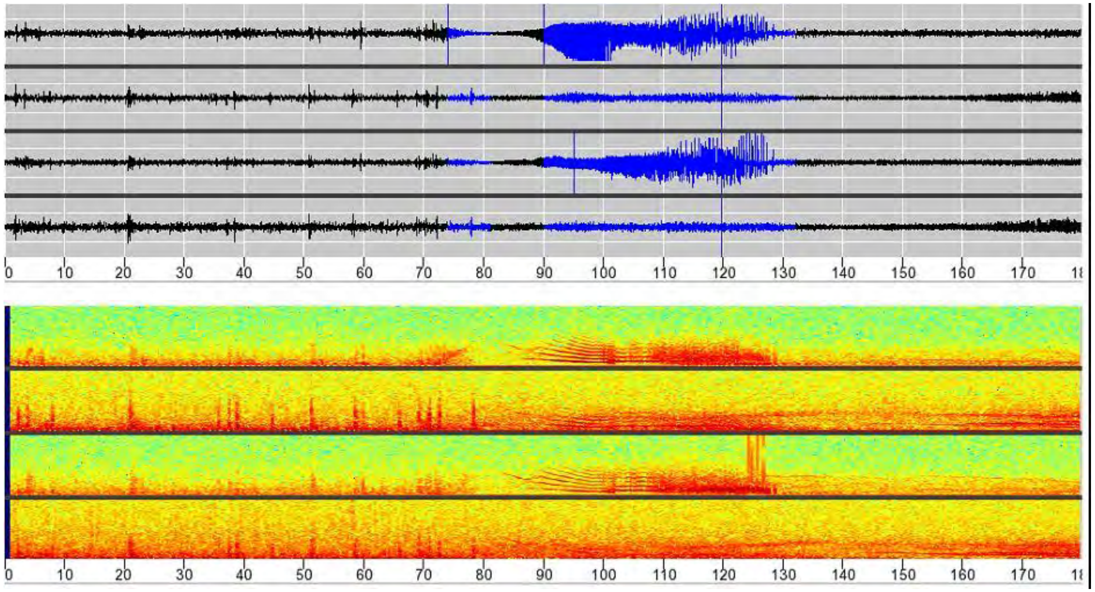
Blood glucose meter

Thermometer

Blood pressure monitor

Heart rate monitor

Medical Implants



NeuroPace

Sustainability Tracking

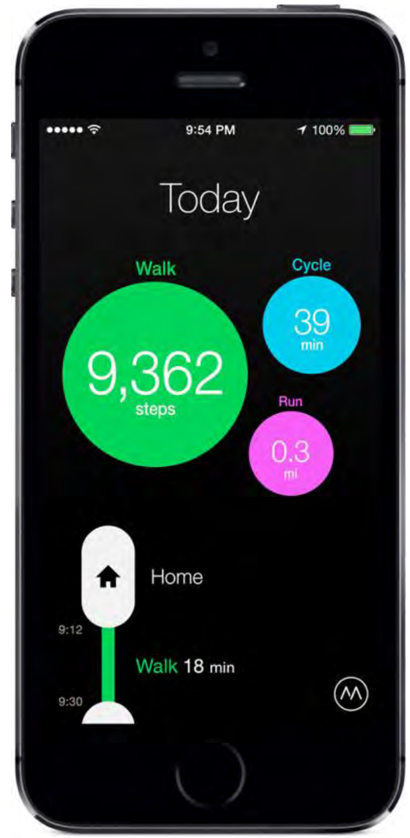
Kill A Watt

Belkin
WeMo Water

Automatic

Location and Activity

FitBit

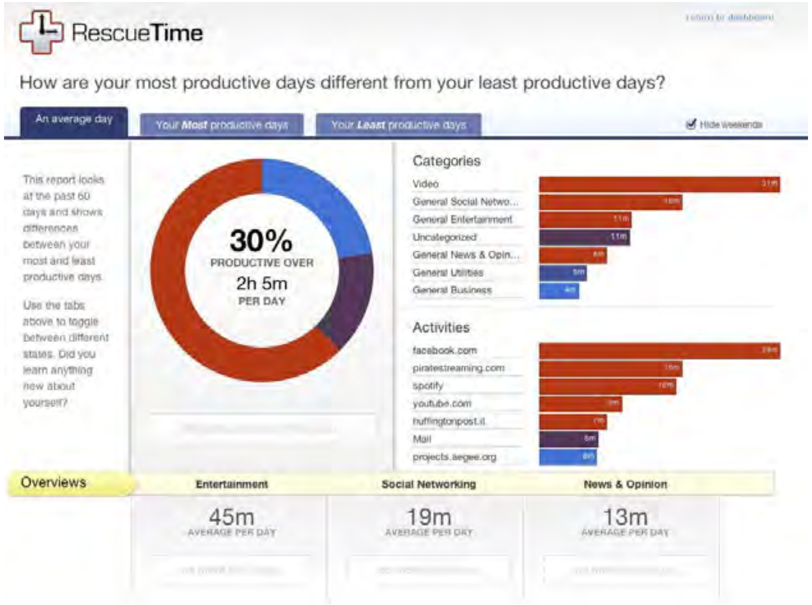


Moves

Garmin

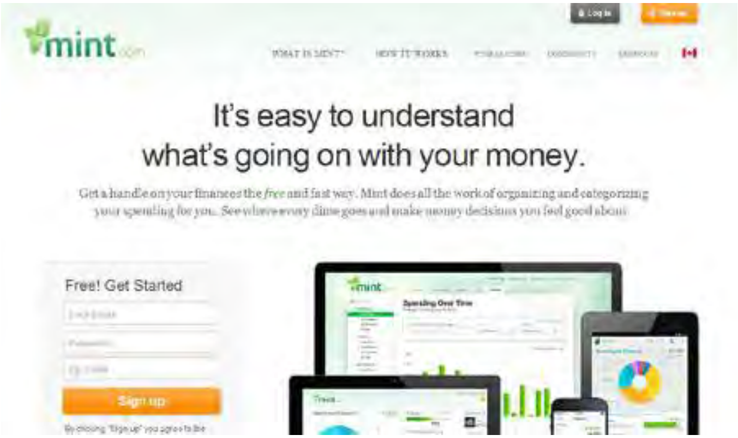
FitBark

Time Tracking



RescueTime

Finances



Mint

You Need a Budget

Background in Personal Informatics

Some Definitions

What is the Point?

What is the Problem?

Chester, T. (2013). *The Sunday Times.*
"You Are Just a Number"

What is Personal Informatics

"We define personal informatics systems as those that help people collect personally relevant information for the purpose of self-reflection and gaining self-knowledge. There are two core aspects to every personal informatics system: collection and reflection."

Li I., Dey A., Forlizzi J. *CHI 2010.*
"A Stage-Based Model of Personal Informatics Systems"

What is Quantified Self

"The Quantified Self is an international collaboration of users and makers of self-tracking tools."

"Our aim is to help people get meaning out of their personal data."

"Self knowledge through numbers."

Wolf G. (2009). *Wired Magazine*.
"Know Thyself: Tracking Every Facet of Life, from Sleep to Mood to Pain, 24/7/365"

What is the Point?

Gnothi seauton

“Know thyself”

Leonardo da Vinci

Leonardo da Vinci

- Odometers on the left
- Pedometer on the right

To track troop activities

Benjamin Franklin

Temperance
Silence
Order
Resolution
Frugality
Industry
Sincerity
Justice
Moderation
Cleanliness
Tranquility
Chastity
Humility

Benjamin Franklin

TEMPERANCE.

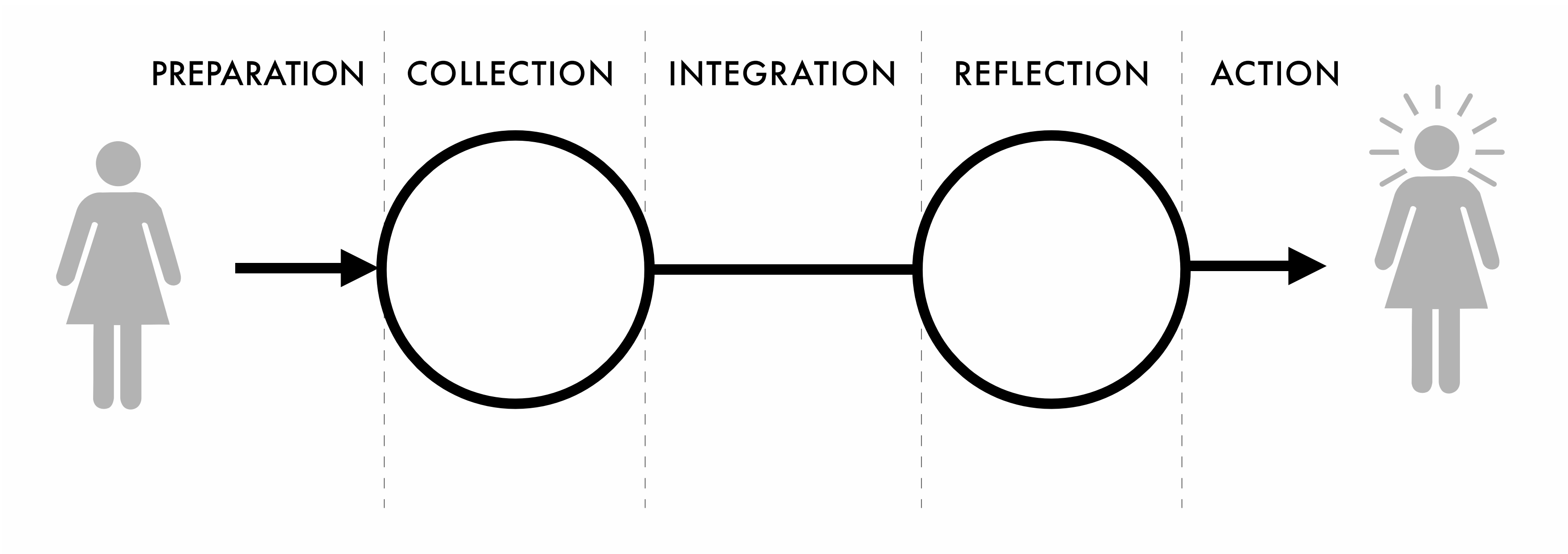
EAT NOT TO DULLNESS.
DRINK NOT TO ELEVATION.

	S.	M.	T.	W.	T.	F.	S.
T.							
S.	*	*		*		*	
O.	* *	*	*		*	*	*
R.			*			*	
F.		*			*		
I.			*				
S.							
J.							
M.							
C.							
T.							
C.							
H.							

Manpokei

万歩計

Five-Stage Model of Personal Informatics



Li I., Dey A., Forlizzi J. *CHI 2010.*
"A Stage-Based Model of Personal Informatics Systems"

Five-Stage Model of Personal Informatics

Alice

20 years old

Has a family history of heart disease

Wants to be more active

Does not know how, because she is busy

Li I., Dey A., Forlizzi J. *CHI 2010.*
"A Stage-Based Model of Personal Informatics Systems"

Preparation

Li I., Dey A., Forlizzi J. *CHI 2010.*
"A Stage-Based Model of Personal Informatics Systems"

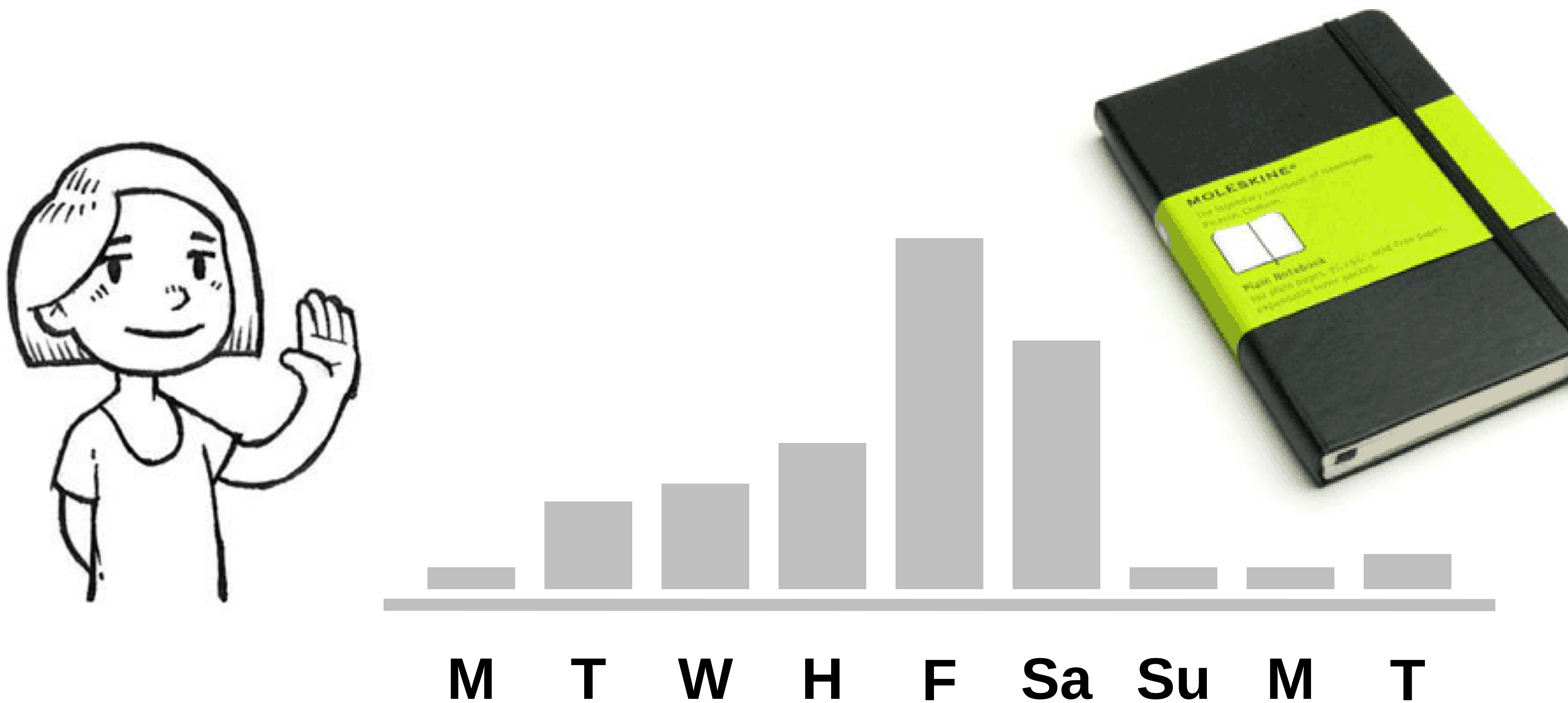
Preparation

Li I., Dey A., Forlizzi J. *CHI 2010.*
"A Stage-Based Model of Personal Informatics Systems"

Collection

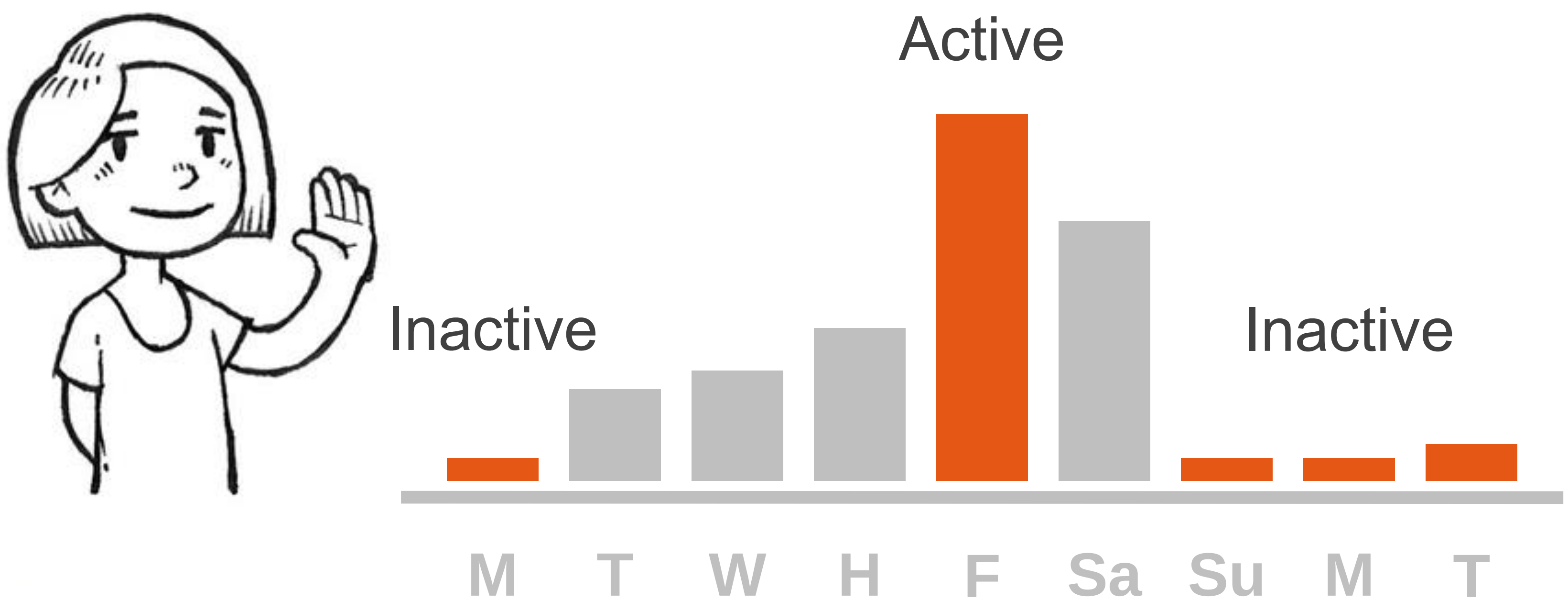
Li I., Dey A., Forlizzi J. *CHI 2010.*
"A Stage-Based Model of Personal Informatics Systems"

Integration



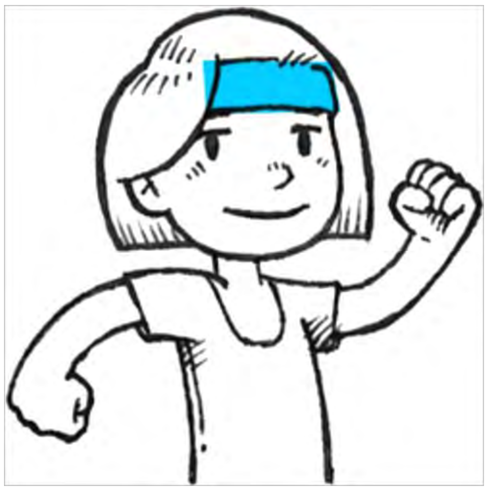
Li I., Dey A., Forlizzi J. *CHI 2010.*
"A Stage-Based Model of Personal Informatics Systems"

Reflection



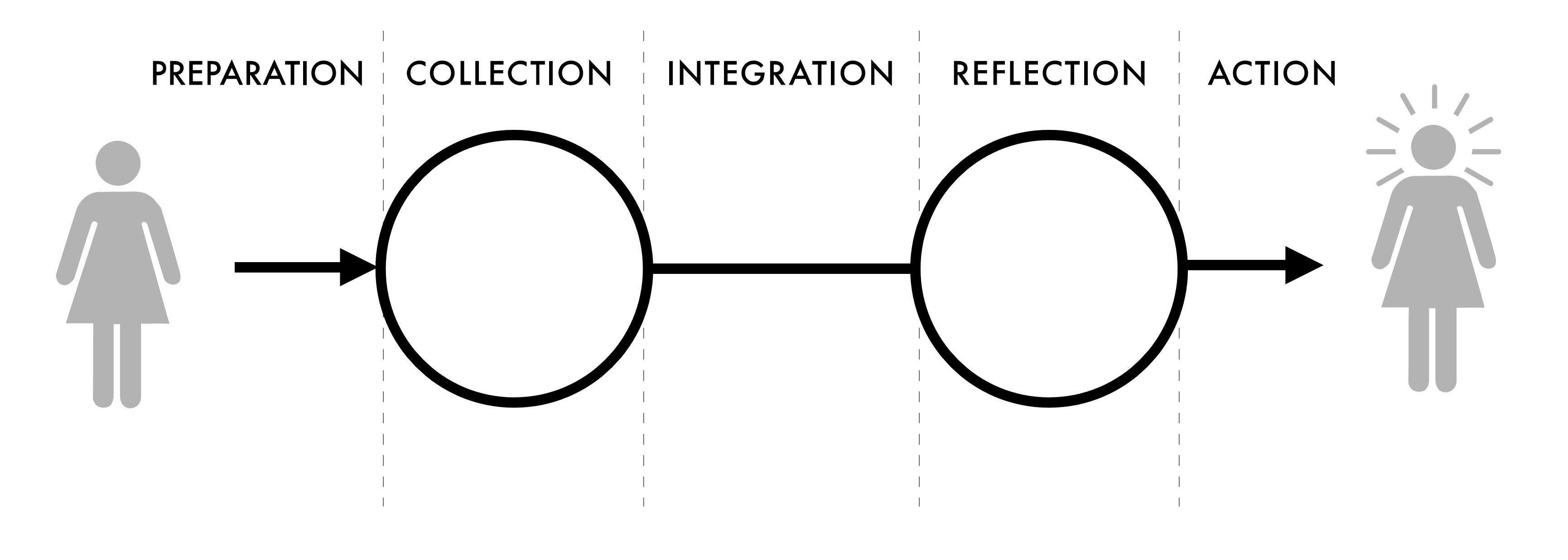
Li I., Dey A., Forlizzi J. *CHI 2010.*
"A Stage-Based Model of Personal Informatics Systems"

Action



Li I., Dey A., Forlizzi J. *CHI 2010.*
"A Stage-Based Model of Personal Informatics Systems"

Five-Stage Model of Personal Informatics



Li I., Dey A., Forlizzi J. *CHI 2010.*
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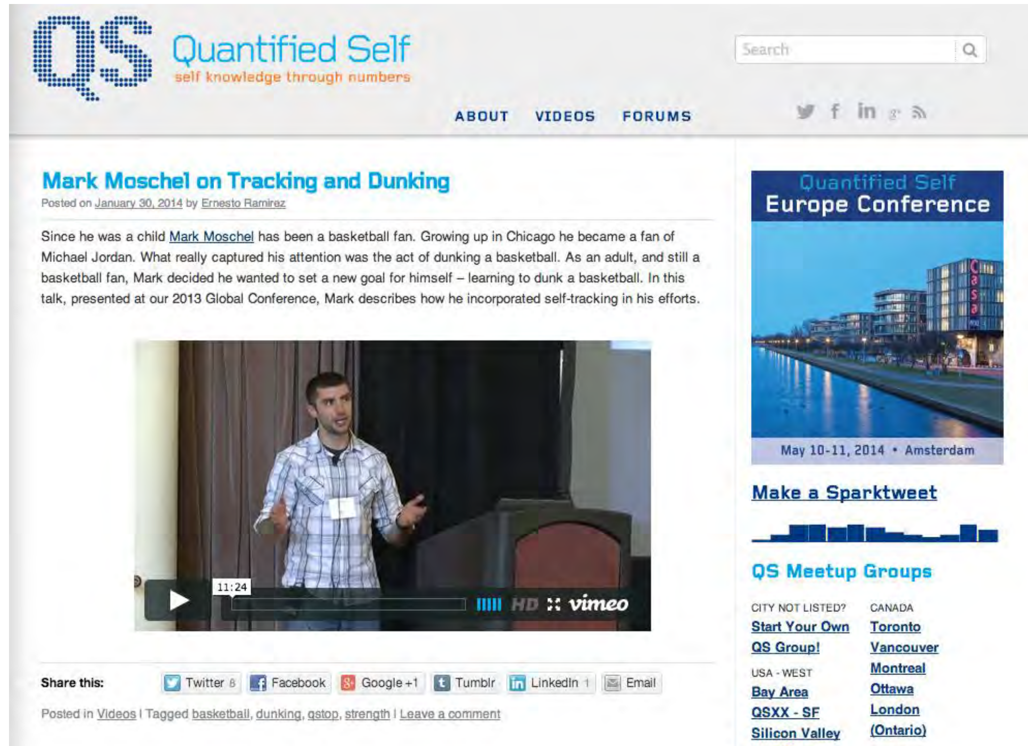
What is the Problem?

Examining serious self-trackers, as they represent the early adopters



Choe E.K., Lee N.B., Lee B., Pratt W., Kientz J.A. CHI 2014.
"Understanding Quantified Selfers' Practices in Collecting and Exploring Personal Data"

Quantified Self Talk Format

1. What I did
2. How I did it
3. What I learned

Analyzed 52 videos

Choe E.K., Lee N.B., Lee B., Pratt W., Kientz J.A. CHI 2014.
"Understanding Quantified Selfers' Practices in Collecting and Exploring Personal Data"

Analysis

Visualizations

Themes

	C	E	F	G	H				
1	City	Gender	Working in a tech company?	Background	Data type				
2	San Francisco	Male	Microsoft	Data analytics	Activity, Food, Sleep, Weight, Body fat, mood				
3	San Francisco	Male	startup	Data analytics, financial modeling, tech startup	Glucose				
4	London	Male	no	electronics engineer	Exercise, Food, Supplements, Medicine, biomedical data, body fat, weight, blood pressure	heart rate monitor, pen and paper, Excel	cancer	6 years	Commercial
5	Seattle	Male	startup	interface designer, VP of product, web development	Weight, Food, Sleep, Productivity	scale, Fitbit, RescueTime (productivity measuring tool)		2 years	Commercial
6	London	Male	startup	software engineer, network engineer	rowing strokes, distance rowed, time rowed, calories	arduino, speadsheet	overweight	5 months	
7	San Francisco	Male	startup	robotics, software, product development	proximity to cars, location	smartphone, sonar		1 year	user-generated
8	Beirut	Female		mechanical engineer	heart rate	custom heart rate monitor			user-generated
9	Toronto	Male	Rogers	programmer, performance manager, big data	food, fitness, cognitive performance, anxiety, media consumption, sleep, location, finance, biomedical data, reading, glucose			20 years	

Profiles

Choe E.K., Lee N.B., Lee B., Pratt W., Kientz J.A. CHI 2014.
"Understanding Quantified Selfers' Practices in Collecting and Exploring Personal Data"

What do they Track?

A Diabetic Experience with Self-Quantification

Analyzing My Cancer Data

Going Vegan in December

Improving Skin Health

Cognitive Performance

15 Weeks of Self-Tracking

Diabetes, Exercise, and QS

Experience Sampling of My Stress

Hacking Your Subconscious Mind

Self-tracking is more than just buying a FitBit

Choe E.K., Lee N.B., Lee B., Pratt W., Kientz J.A. CHI 2014.
"Understanding Quantified Selfers' Practices in Collecting and Exploring Personal Data"

Motivations for Tracking

Motivations	Sub-categories
To improve health	To cure or manage a condition
	To achieve a goal
	To find triggers
	To answer a specific question
	To identify relationships
	To execute a treatment plan
	To make better health decisions
	To find balance
To improve other aspects of life	To maximize work performance
	To be mindful
To find new life experiences	To satisfy curiosity and have fun
	To explore new things
	To learn something interesting

Choe E.K., Lee N.B., Lee B., Pratt W., Kientz J.A. CHI 2014.
"Understanding Quantified Selfers' Practices in Collecting and Exploring Personal Data"

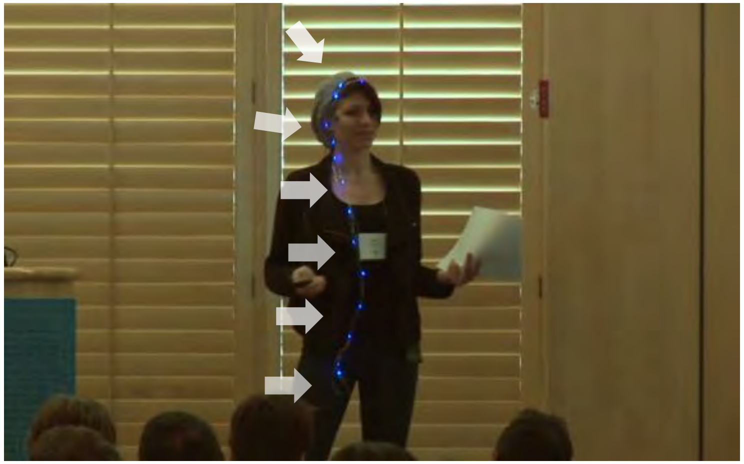
Data Collection and Exploration Tools

Data Collection Tool	% (#)
Commercial hardware	56% (29)
Spreadsheet	40% (21)
Custom software	21% (11)
Pen and paper	21% (11)
Commercial software	19% (10)
Commercial website	10% (5)
Camera	6% (3)
Open-source platform	6% (3)
Custom hardware	4% (2)
Other	10% (5)

Data Exploration Tool	% (#)
Spreadsheet	44% (23)
Custom software	35% (18)
Commercial website	27% (14)
Commercial software	12% (6)
Open-source platform	8% (4)
Statistical software	4% (2)
Pen and paper	2% (1)

Choe E.K., Lee N.B., Lee B., Pratt W., Kientz J.A. CHI 2014.
"Understanding Quantified Selfers' Practices in Collecting and Exploring Personal Data"

Building Custom Tools



Captures smile via wearable sensing
Provides real-time feedback

Captures snoring via mobile app
Provides data visualization

Choe E.K., Lee N.B., Lee B., Pratt W., Kientz J.A. CHI 2014.
"Understanding Quantified Selfers' Practices in Collecting and Exploring Personal Data"

Custom Visualizations

Choe E.K., Lee N.B., Lee B., Pratt W., Kientz J.A. CHI 2014.
"Understanding Quantified Selfers' Practices in Collecting and Exploring Personal Data"

Why are they Building Custom Tools?

Desirable features are not supported

- Collect and reflect on the data using a single tool
- Perform self-experimentation

Barriers to success

- Tracking too many things
- Not tracking triggers and context
- Lacking scientific rigor

Choe E.K., Lee N.B., Lee B., Pratt W., Kientz J.A. CHI 2014.
"Understanding Quantified Selfers' Practices in Collecting and Exploring Personal Data"

Tracking Too Many Things

"I can honestly say that I've made the classic newbie self-tracking mistake which is that I track everything. I didn't know exactly what to track, so I tracked caffeine, dairy, wheat, sugar, nuts, fruit, vegetables, meat, chicken, fish, alcohol supplements…"

People burn out on self-tracking

Choe E.K., Lee N.B., Lee B., Pratt W., Kientz J.A. CHI 2014.
"Understanding Quantified Selfers' Practices in Collecting and Exploring Personal Data"

Not Tracking Triggers and Context

"I was trying to track all these symptoms and I was completely ignoring the cause…"

People lack clues on what to track

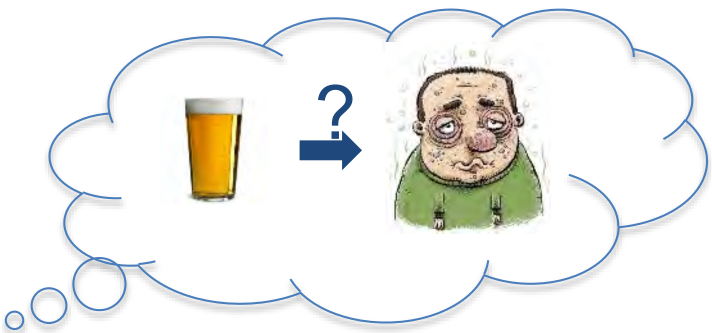
Missing information on how to improve outcome

They track the wrong information

Choe E.K., Lee N.B., Lee B., Pratt W., Kientz J.A. CHI 2014.
"Understanding Quantified Selfers' Practices in Collecting and Exploring Personal Data"

Lacking Scientific Rigor

Conduct self-experimentations without control or without addressing confounding factors



And they conduct flawed experiments

Choe E.K., Lee N.B., Lee B., Pratt W., Kientz J.A. CHI 2014.
"Understanding Quantified Selfers' Practices in Collecting and Exploring Personal Data"

Barriers and Negative Nudges

"It was too time consuming and tedious. I also did not know what to enter if I ate out, so I often did not enter data and that compounded. I also felt embarrassed to do it in front of friends so I stopped."

Negative Nudges:

Contrasting difficulty of entry

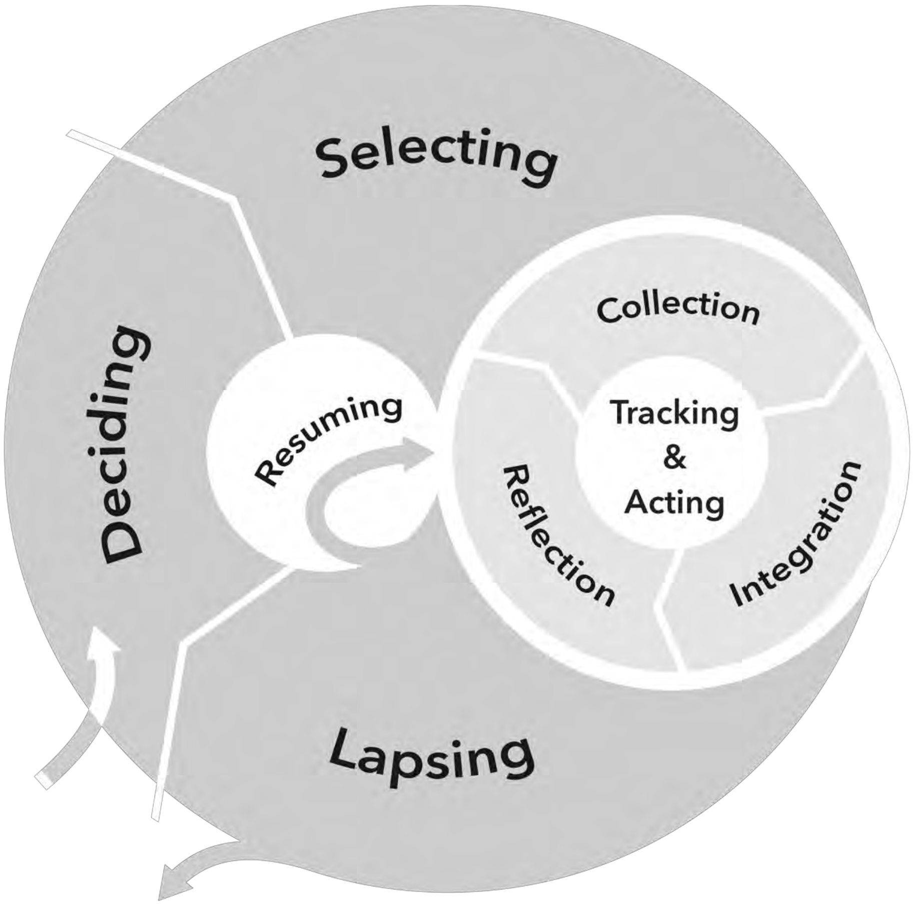
Judgment and choosing not to journal

Stigma and journaling

Lack or decline in social support

Felicia Cordeiro, Daniel A. Epstein, Edison Thomas, Elizabeth Bales, Arvind K. Kagannathan, Gregory D. Abowd, James Fogarty. CHI 2015. Barriers and Negative Nudges: Exploring Challenges in Food Journaling

A Model of Lived Informatics



Extends 5-stage model to surface additional opportunitie and challenges in lifecycle

Returning to a tool (e.g., short/long lapse)

Changing tools (e.g., due to burden)

Changing goals (e.g., due to discovery)

Daniel A. Epstein, An Ping, James Fogarty, Sean Munson. UbiComp 2015.
A Lived Informatics Model of Personal Informatics

Your Challenge

People invest tremendous effort for little value

Do better, help people achieve their goals, solve real problems

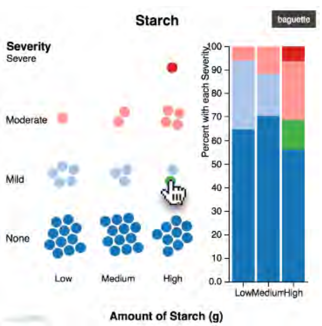
Go beyond the data fetish

- Understand the problems people face
- Find the role for interactive technology

Your Challenge

Explore **tracking beyond the self**:

co-located relationships
remote relationships
communities organizing
people seeking help from peers
people seeking help from experts



Any problem where multiple people collect data, or where multiple people engage in gaining value from data, introduces additional opportunities and challenges in designing for effective interaction with personal data

Some Reflection

We have high expectations

- We want you to do cool stuff

But we are also enthusiastic and we listen

- Email us, point out opportunities, ask questions

If you are not onboard, please drop now

- Please email us so that we know a spot opened

cse440-instr [at] cs.washington.edu

CSE 440: Introduction to HCI

User Interface Design, Prototyping, and Evaluation

Lecture 01:
Introduction and
Personal Informatics

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50

CSE 440: Introduction to HCI

User Interface Design, Prototyping, and Evaluation

Lecture 02:
Design of
Everyday Things

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50

Examining a Design Process

By example:

A video from
the 90s about
a shopping cart
with no bottom

ABC News and IDEO's Deep Dive

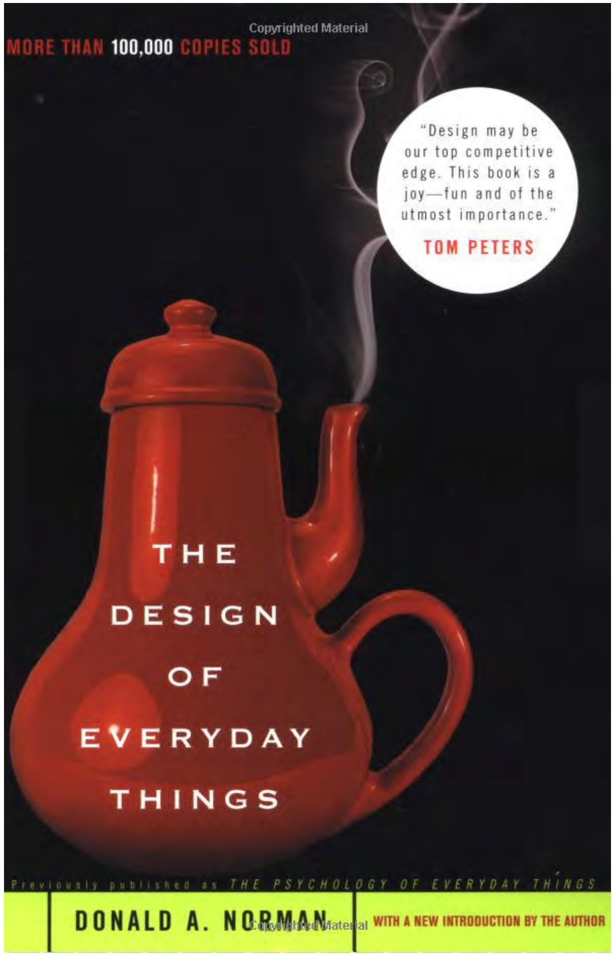
http://courses.cs.washington.edu/courses/cse440/videos/design/IDEO-DeepDive.mp4

Design Terminology

Design of Everyday Things reviews a common and useful vocabulary of design

We will use these in feedback and conversations without even realizing that we are doing it

You should know these terms and recognize them in practice



Norman's Execution-Evaluation Cycle

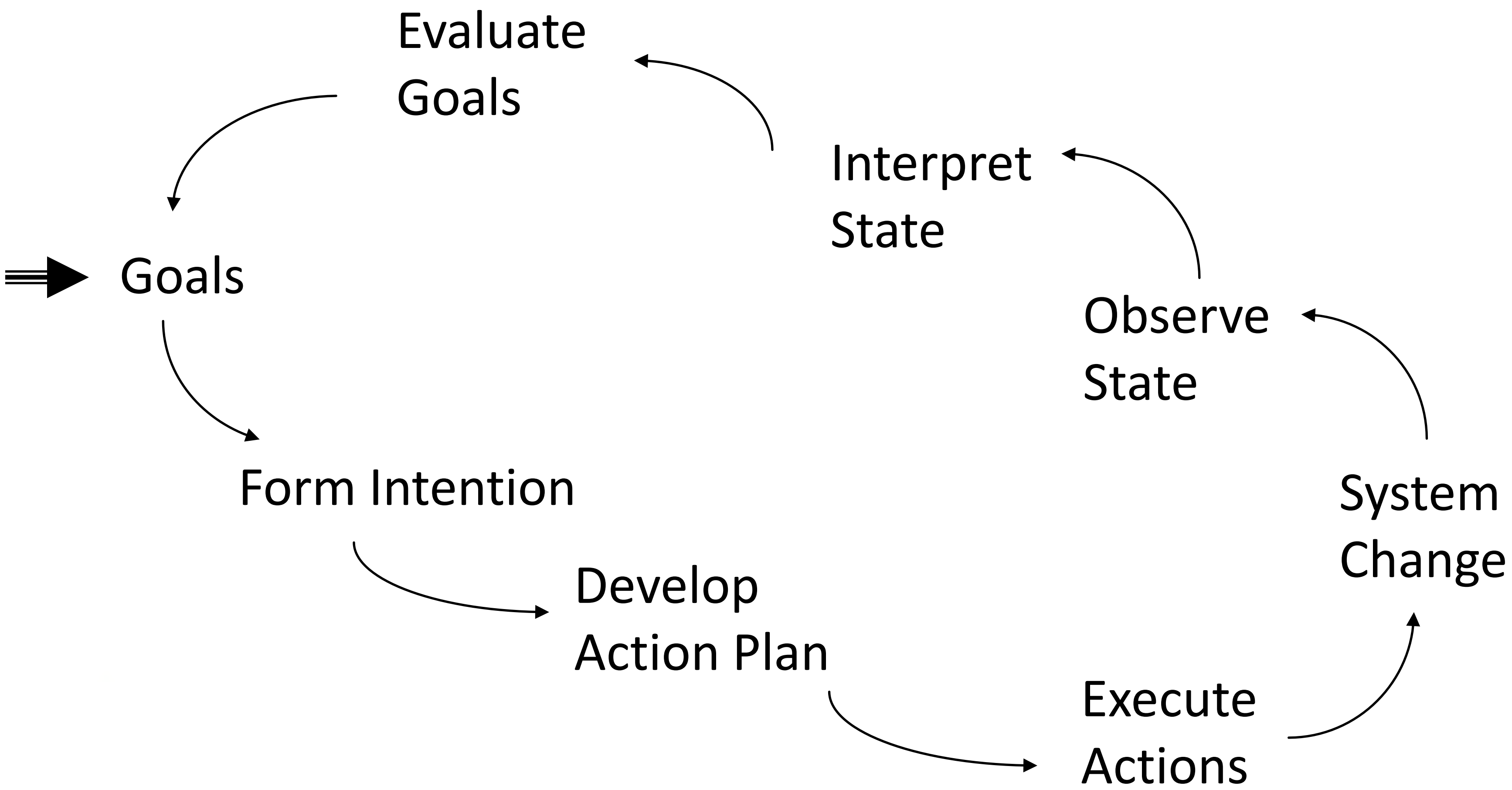
1. Establish the goal.
2. Form the intention.
3. Specify the action sequence.
4. Execute the action sequence.
5. Perceive the system state.
6. Interpret the system state.
7. Evaluate the system state with respect to the goals and intentions.

Revise Goals

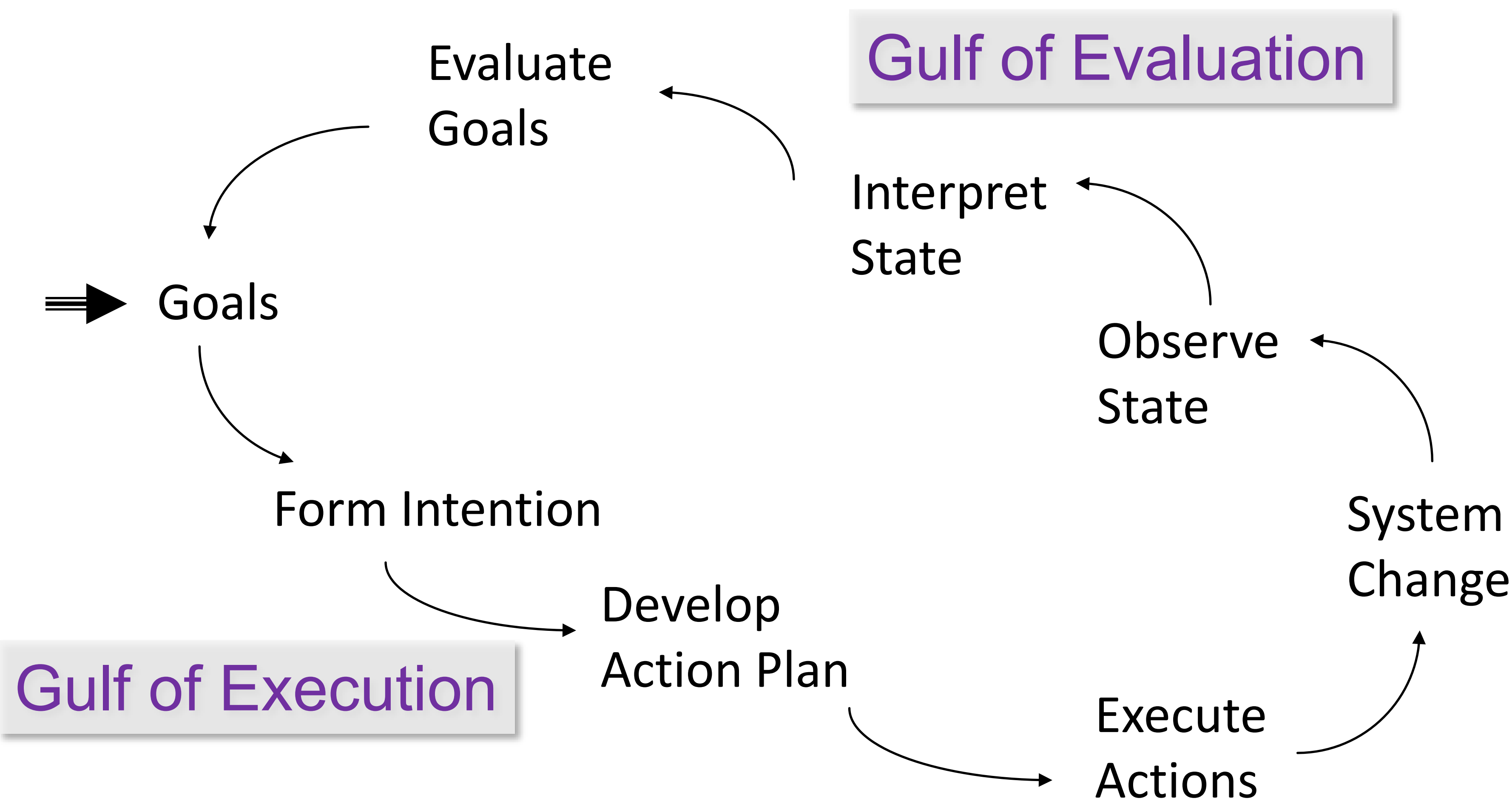
Turning on the Light

1. Establish the goal
   Increase light in the room
2. Form the intention
   To turn on the lamp
3. Specify the action sequence
   Walk to the lamp, reach for the knob, twist the knob
4. Execute the action sequence
   [walk, reach, twist]
5. Perceive the system state
   [hear "click" sound, see light from lamp]
6. Interpret the system state
   The knob rotated. The lamp is emitting light. The lamp seems to work
7. Evaluate the system state with respect to the goals and intentions
   The lamp did indeed increase the light in the room [goal satisfied]

Norman’s Execution-Evaluation Cycle



Norman’s Execution-Evaluation Cycle



Bridging the Gulfs

Gulf of Execution: "How do I do it?"

- Commands and mechanisms need to match the goals, thoughts, and expectations of a person

Gulf of Evaluation: "What does it mean?"

- Output needs to present a view of the system that is readily perceived, interpreted, and evaluated

People build mental models to anticipate and interpret system response to their actions

- What can I do?
- How do I do it?
- What result will it have?
- What is it telling me?

Cooper’s Mental Model Terminology

Implementation Model

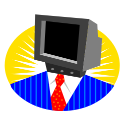
How it works

(Design Model, Designer’s Conceptual Model)

Manifest Model

How it presents itself

(System Image)



Mental Model

How a person thinks it works

(User Model, User’s Conceptual Model)

Cooper's Mental Model Terminology

Implementation Model

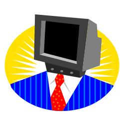
How it works

(Design Model, Designer's Conceptual Model)

Manifest Model

How it presents itself

(System Image)



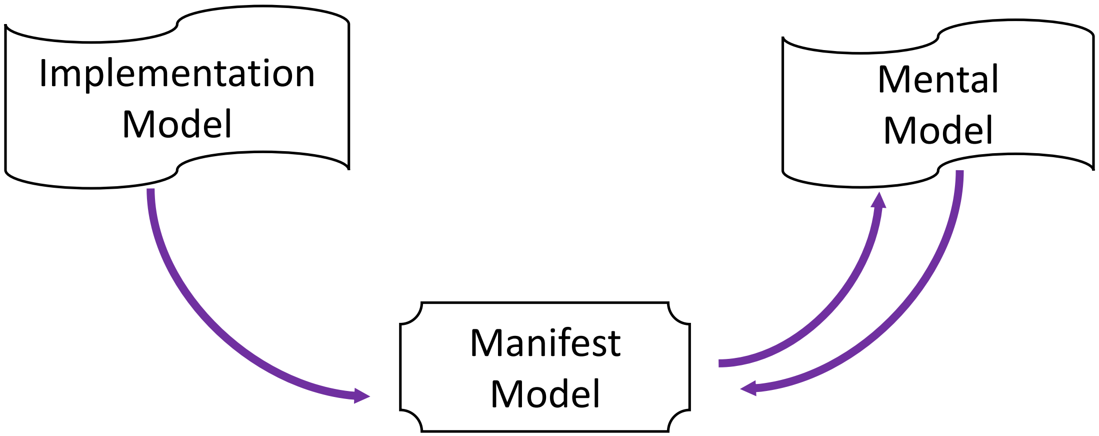
Mental Model

How a person thinks it works

(User Model, User's Conceptual Model)

These terms are sloppy and ambiguous out in the world

Manifest and Mental Models



Designer projects their model into an artifact

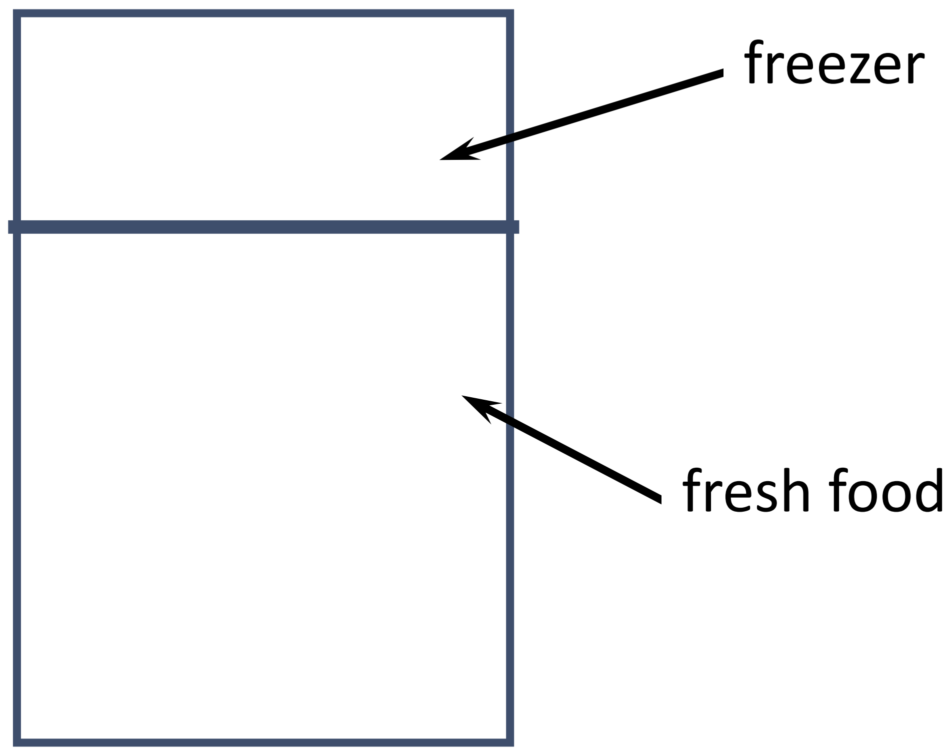
- Person forms their model based on interaction

People struggle until model matches manifest model

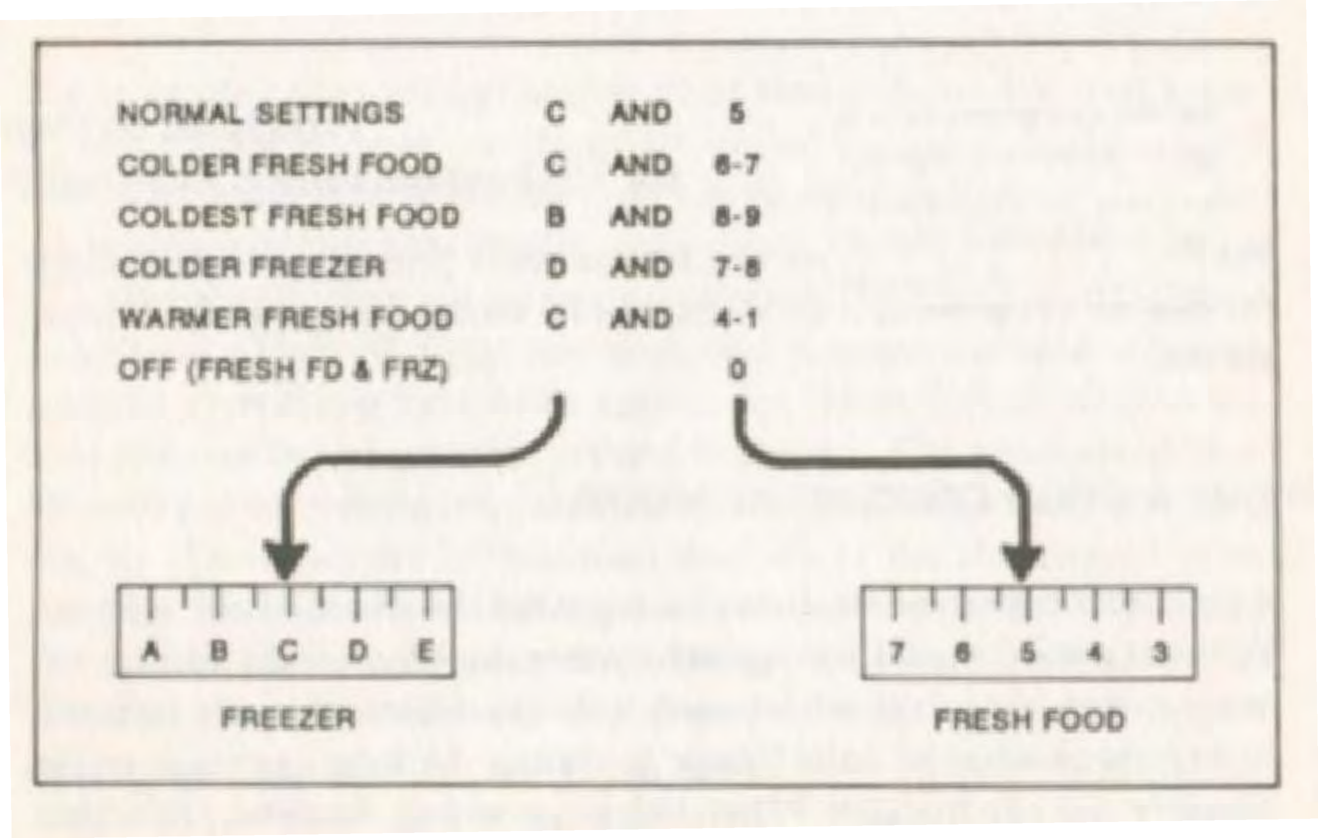
- Update mental model in response to breakdowns
- Matching the implementation model is not necessary

Mental Models

Problem: freezer too cold, fresh food just right

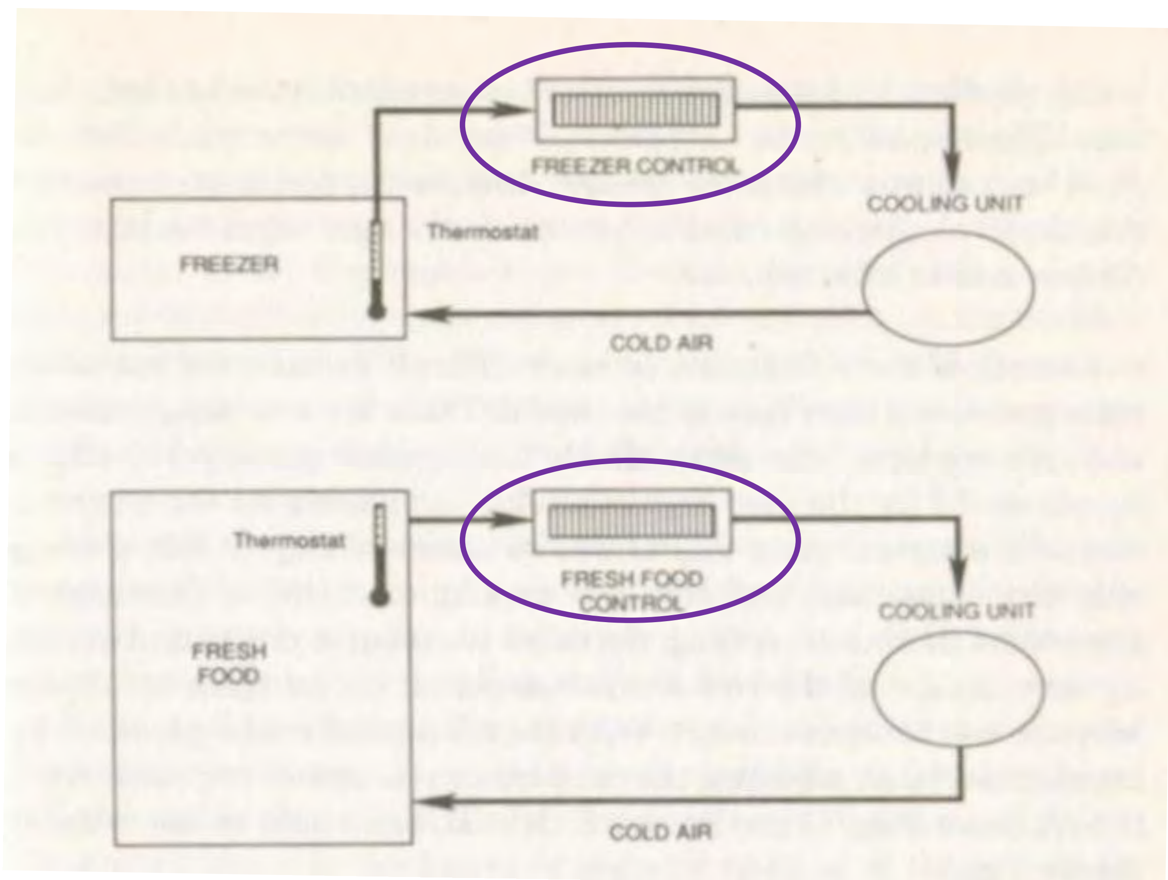


Manifest Model



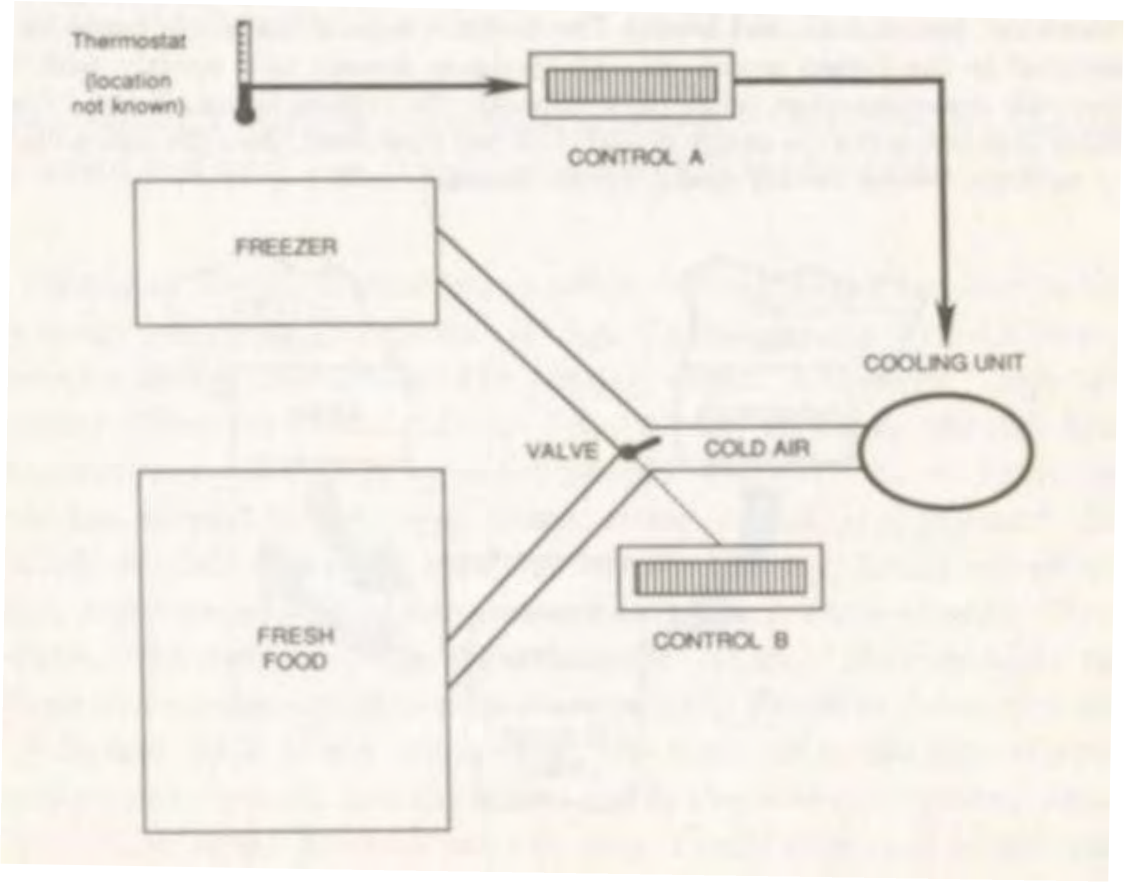
What if I want to make just the freezer warmer?

A Sensible Mental Model

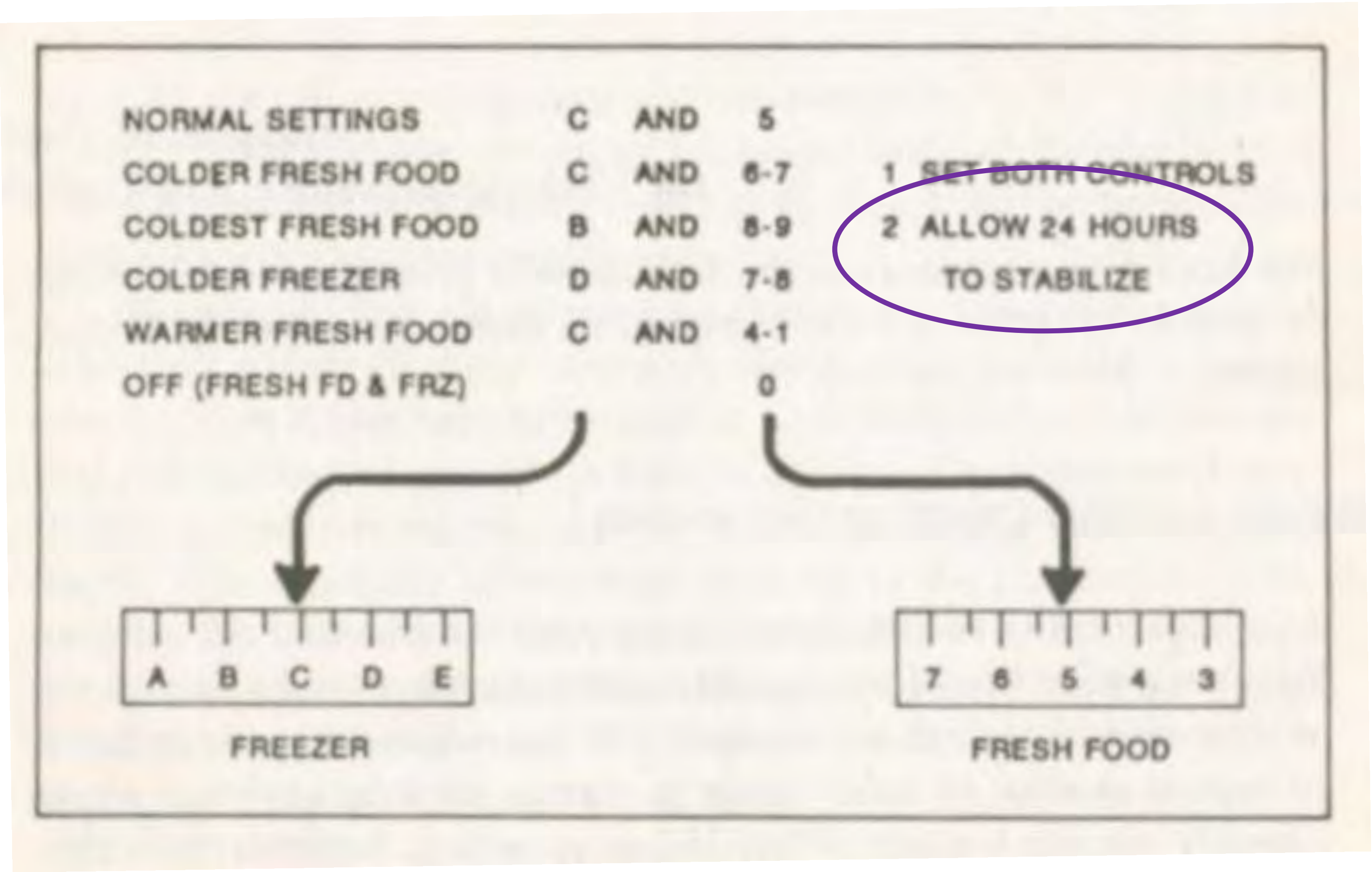


"The Freezer Control controls the freezer temperature and the Fresh Food Control controls the fresh food temperature"

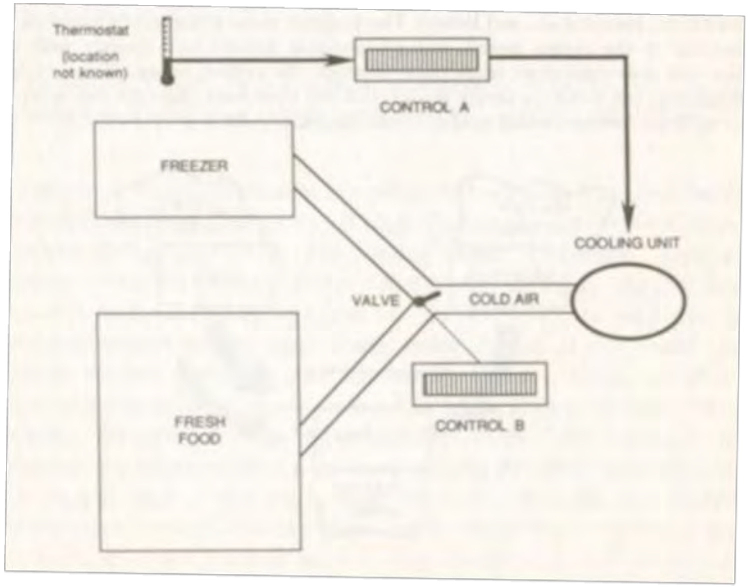
The Implementation Model



A Problem with Feedback



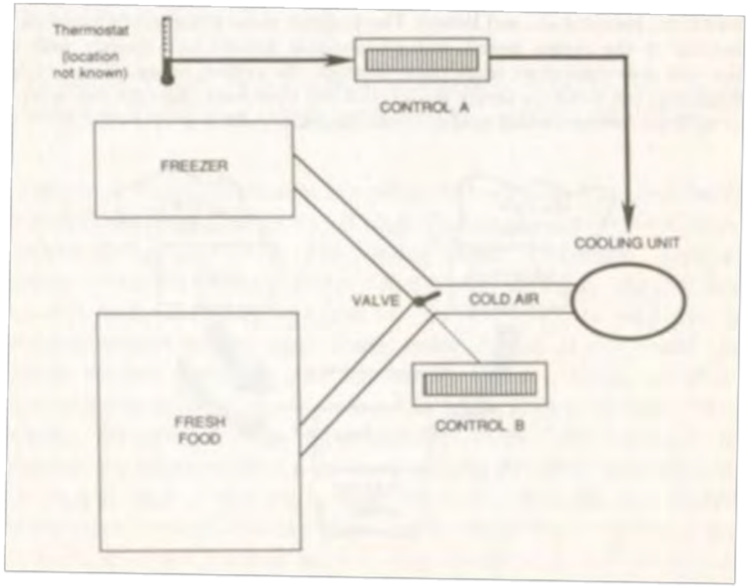
The Implementation Model



Why is there a problem?

Can you fix the problem?

The Implementation Model



Why is there a problem?

Cost constraints

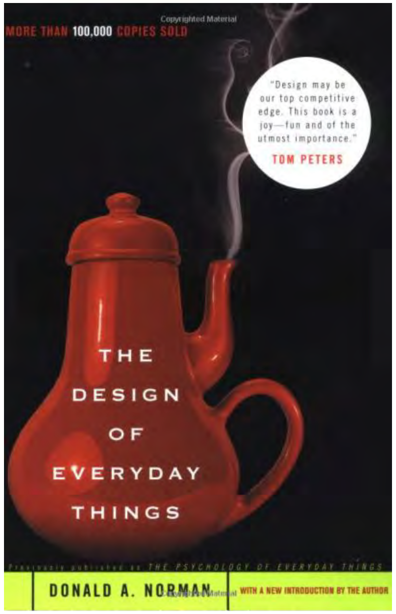
Can you fix the problem?

Make controls correspond to a person's mental model

Make controls correspond to the implementation model

"Design depends largely on constraints."
Charles Eames

Building the Right Model



Having the right model helps people bridge the Gulf of Execution and the Gulf of Evaluation

How can we help people build the right models:

Affordances	Metaphors
Visibility	Knowledge in the World
Constraints	Mapping
Consistency	Modes

Affordances

Visual clue to interaction

knobs afford turning

levers afford moving

buttons afford pushing

Affordances

"The affordances of the environment are what it offers animals, what it provides or furnishes, for good or ill."

Gibson, ecological approach to psychology

"The term 'affordance' refers to the perceived and actual properties of the thing, primarily those fundamental properties that determine just how the thing could possibly be used."

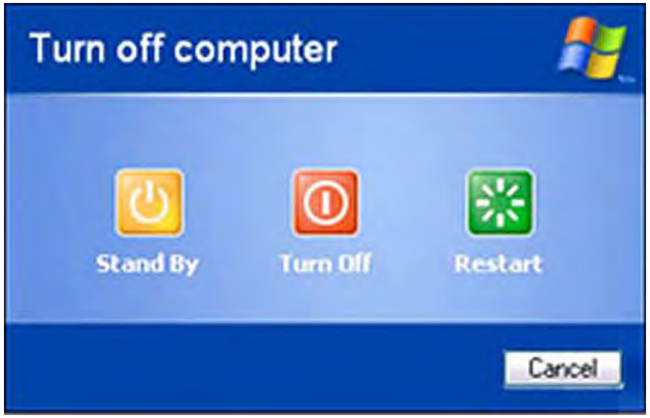
Norman

What’s the Affordance?

Affordances

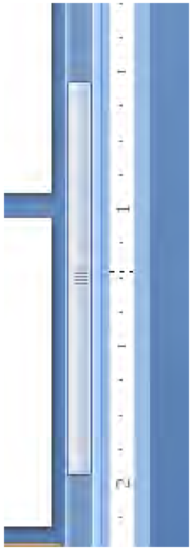
Affordances

Technology affordances are often based in affordances from the physical world



Affordances

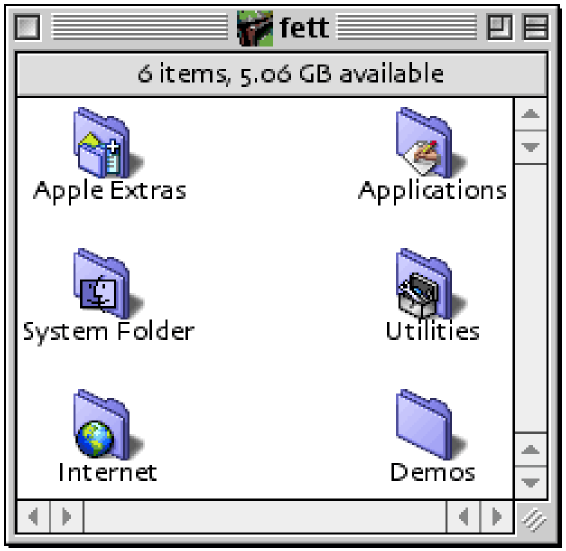
What is the affordance here?

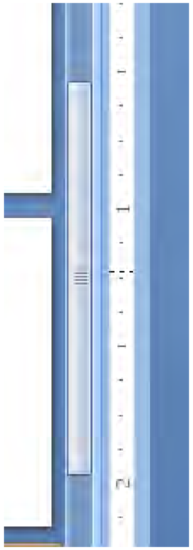


Where does it come from?

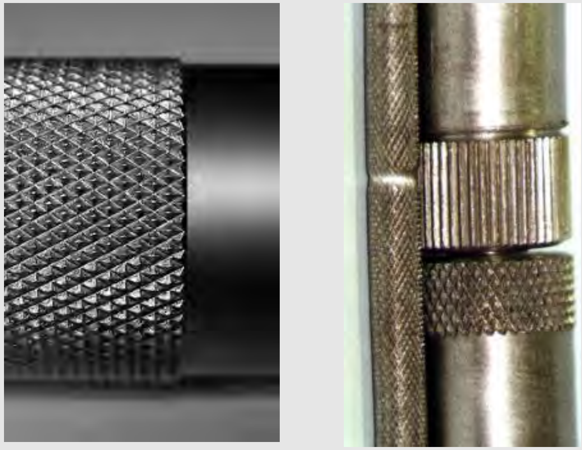
Affordances

What is the affordance here?





Knurling



Where does it come from?

Sequential Affordance

Acting on a perceptible affordance leads to information indicating new affordances

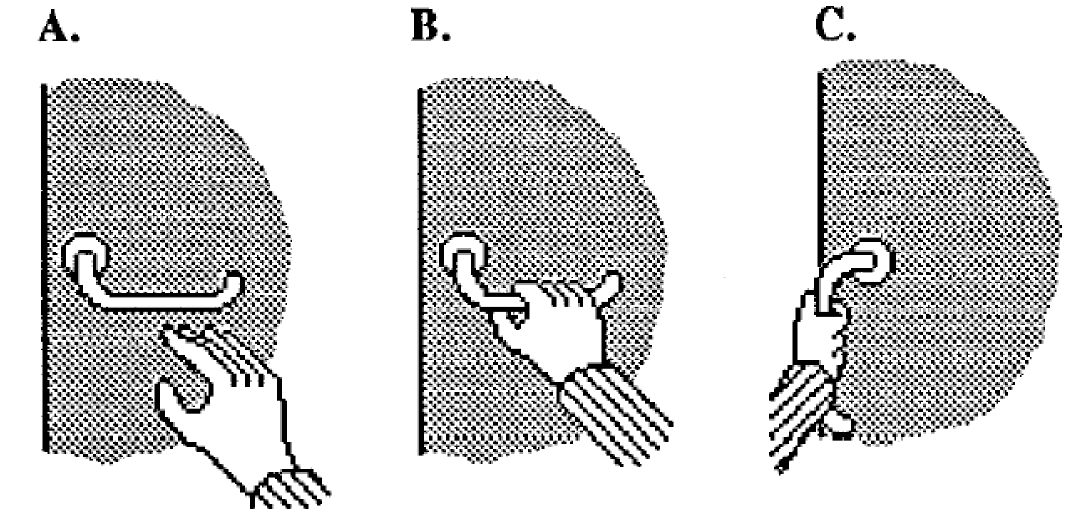


Figure 4. *Sequential affordances: one affordance leads to another. Visual information indicates grasping (A & B); tactile information indicates turning (B & C).*

Sequential Affordance

Acting on a perceptible affordance leads to information indicating new affordances

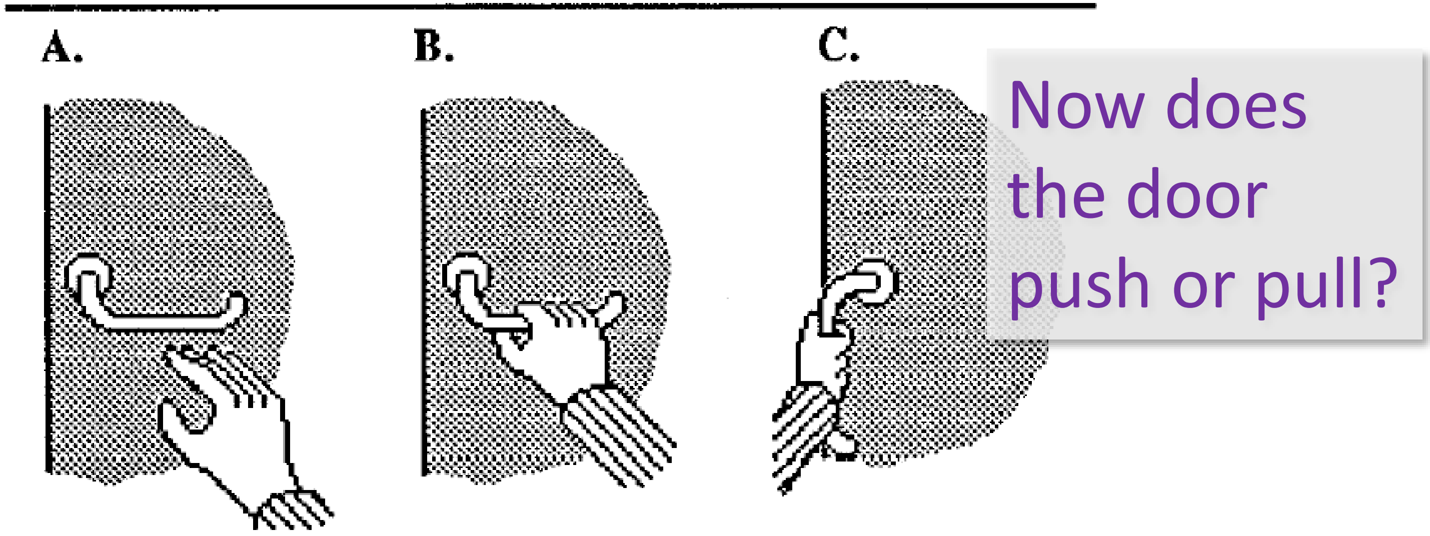
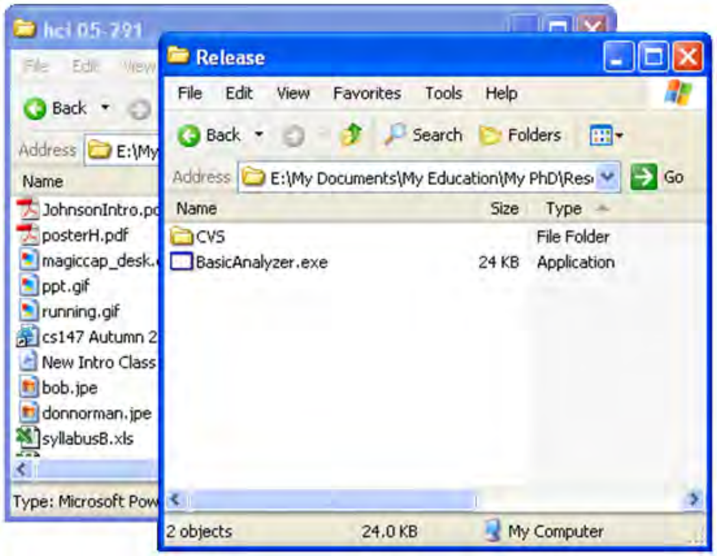


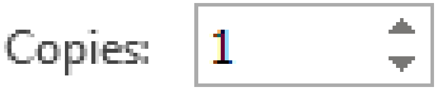
Figure 4. *Sequential affordances: one affordance leads to another. Visual information indicates grasping (A & B); tactile information indicates turning (B & C).*

Nested Affordances

Affordances due to spatial relationships revealing what actions can be done

- Proximate to, contained in, part of





In Other Words

An affordance is what a thing communicates about how it can be used, often by its appearance

"In general, when the apparent affordances of an artifact matches its intended use, the artifact is easy to operate. When apparent affordances suggest different actions than those for which the object is designed, errors are common."

Gaver

Challenges arise if there is a mismatch between implied use versus intended use

False Affordances

When there is perceptual information suggesting an implied use that does not exist

(Just an image of a button, not one that responds)

False Affordances

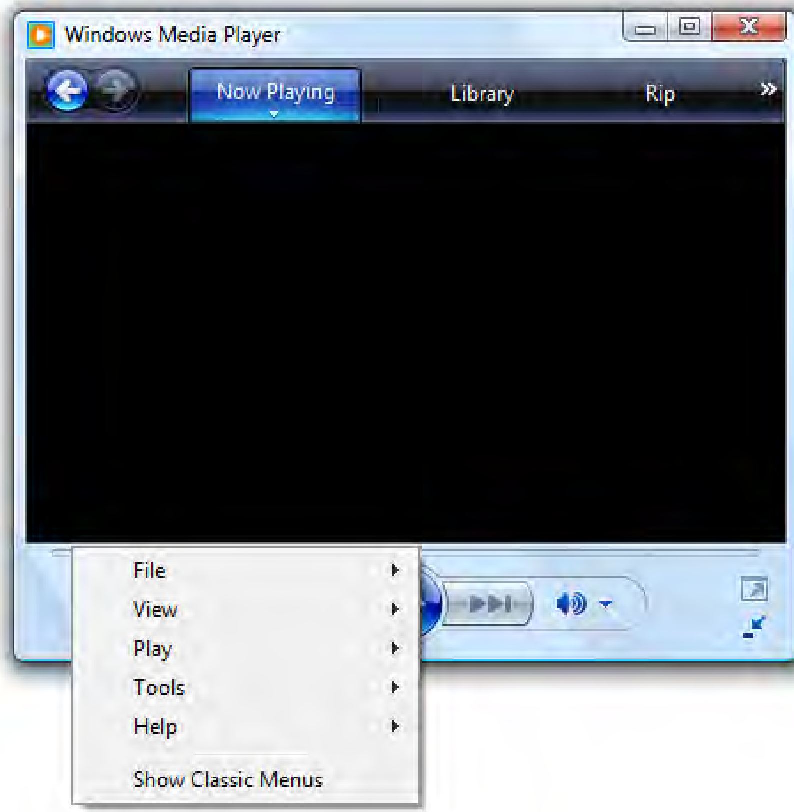
False Affordances

False Affordances

False Affordances

Hidden Affordances

When there is no perceptual information suggesting an actual intended use



Hidden Affordances

Hidden Affordances

Logos linking to home is a convention, but not afforded by the page

Confusion of the Term

“Note also that affordances are not intrinsic, but depend on the background and culture of users. Most computer-literate user will click on an icon. This is not because they go around pushing pictures in art galleries, but because they have learned that this is an affordance of such objects in a computer domain…”

Dix

I disagree. Icons do not afford “pushability” or “clickability” by their attributes. They do not give an indication of their intended use, except by convention.

Clarification on Convention

"Designers sometimes will say that when they put an icon, cursor, or other target on the screen, they have added an 'affordance' to the system. This is a misuse of the concept. … It is wrong to claim that the design of a graphical object on the screen 'affords clicking.' … Yes, the object provides a target and it helps the user know where to click and maybe even what to expect in return, but those aren't affordances, those are conventions, and feedback, and the like. … Don't confuse affordances with conventions."

Norman

Metaphors

Suggest an existing mental model

- “horseless carriages”, “iron horses”, “wireless”

Desktop metaphor

- Not an attempt to simulate a real desktop
- Leverages knowledge of files, folders, trash
- Explains why some windows seem hidden

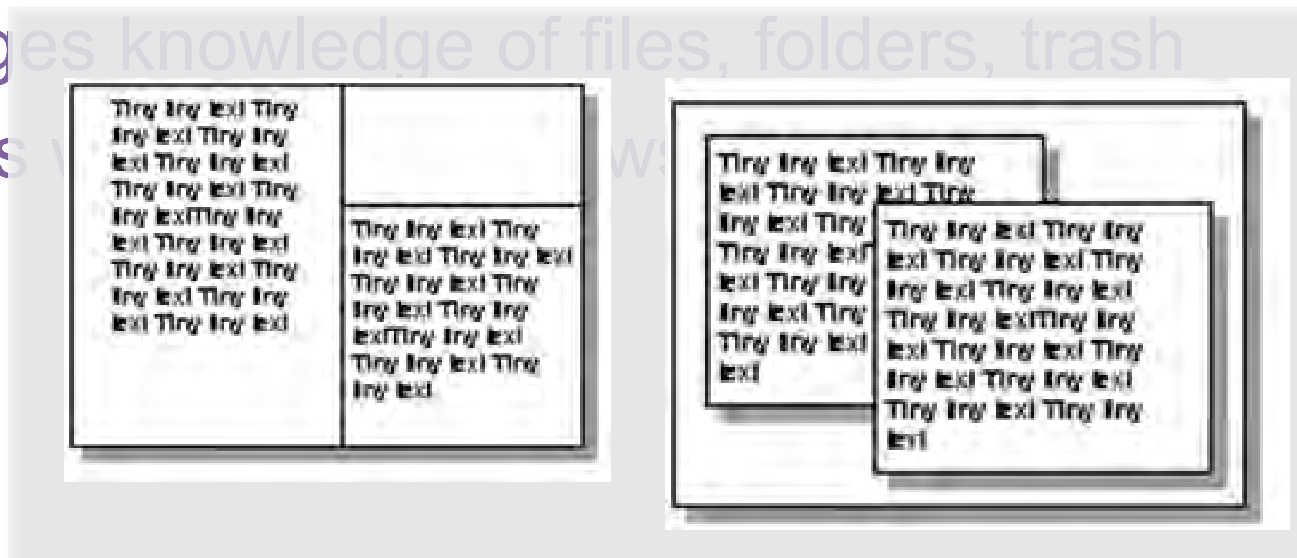
Metaphors

Suggest an existing mental model

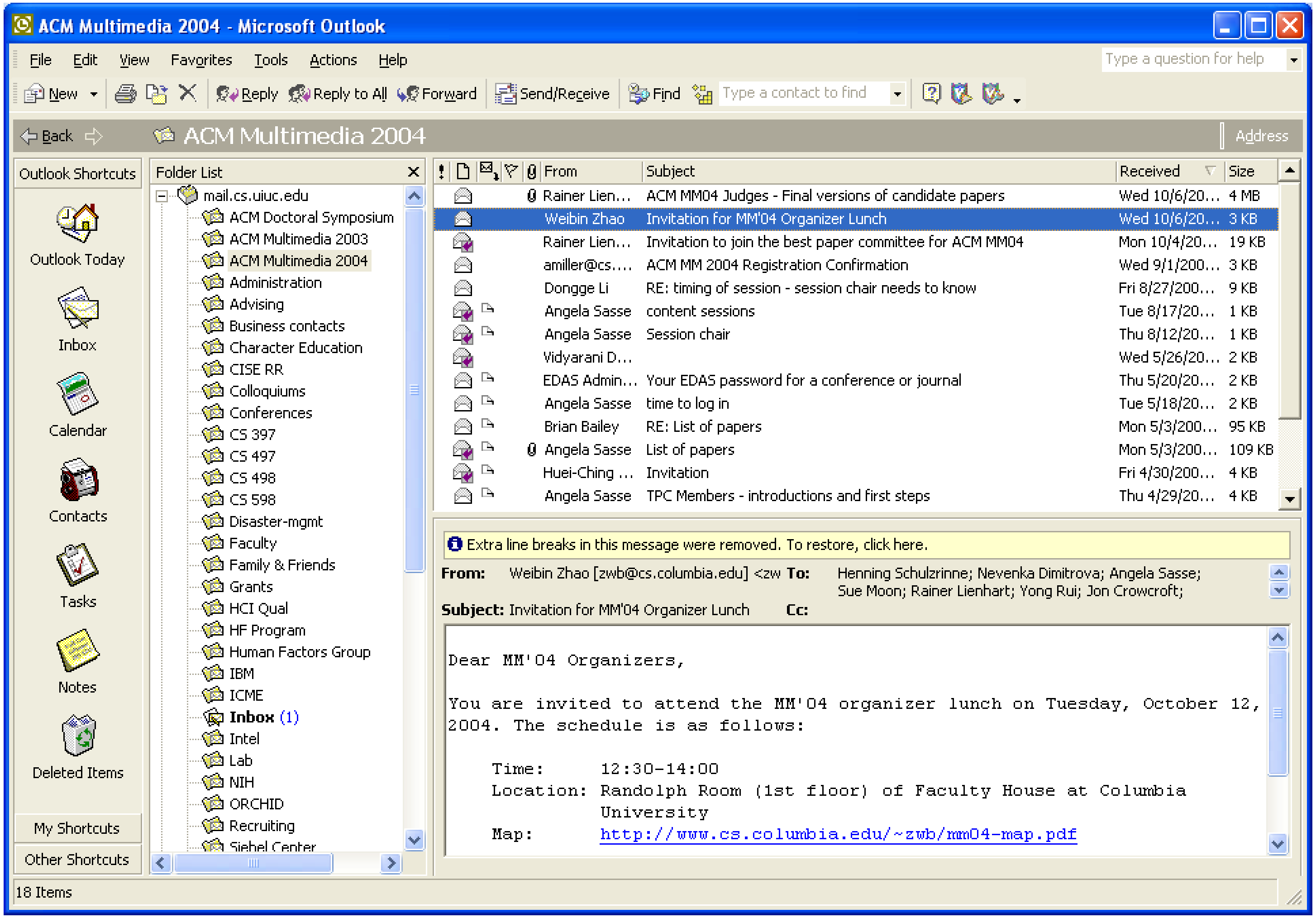
- “horseless carriages”, “iron horses”, “wireless”

Desktop metaphor

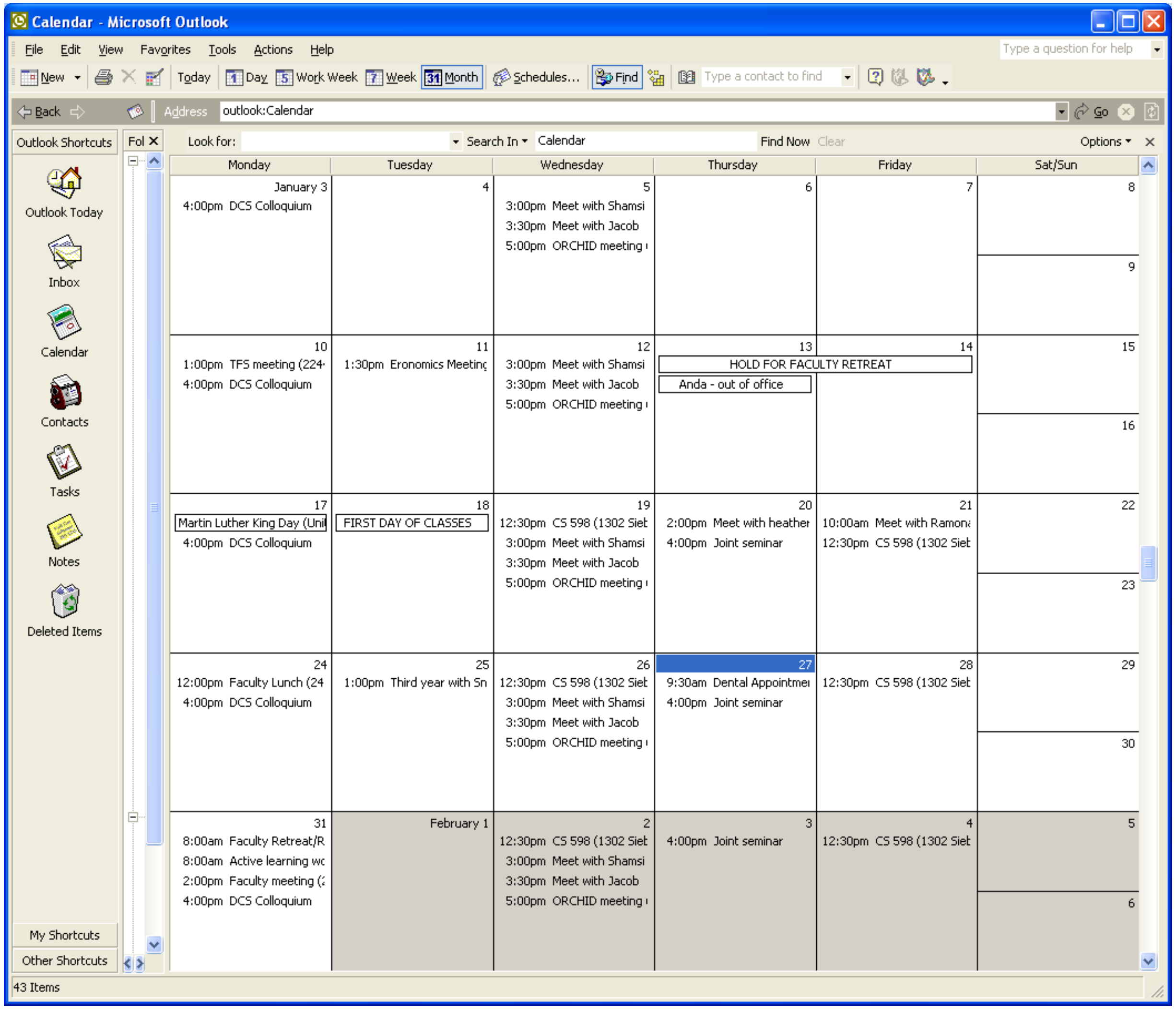
- Not an attempt to simulate a real desktop
- Leverages knowledge of files, folders, trash
- Explains



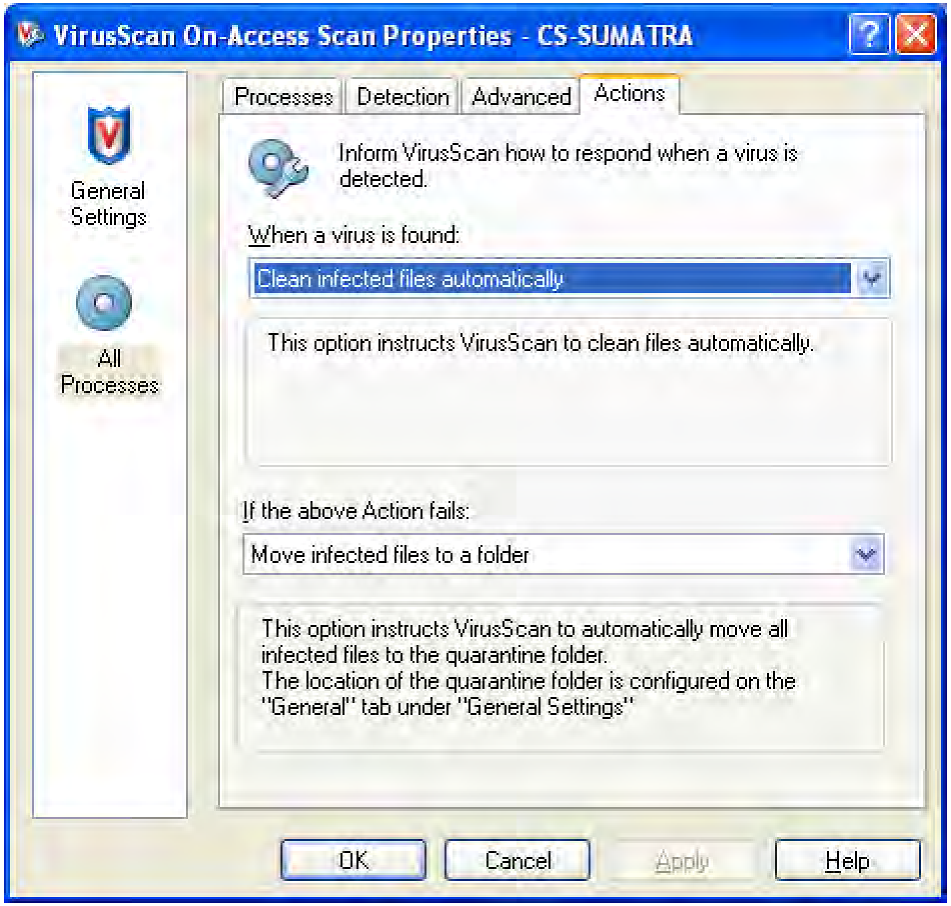
Mail Metaphor



Calendar Metaphor

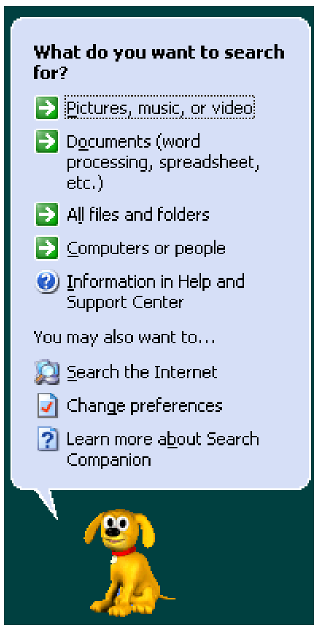


Health Metaphor



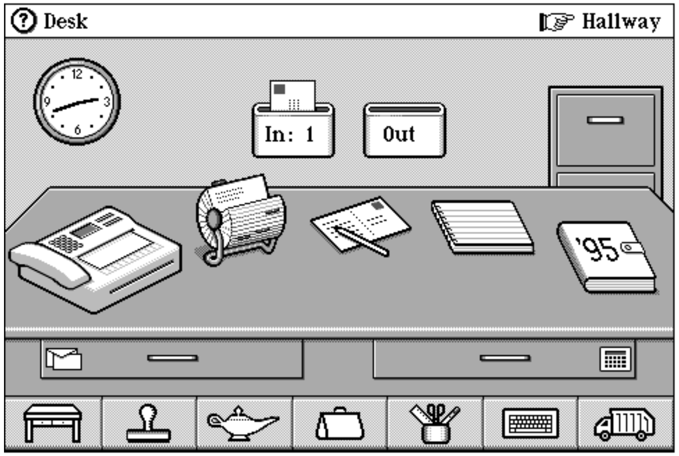
Shallow or Inappropriate Metaphors

Informs a small range of possibilities, or none at all



It is just a menu and a dialog box?

What does the living room add?



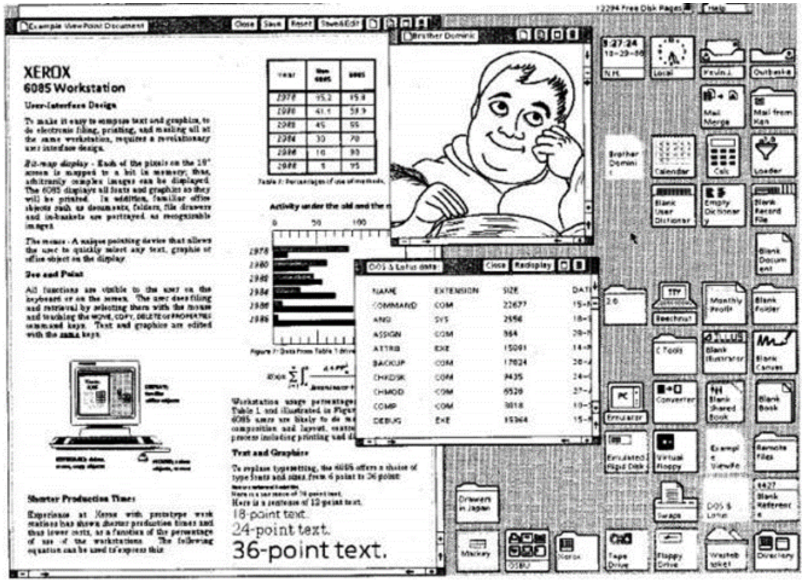
Magic Cap

Microsoft Bob

Mixed Metaphors

Two or more different metaphors coexist with some supposed relation

- The desktop metaphor
- Windows into content



Good? Bad?

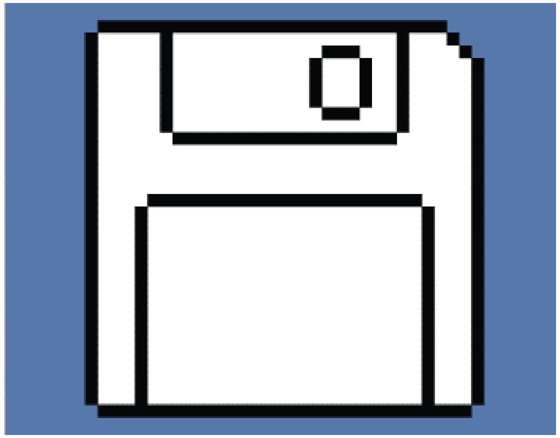
Neither? Both?

Windows are views into larger content regions

No desktop has windows

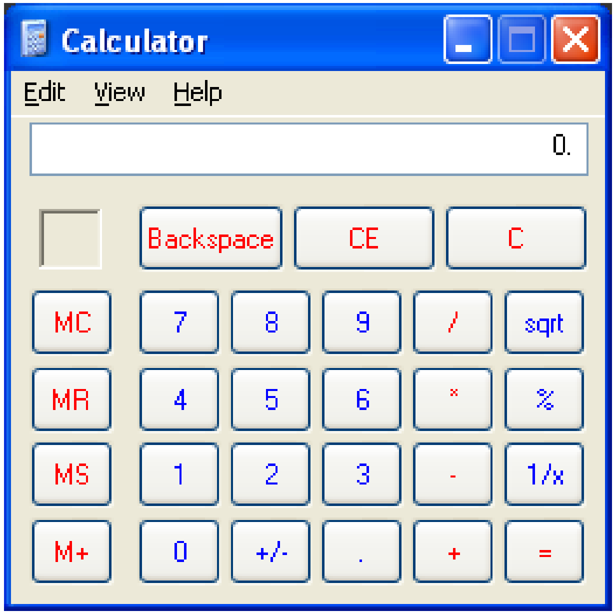
Broken Metaphors

Are not consistent, do not operate in every circumstance, or do not uphold things consistent with what the metaphor would suggest



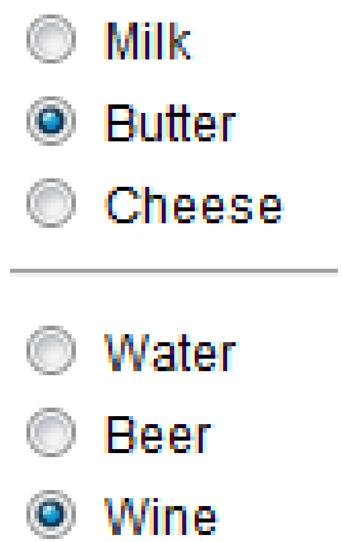
Mechanical-Age Metaphors

Operate as their mechanical-age counterparts did, not taking advantage of the digital domain to escape the limitations of the original



Dead Metaphors

Lost the original imagery of their meaning



Metaphors versus Idioms

Idioms

- rely on shared experience or custom
- are learned, often early in life
- are supported or revealed by context
- become conventions
- do not rely on metaphors

Idiomatic widgets (e.g., screen splitter, dragable title bar)

Single click to select, double click to open

Hyperlinks

Idioms

Star Trek IV: Scotty Uses a Mouse

Idioms

Star Trek IV: Scotty Uses a Mouse

Metaphors and Affordances

Affordances “jump start” a model for interaction

Metaphors “jump start” a model of a system

But if designed poorly, both can be damaging

- Lead to an incorrect model, undermine interaction
- Can limit designer creativity
- Can reduce the advantages of software
- Can be “cute” at the expense of functional

Visibility

Phones

How do you

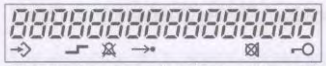
put somebody on hold

change volume

Visibility

Location of Controls

Display



(This display shows all of the possible configurations.)

0 15-30	During a conversation, the call duration is displayed. (Example: 15 minutes, 30 seconds)
	The unit is in the programming mode (p. 9, 16, 20).
	The AUTO button was pressed while dialing or storing phone numbers for the Speed Dialer (p. 16, 19).
	The LOWER button was pressed (p. 21, 23).
	The ringer is set to OFF (p. 10).
	The MUTE button was pressed during a conversation (p. 24).
	The dial lock mode is set. To cancel the mode, see page 27.
F	The FLASH button was pressed while storing phone numbers.
P	The PAUSE button was pressed while dialing or storing phone numbers.
	You pressed [*] while dialing or storing phone numbers in the TONE mode.
	You pressed [#] while dialing or storing phone numbers in the TONE mode.
	While storing a phone number in an UPPER memory location for the One-Touch Dialer, " " will appear when you press a one-touch auto dial button (p. 20).
	While storing a phone number in a LOWER memory location for the One-Touch Dialer, " " will appear when you press a one-touch auto dial button (p. 21).
	The MUTE button was pressed as a secret button while storing phone numbers (p. 18, 22).
	While programming function items, such as the dialing mode, " " will flash as a cursor.

Preparation

5

Visibility

Changing Ringer Volume

- Press “Program”
- Press “6”
- Set Volume
  - Low - Press “1”
  - Medium - Press “2”
  - High - Press “3”
- Press “Program”

Visibility

Controls available on watch with 3 buttons?

- Too many and they are not visible

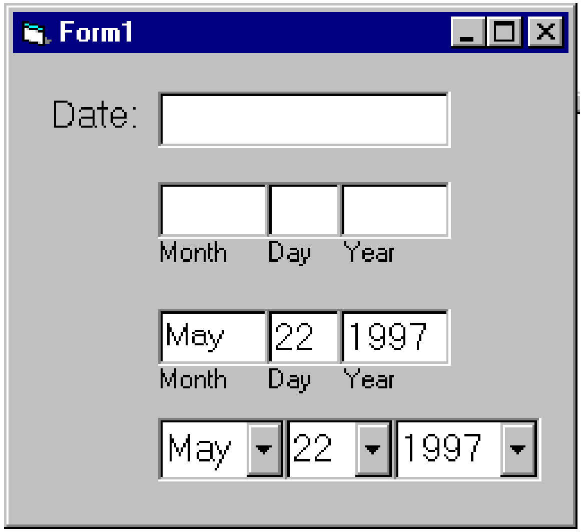
Compare to controls on simple car radio

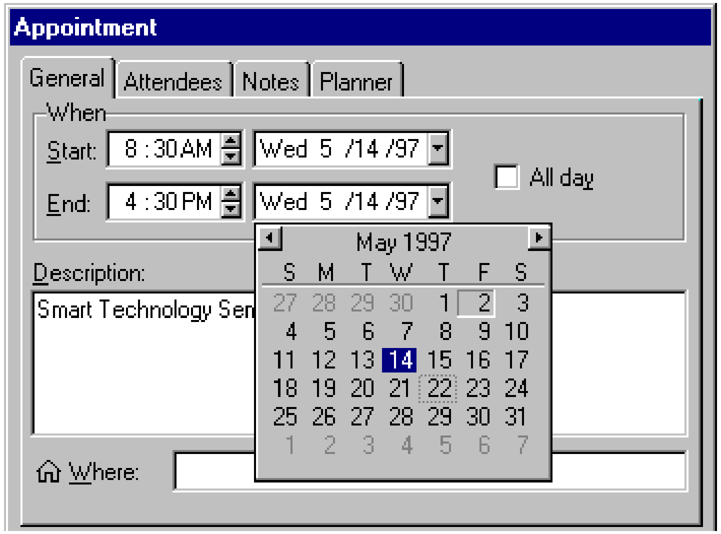
- Number of controls ≈ Number of functions
- Controls are labeled and grouped together

Knowledge in the World

Constraints

Prevent some actions while allowing others





Prevent errors before they can happen

Disruptive error messages are a last resort

Constraints

Constraints

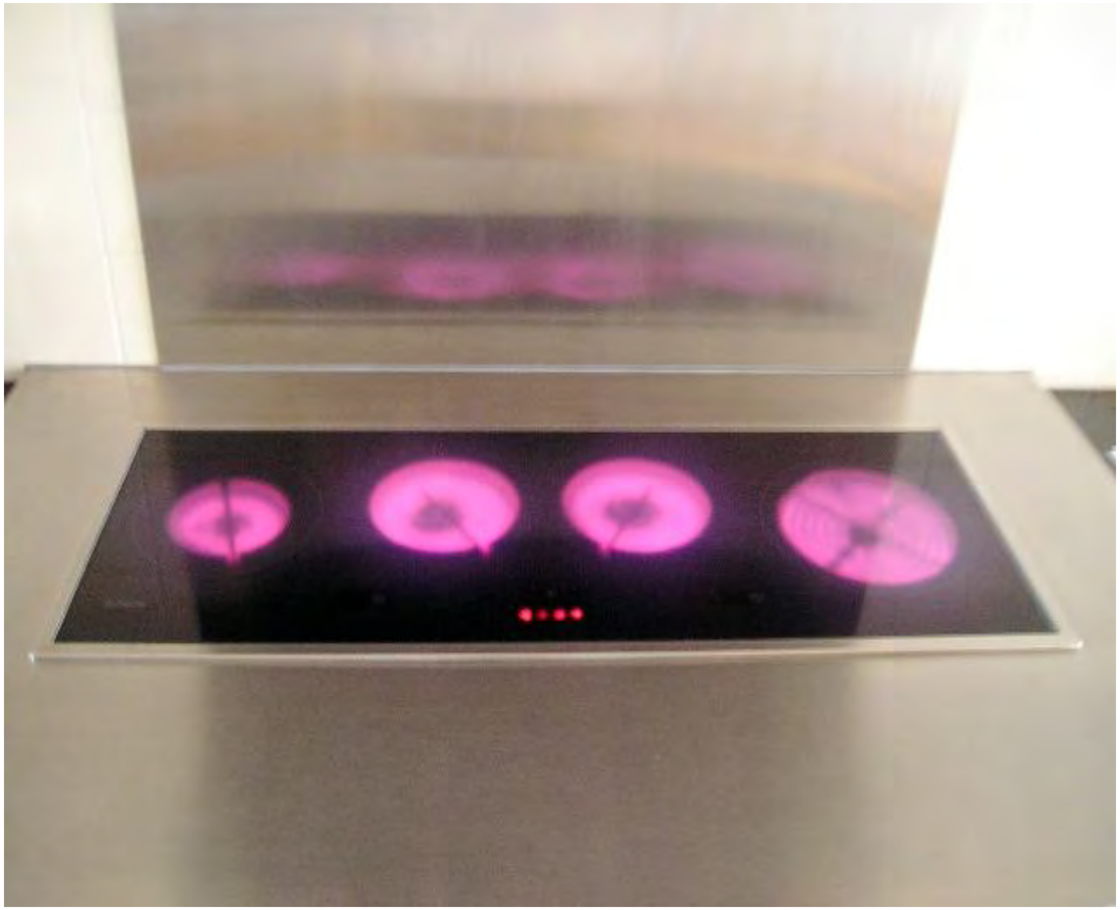
Constraints

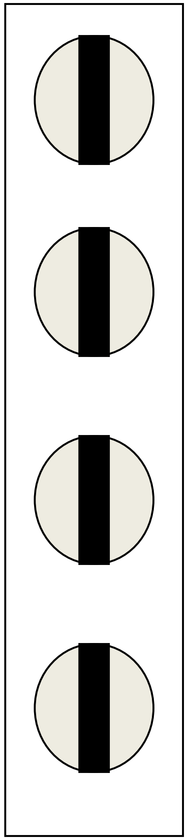
Mapping

Correspondence between an interface and the corresponding action in ‘the world’

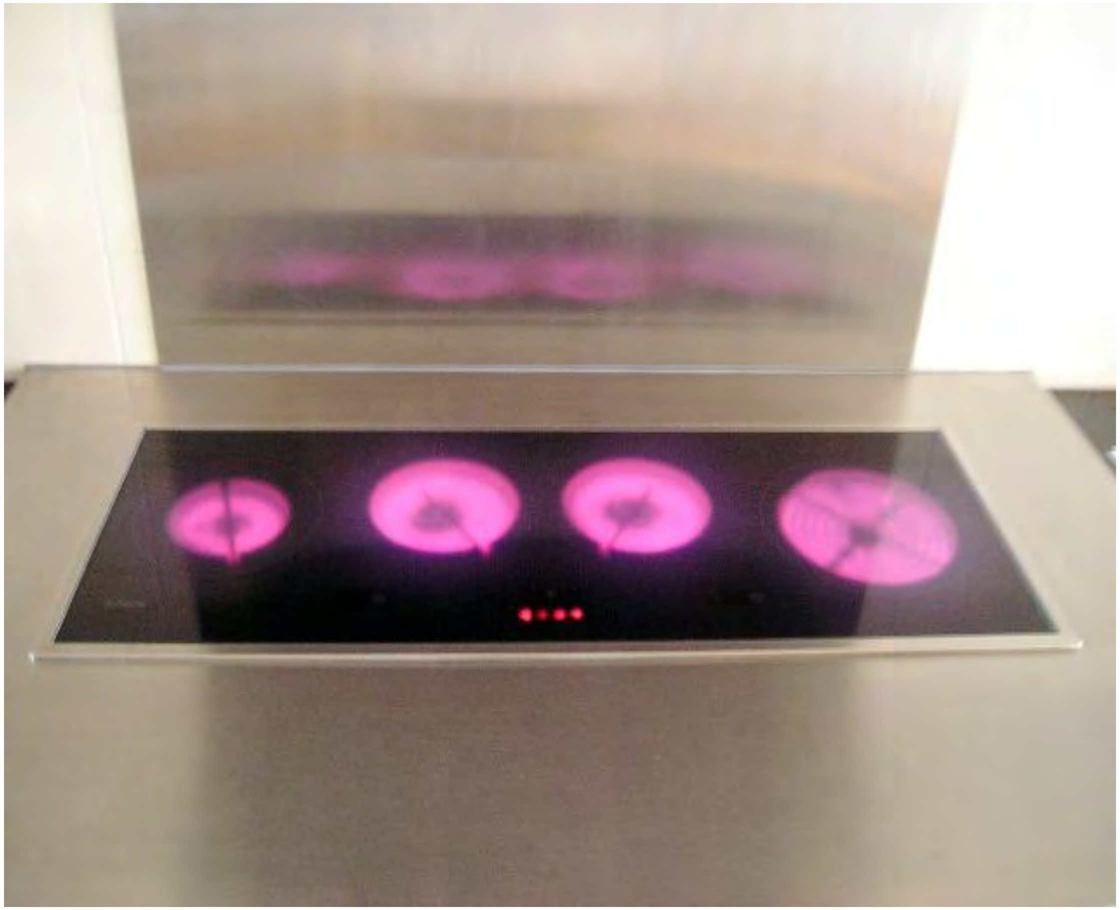
Minimize cognitive steps to transform action into effect, or perception into comprehension (i.e., execution and evaluation)

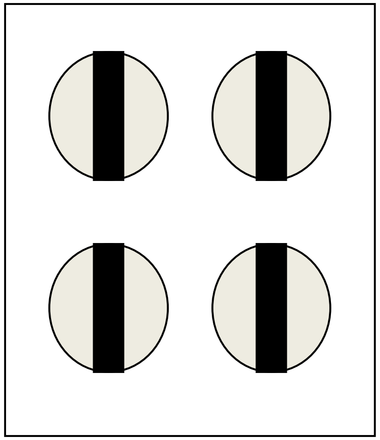
Very Bad Mapping





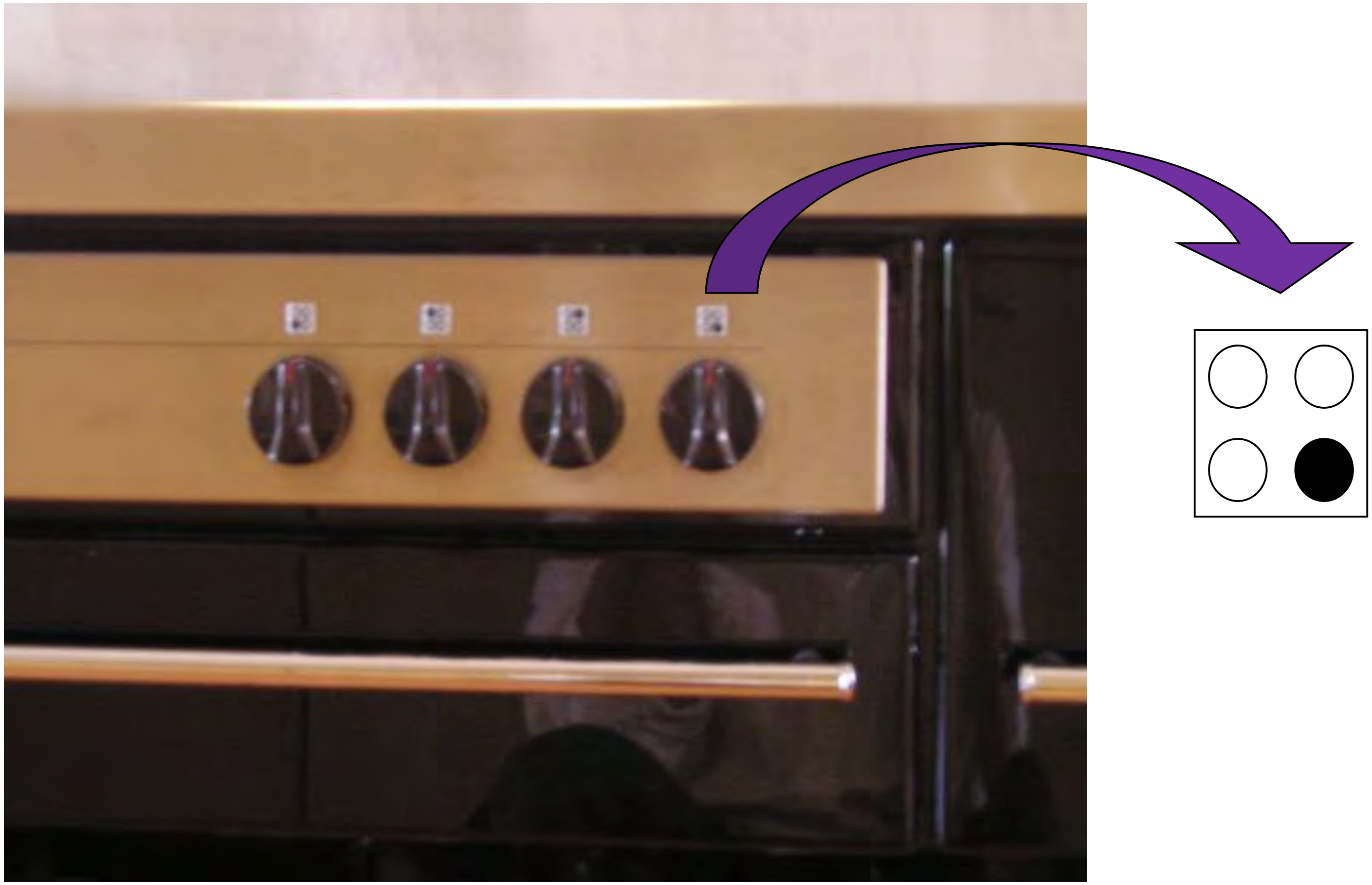
Slightly Better Mapping



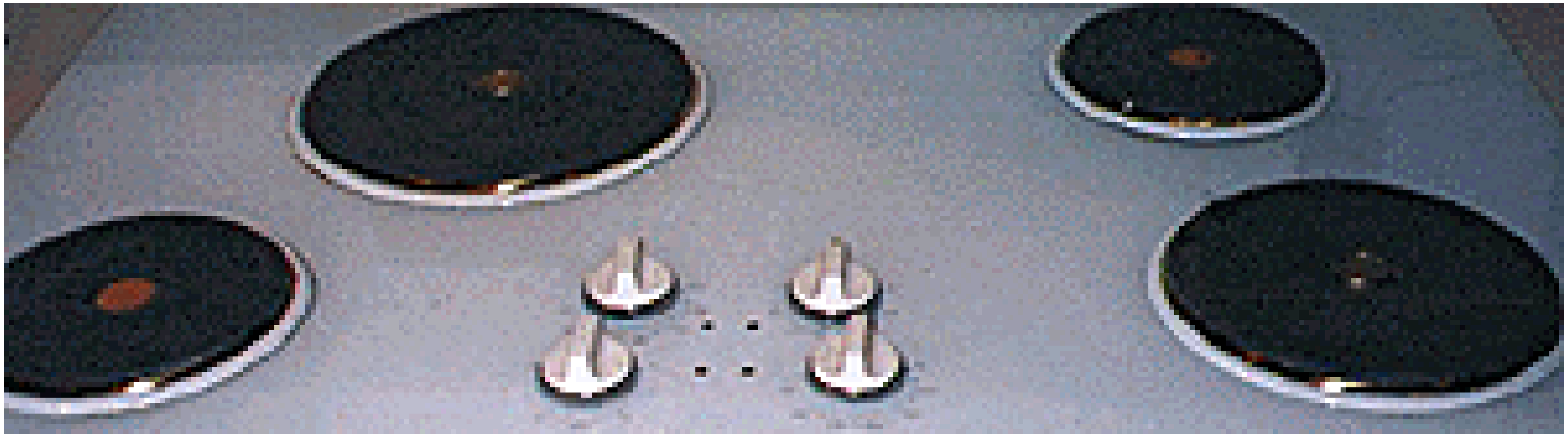


Good Mapping

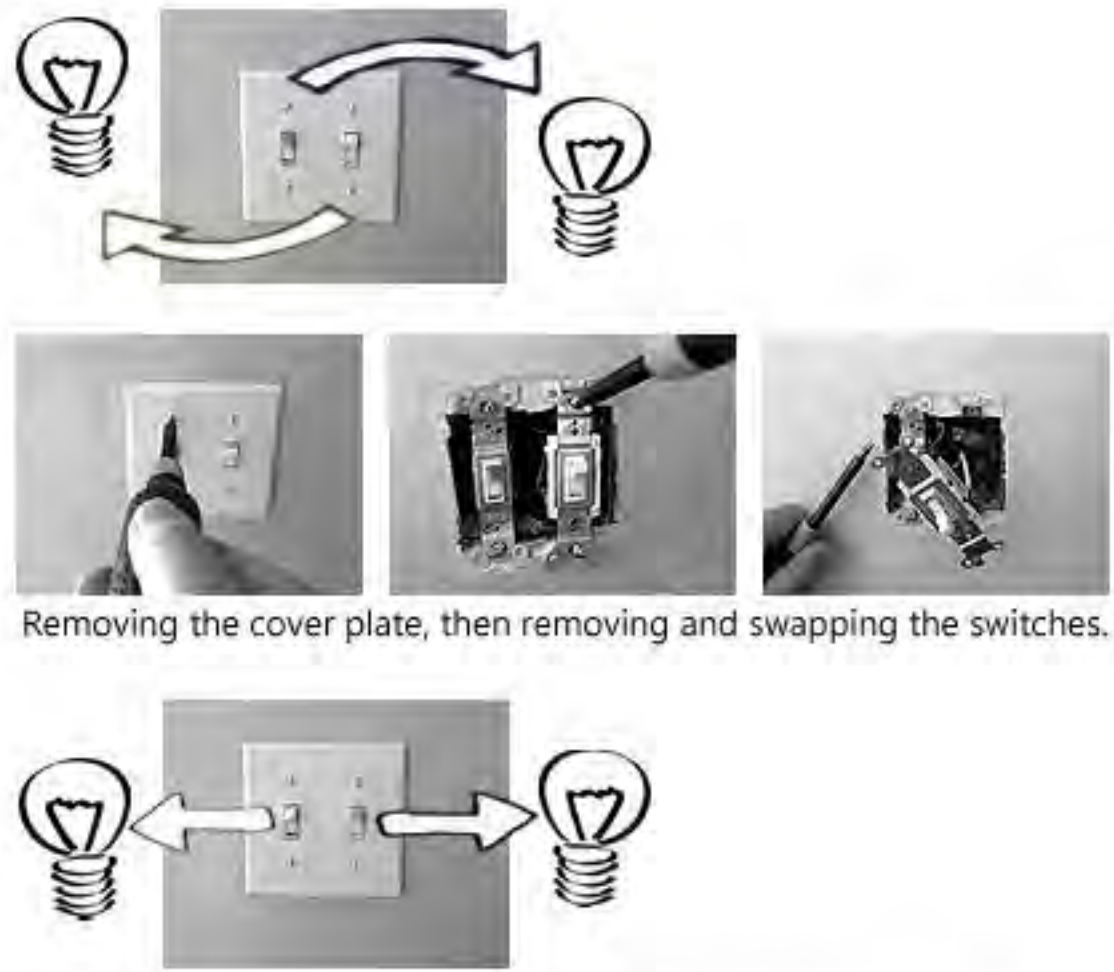
Not this Stove



Great Mapping



Mapping

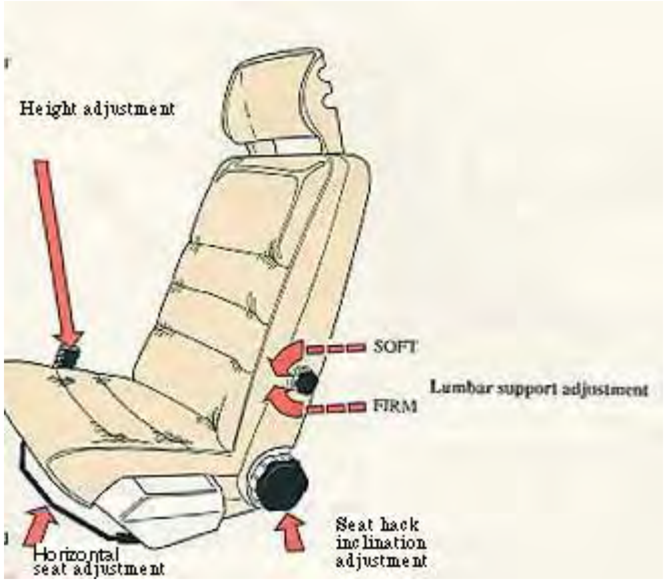


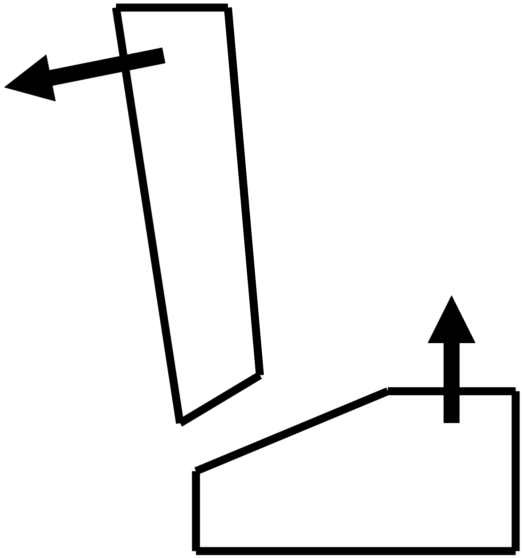
From http://fivesketches.com/2009/11/natural-mapping-of-switches/

Mapping


50 EURO CENT
20 EURO CENT
10 EURO CENT
500 EURO
500
500 EURO
10 EURO
10 EURO
200 EURO
200 EURO
200
100 EURO
100
100

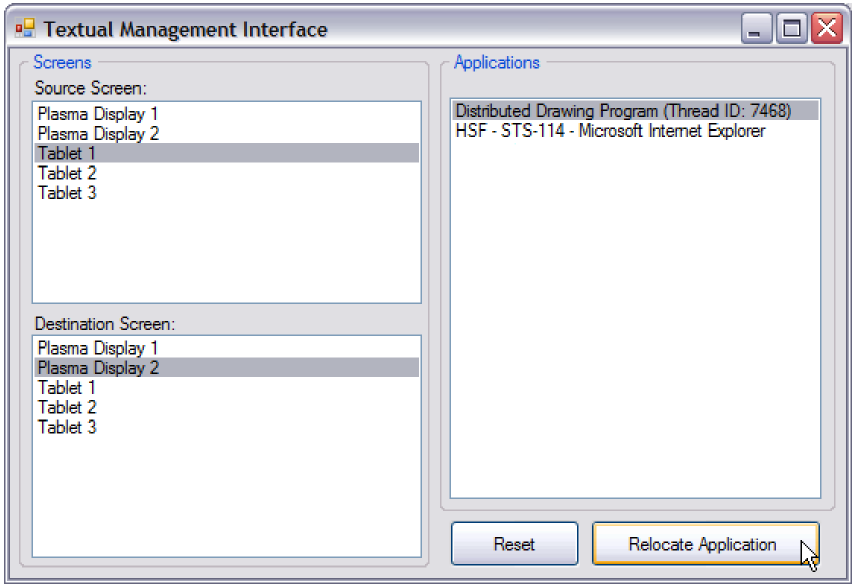
Mapping


Height adjustment
SOFT
Lumbar support adjustment
FIRM
Seat back
inclination
adjustment
Horizontal
seat adjustment

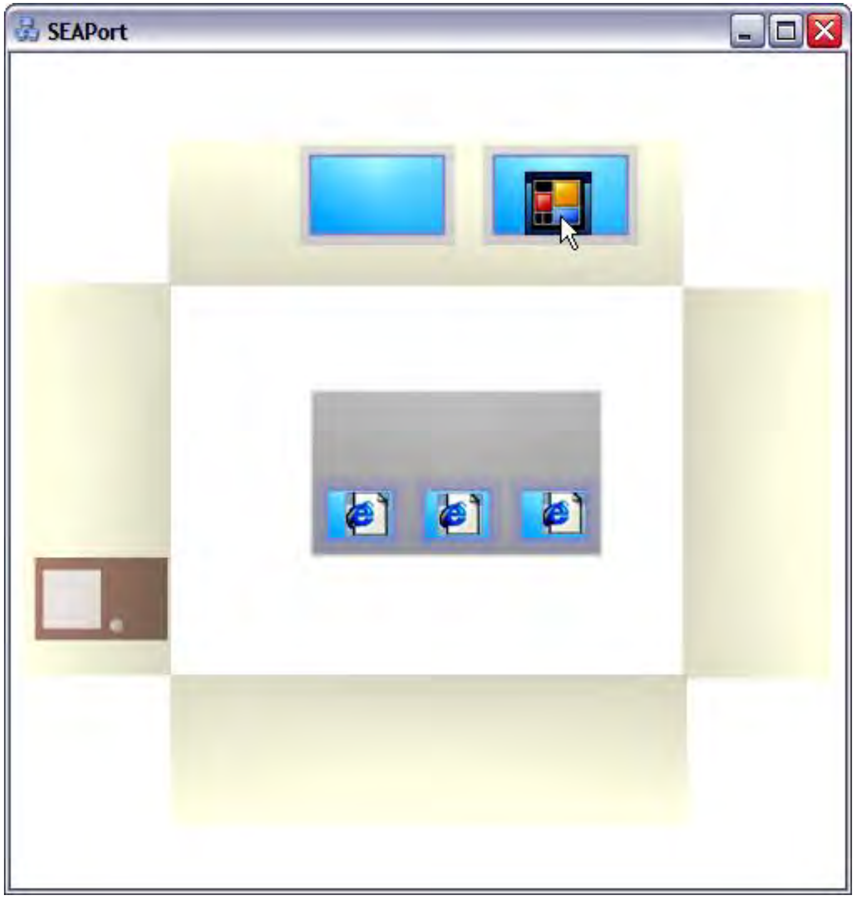


Mapping


ORCHID


Textual Management Interface
Screens
Source Screen:
Plasma Display 1
Plasma Display 2
Tablet 1
Tablet 2
Tablet 3
Destination Screen:
Plasma Display 1
Plasma Display 2
Tablet 1
Tablet 2
Tablet 3
Applications
Distributed Drawing Program (Thread ID: 7468)
HSF - STS-114 - Microsoft Internet Explorer
Reset
Relocate Application

Mapping



Consistency

Interfaces should be meaningfully consistent

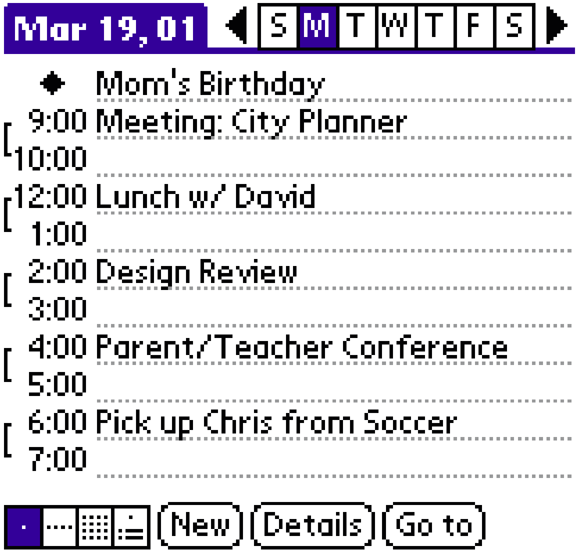
- Ubiquitous use of same keys for cut/copy/paste

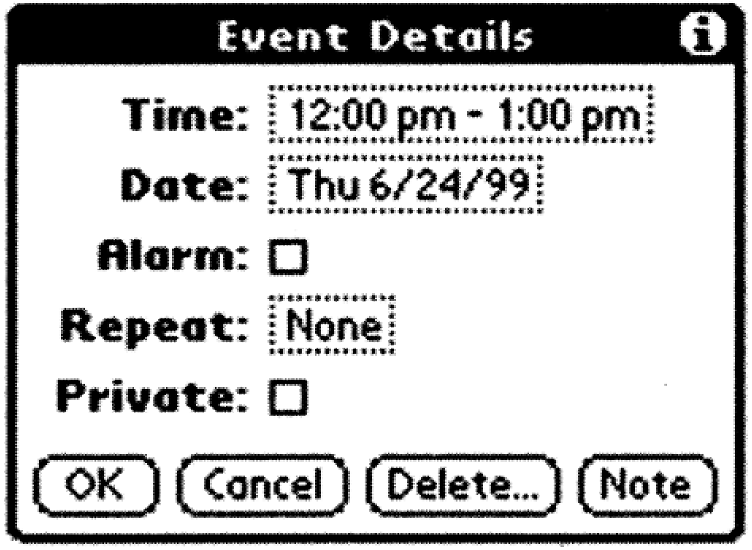
Types of consistency

- Internal (i.e., within itself)
  - e.g., same terminology and layout throughout
- External (i.e., with other applications)
  - e.g., common widget appearance
  - e.g., design patterns common across applications

Is Consistent Always Better?

Should "new" & "delete" be in the same place?





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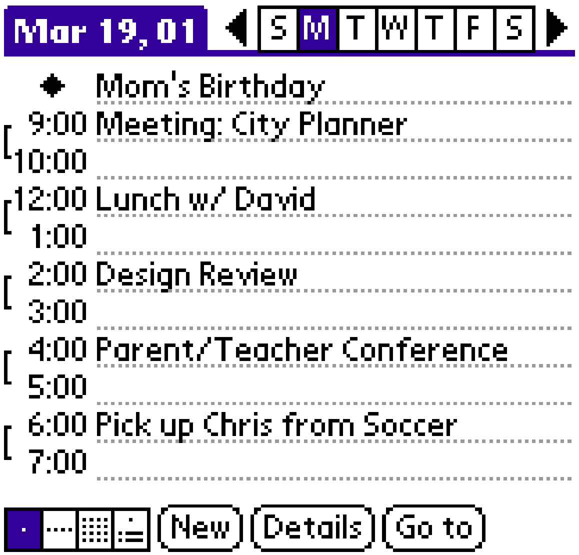
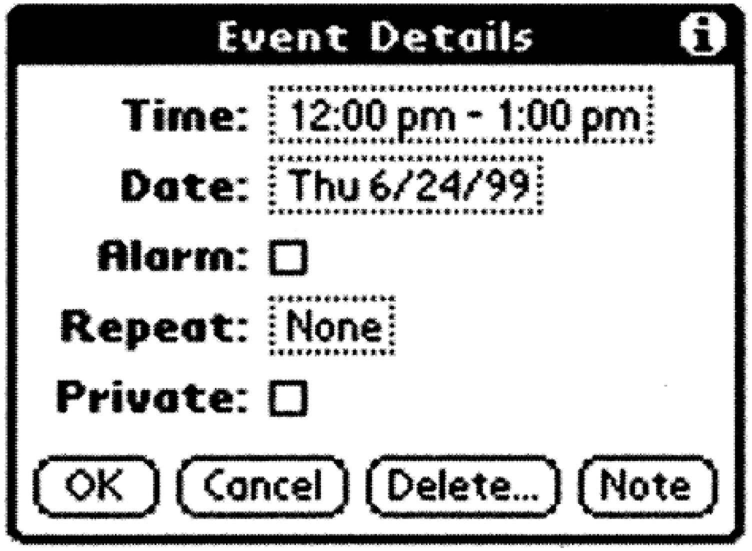
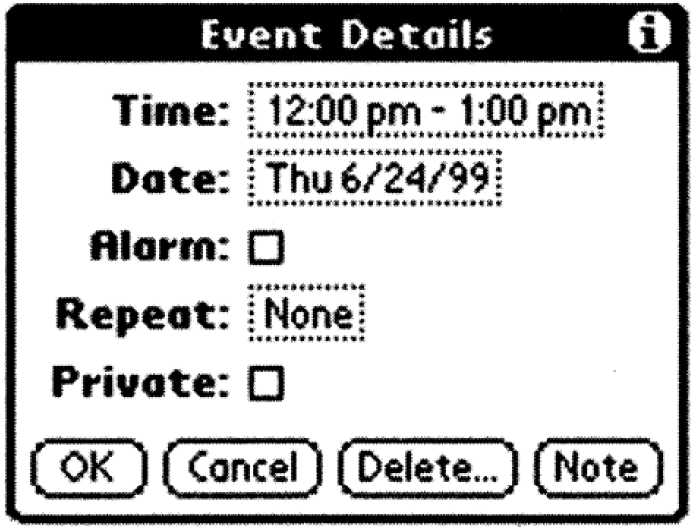




New is common, delete is not

Is Consistent Always Better?

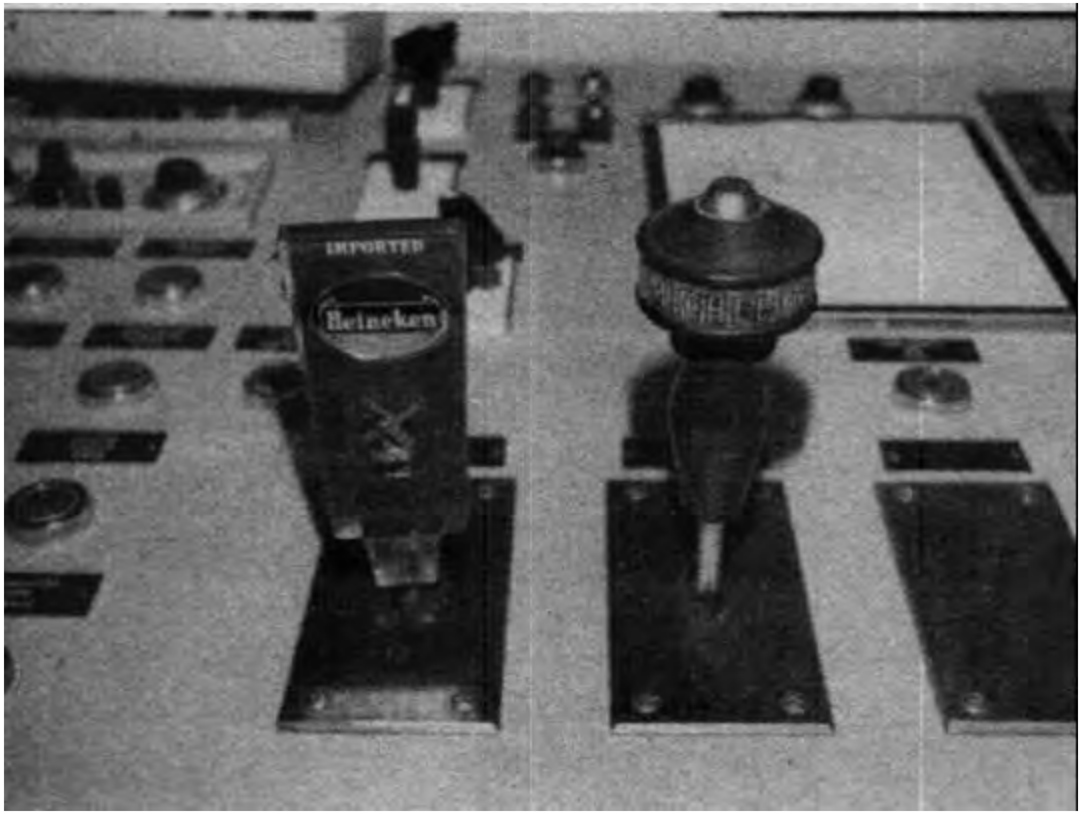


Original focus on consistency, later design for mobile form

Is Consistency Always Better?

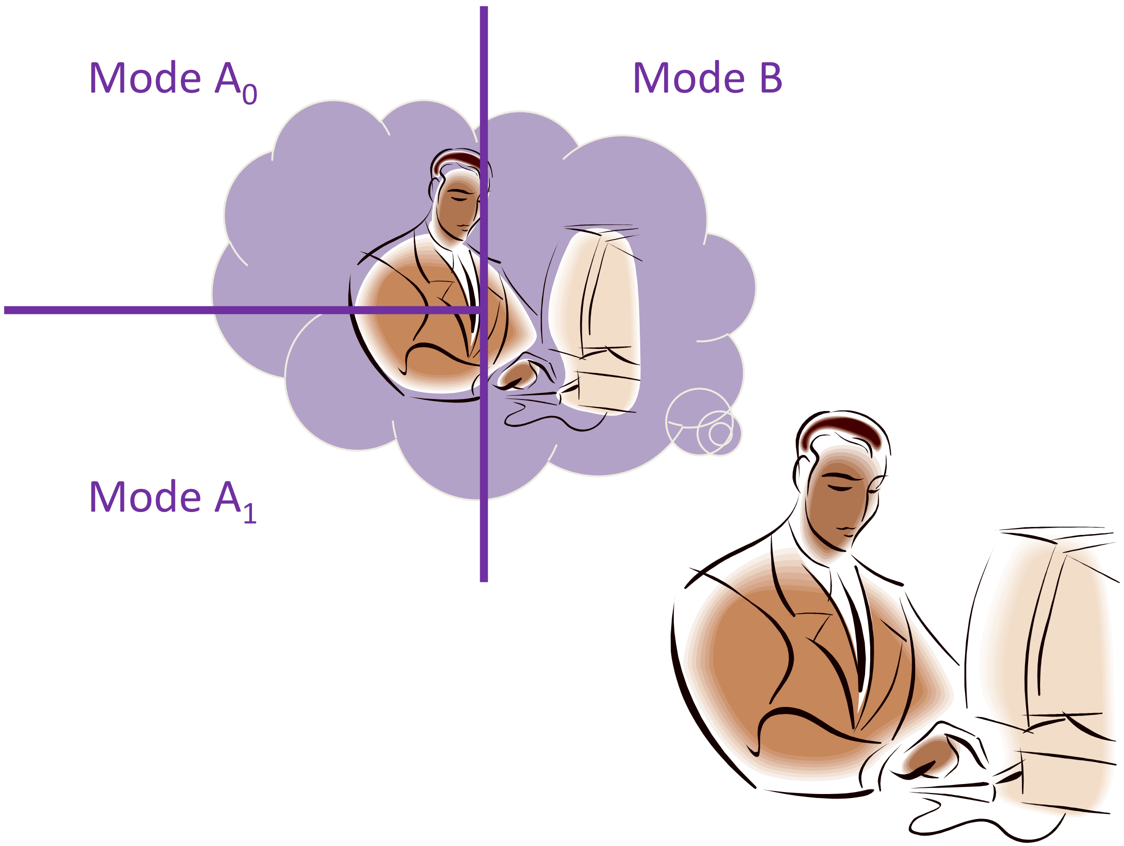
Is Consistency Always Better?

Is Consistency Always Better?



Modes

Modes force people to divide their model



Active versus Passive Modes

Active modes require constant action to maintain

- When that action has ended, so does the mode
- e.g., Shift

Passive modes require action to set, and a separate action to unset, or to set again

- e.g., CAPS LOCK

Active modes are generally preferred

Standardization

If all else fails, standardize

Fewer things to memorize

Reduced learning time

Adapt to new situations faster

e.g., keyboard layout not optimal, but standard

Norman’s Seven Principles for Design

Use knowledge in the head and in the world

Simplify the structure of tasks

Making things visible

Get the mappings right

Exploit the power of constraints

Design for error

When all else fails, standardize

CSE 440: Introduction to HCI

User Interface Design, Prototyping, and Evaluation

Lecture 02:
Design of
Everyday Things

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50

CSE 440: Introduction to HCI

User Interface Design, Prototyping, and Evaluation

Lecture 03:
Contextual Inquiry &
Design Research

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50

Project Status and Assignments

Proposals to be "Funded" and Posted for Bidding

- Bidding Tomorrow, Team Formation Thursday

Looking Forward

- Ideation on Friday in Section
- 2b: Design Research Plan due Tuesday 1/17
- 2c: Design Research Check-In due Friday 1/20
- 2d: Design Research Review due Tuesday 1/24

Other Assignments

- Assignment 0 Due Today
- Reading 1 Posted, Due Friday

Amazing Color Changing Card Trick

Why did I show you that?

If we are focusing on the wrong thing,
we can completely miss other important things

Our assumptions and pre-conceptions play a huge role in how we focus our attention

Today is about this danger when understanding the context for which you design technology

“You Are Not the Customer”

Seems obvious, but…

- You have different experiences
- You have different terminology
- You have different ways of looking at the world

Easy to think of self as typical

Easy to make mistaken assumptions

Today

Ethnography

Contextual Inquiry

Additional Methods

Ethnography

Emerged in 1920s as a new anthropology method, exploring why groups think and act as they do

Learn local language, record myths, customs, and ceremonies in much greater detail than prior work

You will likely never perform an ethnography

Ethnography

Traditional science attempts to understand a group or individual objectively

- Understand the subject of study from the outside in a way that can be explained to “anyone”

Ethnography attempts to understand a group or individual phenomenologically

- Understand the subject of study as the subject of study understands itself

Four Ethnographic Principles

Natural settings

Holism

Descriptive

Member point-of-view

Four Ethnographic Principles

Natural Settings

- Conducted in the setting of the participant
- Focus on naturally occurring, everyday action
- Cannot use laboratory, experimental settings, or a phone call to gather this type of data

You really do have to go out there and see it

Four Ethnographic Principles

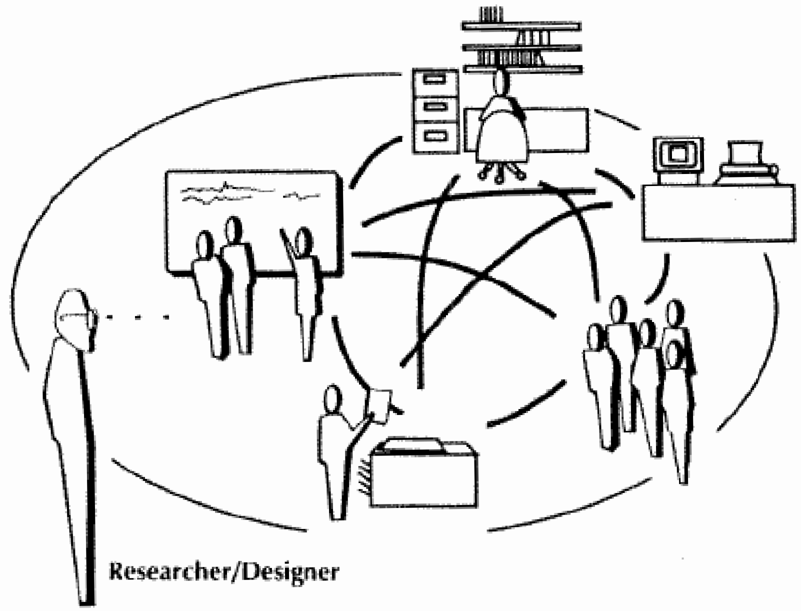
Holism

Behavior can only be understood in its larger social context; that is, holistically.

HOLISTIC

Particular behaviors understood in relation to how they are embedded in the social and historical fabric of everyday life.

Focus on relationship between the parts

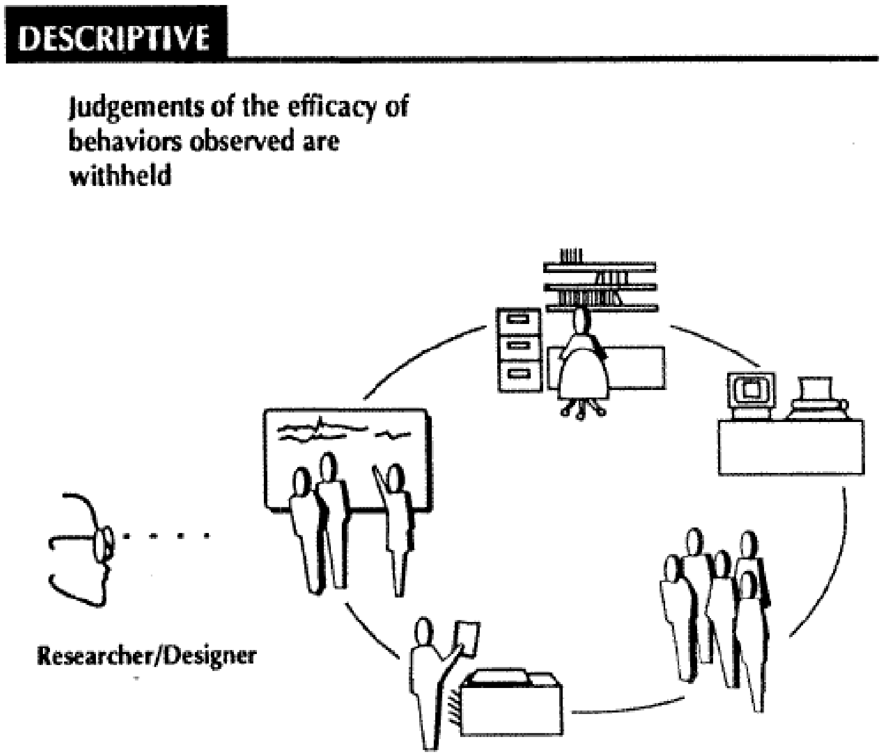


Four Ethnographic Principles

Descriptive

Study how people actually behave, not how they ought to behave.

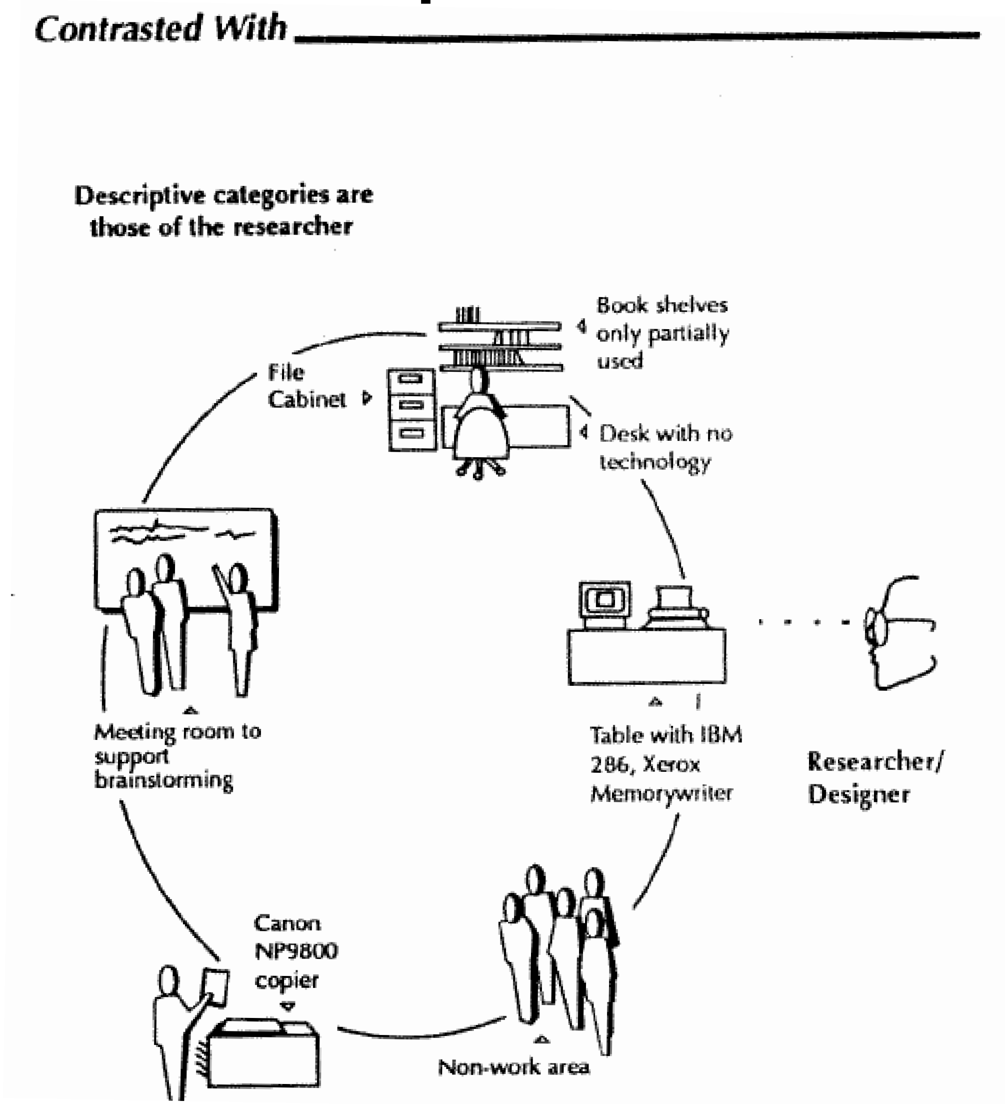
Defer judgment.



Four Ethnographic Principles

Member
Point-of-View

See through participant eyes in order to grasp how they interpret and act in their world.



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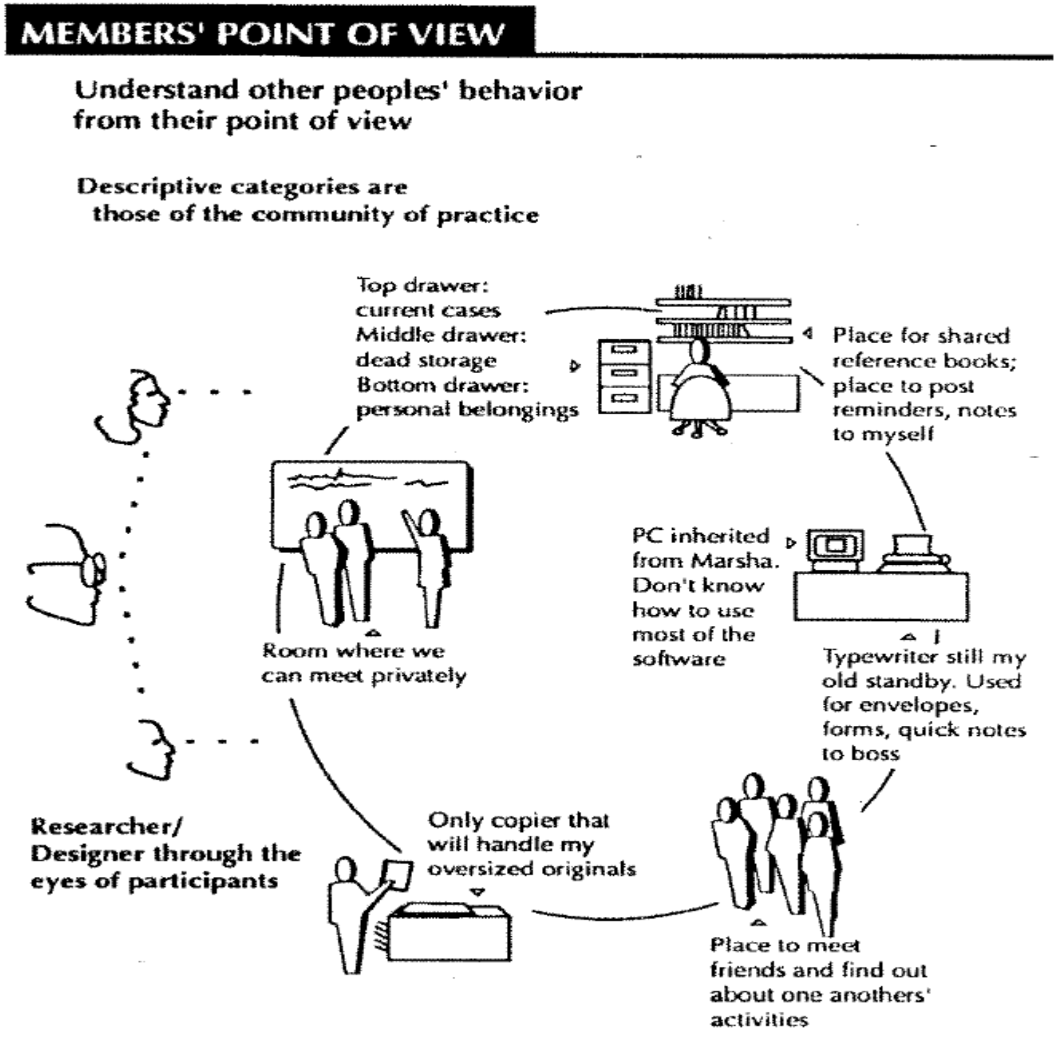


Design Ethnography

Quicker than traditional ethnography

- Days, weeks, or months, not years

Sometimes “concurrent ethnography”

- The ethnography is being done at the same time that design is under way

Goal is to generate insights informing design

- Sometimes “ethnographically inspired methods”

Translating from raw field observation to design ideas can be a difficult process

Today

Ethnography

Contextual Inquiry

Additional Methods

Contextual Inquiry

Applied design ethnography

"The core premise of Contextual Inquiry is very simple: go where the customer works, observe the customer as he or she works, and talk to the customer about the work. Do that, and you can't help but gain a better understanding of your customer."

Hugh Beyer and Karen Holtzblatt

User, Subject, or Participant?

Only two groups refer to their customers as users

In traditional science, “subjects” are “subjected to” experiments as researcher develops understanding

In ethnographically-oriented design methods, “participants” instead “participate” in helping the researcher develop understanding

This is not simple correctness, nor only about respect, it is a mindset that matters for being open

What is your relationship?

In a scientist/subject relationship:

The scientist does stuff

The subject responds in some way

The scientist collects data, goes back to their office, and analyzes the data to gain understanding

This is not very appropriate for gaining phenomenological understanding

What is your relationship?

In an interviewer/interviewee relationship:

- The interviewer asks a question
- The interviewee responds immediately
- At a pause, the interviewer asks the next question from their list
- When all the questions are answered, the interview is complete

This would support gaining phenomenological understanding if you knew what questions to ask

Implying you have phenomenological understanding

What is your relationship?

In a master/apprentice relationship:

- The master is doing stuff
- The master explains what they are doing
- The apprentice asks clarification questions
- The master answers

This relationship is at the heart of contextual inquiry

Master/Apprentice Relationship

Seeing the work reveals structure

- Many instances and interviews reveal the picture

Every current activity recalls past instances

> A customer describing how she learned a feature told us, "I looked it up in the documentation." But when we asked her to look it up again, she was able to show us: "I looked the function up in the index and scanned the section. I saw this icon in the margin that I recognized from the screen, so I read just this paragraph next to it. It told me all I needed to know." The documentation provided the context she needed to recover a detailed story, and the detail revealed aspects that had been overlooked—that the icon was her visual cue to the relevant part of the page.

Unique or One of Many?

“Take the attitude that nothing any person does is done for no reason; if you think it’s for no reason, you don’t yet understand the point of view from which it makes sense. Take the attitude that nothing any person does is unique to them, it always represents an important class of customers whose needs will not be met if you don’t figure out what’s going on.”

(p. 63, Contextual Design)

Not Quite Master/Apprentice

The goal is not to learn to do the task

Instead, the goal is to learn how the participant does the task in order to learn how to support it

And for the researcher to enlist the participant's active assistance in understanding the task

Not Quite Master/Apprentice

In a contextual inquiry relationship:

- The participant is doing stuff
- The participant explains what they are doing
- The researcher offers an interpretation
- The participant agrees or corrects

Partners

- Not really an interview
- Not really an apprentice

Principles of Contextual Inquiry

Context

- Must be done in the setting of the participant.

Partnership

- Master/apprentice model; investigator is humble.

Interpretation

- Observed facts must be regarded for their design implications. Raw facts without interpretation are not very useful.

Focus

- Themes that emerge during the inquiry. You cannot pay attention to all facets of someone’s work at all times.

Context

Go to the workplace & see the work as it unfolds

People summarize, but we want details

Keep it concrete when people start to abstract

"Do you have one? May I see it?"

Context

Imagine studying how a student writes a paper

Why not just ask?

Context

Imagine studying how a student writes a paper

Why not just ask?

May not remember details

- Getting roommate to read drafts

May skip critical difficulties

- Trouble locating references on the Web

Context

Avoid summary data by watching work unfold

We once asked a secretary how she started her day. Her answer was, "I guess I just come in and check my messages and get started." She wasn't able to go beyond this brief summary overview. It was the first thing in the morning and she had just arrived at the office, so we asked her to go ahead and do as she would any other morning. She unhesitatingly started her morning routine, telling us about it as she went: "First I hang up my coat, then I start my computer. Actually, even before that I'll see if my boss has left something on my chair. If he has, that's first priority. While the computer's coming up, I check the answering machine for urgent messages. There aren't any. Then I look to see if there's a fax that has to be handled right away. Nope, none today. If there were, I'd take it right in and put it on the desk of whoever was responsible. Then I go in the back room and start coffee. Now I'll check the counters on the copier and postage meter. I'm only doing that because today's the first of the month. . . ."

Have them think aloud..

Context

“One customer said he would not use a manual’s index to find the solution to a problem: ‘It’s never in the index.’ He could not say what led him to this conclusion, what he had looked up and failed to find. All his bad experiences were rolled up into one simple abstraction: it’s not there. But when we watched him looking things up, we could see that he was using terms from his work domain, but the index listed parts of the system.”

Context

"A customer was unable to describe how she made her monthly report. When asked to create it, she pulled out her last report and started filling in the parts."

Context

If cannot observe, ground in an instance

Span time by replaying past events in detail

Look for holes

Ask questions to fill them

Use artifacts for context

If story has not yet ended, go back to a story that did

Customer: *When I got this problem report I gave it to Word Processing to enter online—*

(Why did she decide to give it to Word Processing? Did she do anything first?)

Interviewer: *So you just handed it on automatically as soon as you got it?*

C: *No, it was high priority, so I read it and decided to send a copy to the Claims department.*

(How did she decide it was high priority? Is it her decision?)

I: *How did you know it was high priority?*

C: *It has this green sticker on it.*

(Someone else made the decision before the report ever got here. Who and when?)

I: *Who put on the green sticker?*

C: *That's put on by the reporting agency. They make the decision about whether it's high priority and mark the report.*

(We can better pursue how the reporting agency makes the decision with them; we'll only get secondhand information from this user. Instead of trying to go further backward, look for the next missing step forward: doesn't Claims get a more personal communication than just the report?)

I: *Did you just send it on to Claims, or did you write them a note about why they needed to see it?*

C: *Oh, I always call Claims whenever I send them one of these reports.*

Partnership

- Traditionally, interviewer has too much power
  - You do not know what will turn out to be important
- Apprenticeship model tilts power back too far
  - You are not there to learn the skill

- Interviewer should create a partnership
  - Alternate between watching and probing

Partnership

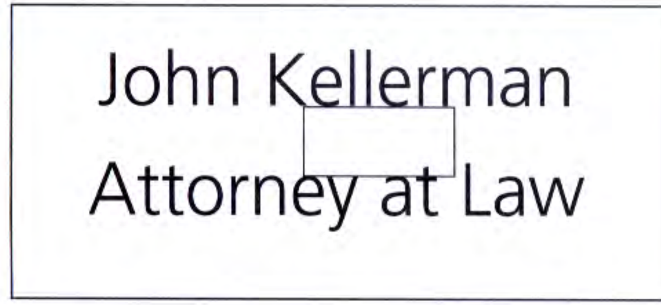
Withdrawal and return

Researcher observes action that indicates something meaningful

The researcher asks about this, and the pair withdraw from the task

Discuss the question

Then return to the task



In one interview with a user of page layout software, the user was positioning text on the page, entering the text and moving it around. Then he created a box around a line of text, moved it down until the top of the box butted the bottom of the line of text, and moved another line of text up until it butted the bottom of the box. Then he deleted the box.

Interviewer: *Could I see that again?*

Customer: *What?*

I: *What you just did with the box.*

C: *Oh, I'm just using it to position this text here. The box doesn't matter.*

I: *But why are you using a box?*

C: *See, I want the white space to be exactly the same height as a line of text. So I draw the box to get the height.* (He repeats the actions to illustrate, going more slowly.) *Then I drag it down, and it shows where the next line of text should go.*

I: *Why do you want to get the spacing exact?*

C: *It's to make the appearance of the page more even. You want all the lines to have some regular relationship to the other things on the page.*

Partnership

Do not squash design ideas if they arise

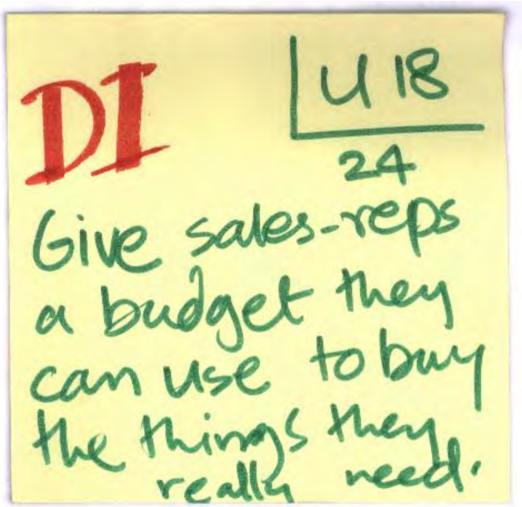
This is design, not dispassionate science

Get instant feedback

If it works, you understand the work practice and have a solution

If it fails, you can improve your understanding of the work

Find the issues behind design ideas



Partnership

Avoiding Other Relationship Models

Interviewer / Interviewee

- You are not there to
  get a list of questions answered

Expert / Novice

- You are not there to answer questions

Guest / Host

- Move closer, ask questions, be nosy

Interpretation

Chain of Reasoning

- Fact, Hypothesis,
  Implication for Design, Design Idea

Design is built upon interpretation of facts

- Design ideas are
  end products of a chain of reasoning
- So interpretation had better be right

Share interpretations with users to validate

- Will not bias the data
- Teaches participant to see structure in the work

Interpretation

Instead of asking open ended questions…

- “Do you have a strategy to start the day?”
- “Not particularly.”

… give participants a starting point

- “Do you check urgent messages first, no matter where they are from?
- “Actually, things from my boss are important, because they are for me to do. Messages or faxes may be for anybody.”

Participants fine-tune interpretations

- Probe contradictions until assumptions fit

Interpretation

Non-verbal cues can confirm or negate

Yes and Nos

- "Huh?" – way off
- "Umm, could be" – probably no, just being polite
- "Yes, but…" or "Yes, and" – depends what follows

Commit to hearing what people actually say

- Most have not ever had people actually pay careful attention to what they are doing

Focus

Everybody has a focus, you cannot prevent it

- Entering focus
- Project focus

Because you will have a focus, be mindful of that focus and use it to your advantage

Brainstorm and define your focus

Focus

- Focus defines the point of view
  - Clear focus steers the conversation
  - Everyone in the team has an entering focus
- Focus lets the interviewer sees more
  - Focus reveals detail
- Focus conceals the unexpected
  - Focus on one, and lose the other
- Start with a focus and then expand

Focus

Opportunities to expand focus:

Surprises, contradictions, idiosyncrasies

- Nothing any person does is for no reason

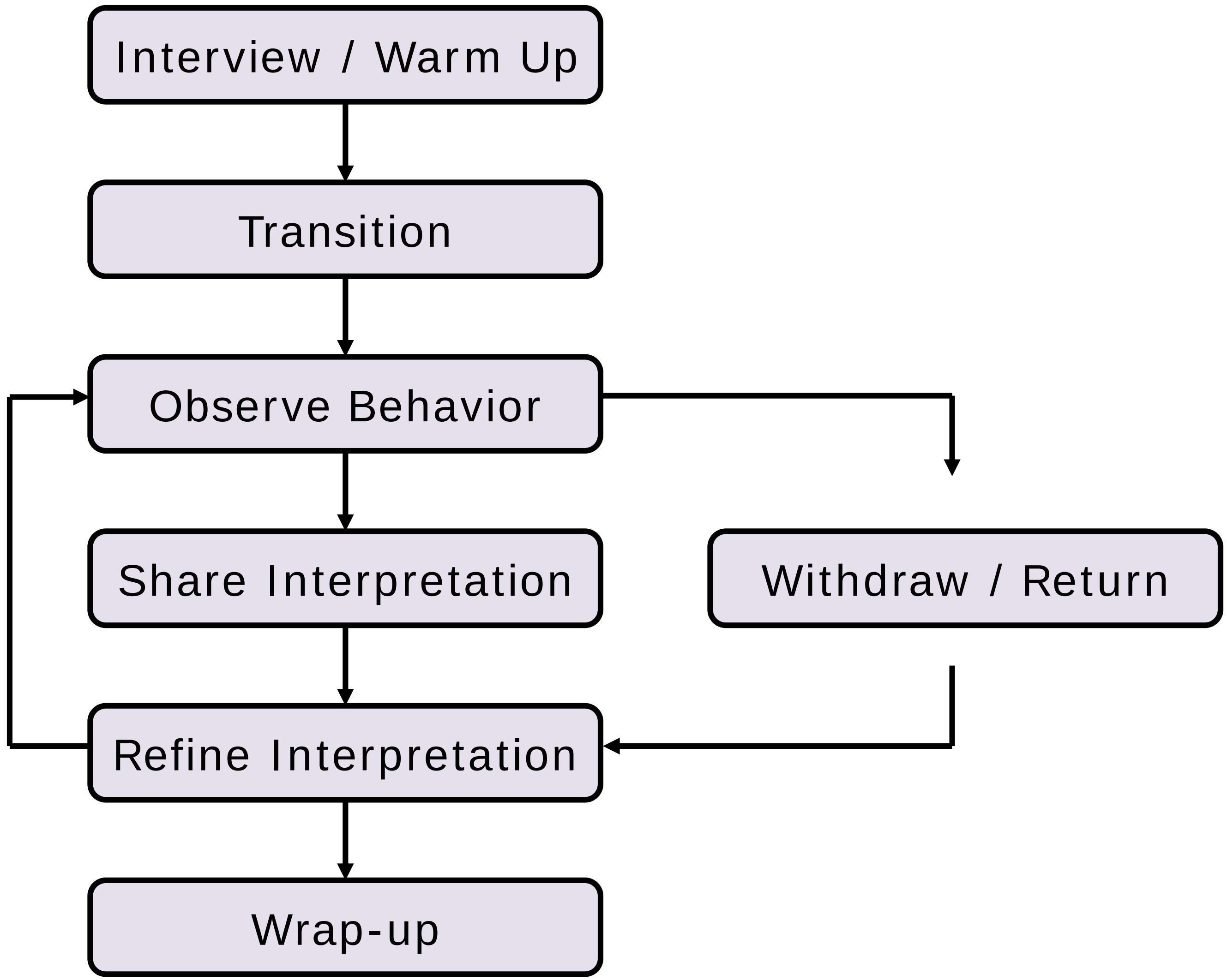
Nods

- Question assumptions even if they match
- “Do they really do that? Why would they do that?”

What you do not know

- Treat interview as an opportunity to learn new stuff
- Even if the participant is not knowledgeable, extent of their knowledge / misinformation can be useful

The Stages of a Contextual Inquiry



Explain the Rules

Be sure you explain “the rules” of how you’ll be interacting during the contextual inquiry

If this isn’t completely clear, the encounter may devolve into a traditional interview (since this relationship is more familiar to people)

How to Screw it Up

- Slipping into abstraction
  - Keep it concrete, in the work, in the details
- Not being inquisitive or nosy enough
  - If you have the impulse to ask, do it right away
- Being too pushy with interpretation
  - If you ignore corrections, participant will shut down

How to Screw it Up

- With the wrong person
  - They need to be willing to partner with you
- Turning it into a regular interview
  - If you could have done it in a coffee shop, then you did not do a contextual inquiry
- Multiple people present
  - Can be good if they talk, surface their thoughts
  - Bad if they do not talk, are not forthright

How to Screw it Up

Overly disrupting the task

- If you change the task, your data is less useful
- Withdrawal and return, maybe on a schedule
- Retrospective methods might be necessary
- (e.g., going through artifacts, prior critical incident)

Being stuck in your focus

- Important to have a focus,
  expectations of what you expect to be important
- But you learn by attending to misconceptions

When All Else Fails

Remember Master/Apprentice

Remember Context

Remember Withdraw & Return

Affinity Diagrams

Generated during group session

Each observation, idea, note to a post-it

Notes are hierarchically organized into themes, based on project focus

Today

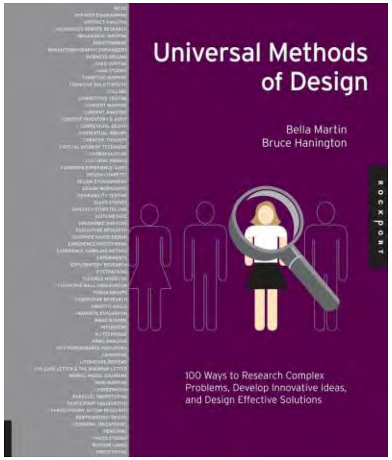
Ethnography

Contextual Inquiry

Additional Methods

Many Design Research Methods

Many other design research methods are available, with different strengths

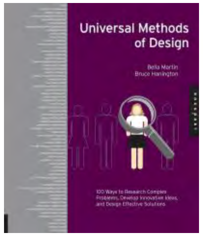


Often apply multiple methods for complementary perspectives

Fundamental goal remains to gain design insight through improved understanding of problems

Interviews

Method 48



Similar to contextual inquiry,
but lacking context of direct observation

- Set a focus, record, take notes, have two people

Can be Structured / Semi-Structured

- Avoid leading questions

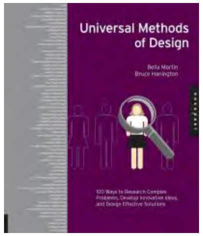
Interpret responses

- Repeat and rephrase, probe terms and concepts
- “can you give an example”, “tell me more”,
  “what do you mean”, “why was that important”
- Ask when it did not happen as expected

Pair with questionnaires for depth / to humanize

Focus Groups

Method 43



Moderated conversation among peers

- Moderator helps establish this, participants share experiences, wants/needs

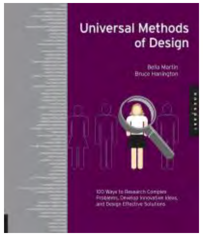
Researcher benefits from their conversations

Prompts discussion topics

- Explanations of problems in status quo
- Underlying emotions in a process
- Desires / disagreements for new designs

Diary Study

Method 30



Participants keep a diary

- Possibly as primary data
- Possibly to create mindfulness before interview

timeout

Need

Mon	Tue	Wed	Thu	Fri	Sat	Sun

12am - 3am	3am - 6am	6am - 9am	9am - 12pm	12pm - 3pm	3pm - 6pm	6pm - 9pm	9pm - 12am

You needed: ☑ Info. ☑ Assist. ☐ Other

What did you need? to know if stroller could be used on Don Valley Trail

Why did you need it? because to take baby for walk in trail but it must be ice-free

Where were you? at home

What were you doing? planning outing

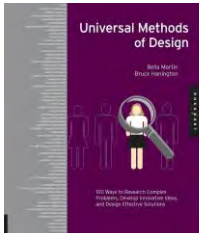
When did you need it? 5-10 mins

What I needed was very important.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Diary Study

Method 30



Participants keep a diary

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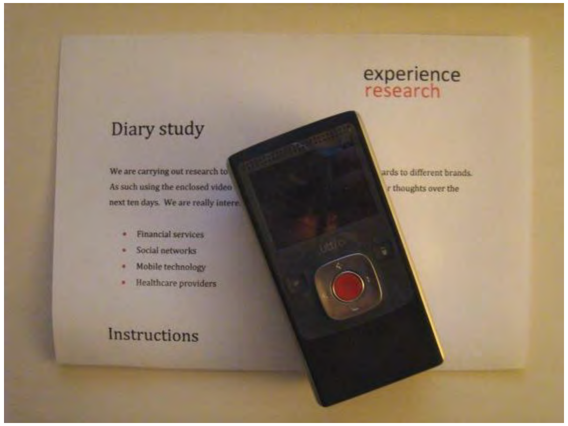
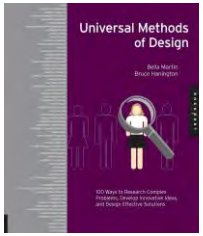


Diary Study

Method 30

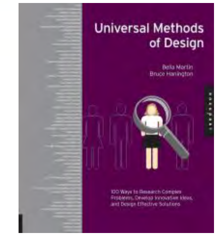


Participants keep a diary

- Possibly as primary data
- Possibly to create mindfulness before interview

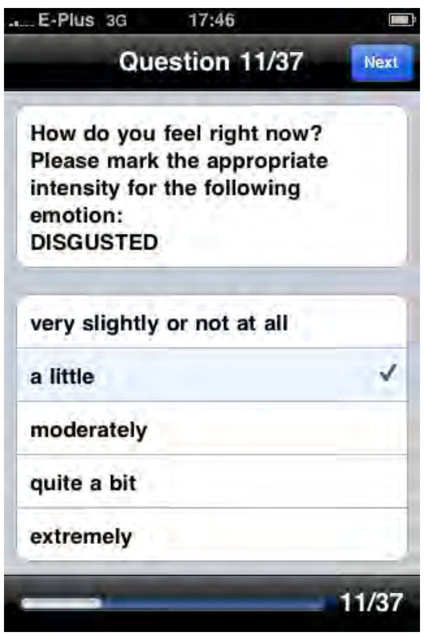
Experience Sampling

Method 37



Emerges from "beeper study" method

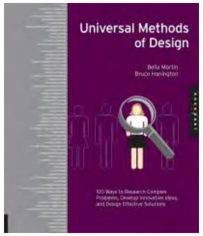
- Can be random, can be context-aware
- Can gather self-report, photos, sensor data



Many Design Research Methods

Personal Inventories

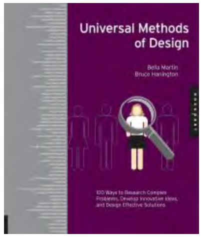
Method 62



“collections of artifacts
selected by the participant”

Cultural Probes

Method 24



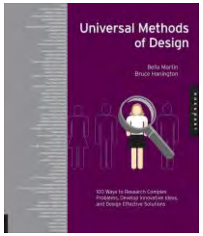
“materials designed to inspire
people to thoughtfully consider
personal context and circumstance”

“maps … asked the elderly to mark zones for
meeting others, being alone, dreaming…”

Many Design Research Methods

Behavior Mapping

Method 06

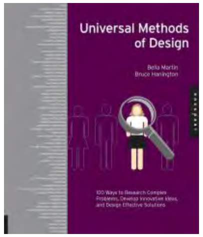


"place-centered mapping"

"individual-centered mapping / traces"

Graffiti Wall

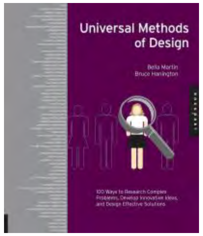
Method 45



"candid feedback on behaviors and perceptions of current spaces"

Shadowing

Method 76



“observational method that involves tracking somebody in their role”

- “not intended to be covert … however subtle instances might be completed in public spaces …”

Useful reminder to be thoughtful and safe

- multiple groups have been asked to leave
- be safe, be mindful of people

Value Sensitive Design

To be useful or usable is not the same as supporting important human values

Examples?

Value Sensitive Design

To be useful or usable is not the same as supporting important human values

Examples?

Independence
Privacy
Trust
Accountability
Ownership and Property
Fairness
Freedom from Bias
Human Safety
Universal Access
Sustainability

Value Suitabilities

Value Sensitive Design is an interactional theory

- Values are not inherent in a given technology
- But a technology is not value neutral
- Some technologies are more suitable than others for supporting given values

Value Sensitive Design investigates stakeholders, values, and value suitabilities

- Direct and indirect stakeholders

Tripartite Method

Conceptual Investigations

- Analyses of the values involved in a system

Technical Investigations

- Identify or develop technical mechanisms
- Investigate suitability to support values

Empirical Investigations

- Investigate who the stakeholders are,
  which values are important to them,
  and how they prioritize these values

CSE 440: Introduction to HCI

User Interface Design, Prototyping, and Evaluation

Lecture 03:
Contextual Inquiry &
Design Research

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50

CSE 440: Introduction to HCI

User Interface Design, Prototyping, and Evaluation

Lecture 04:
HCI History

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

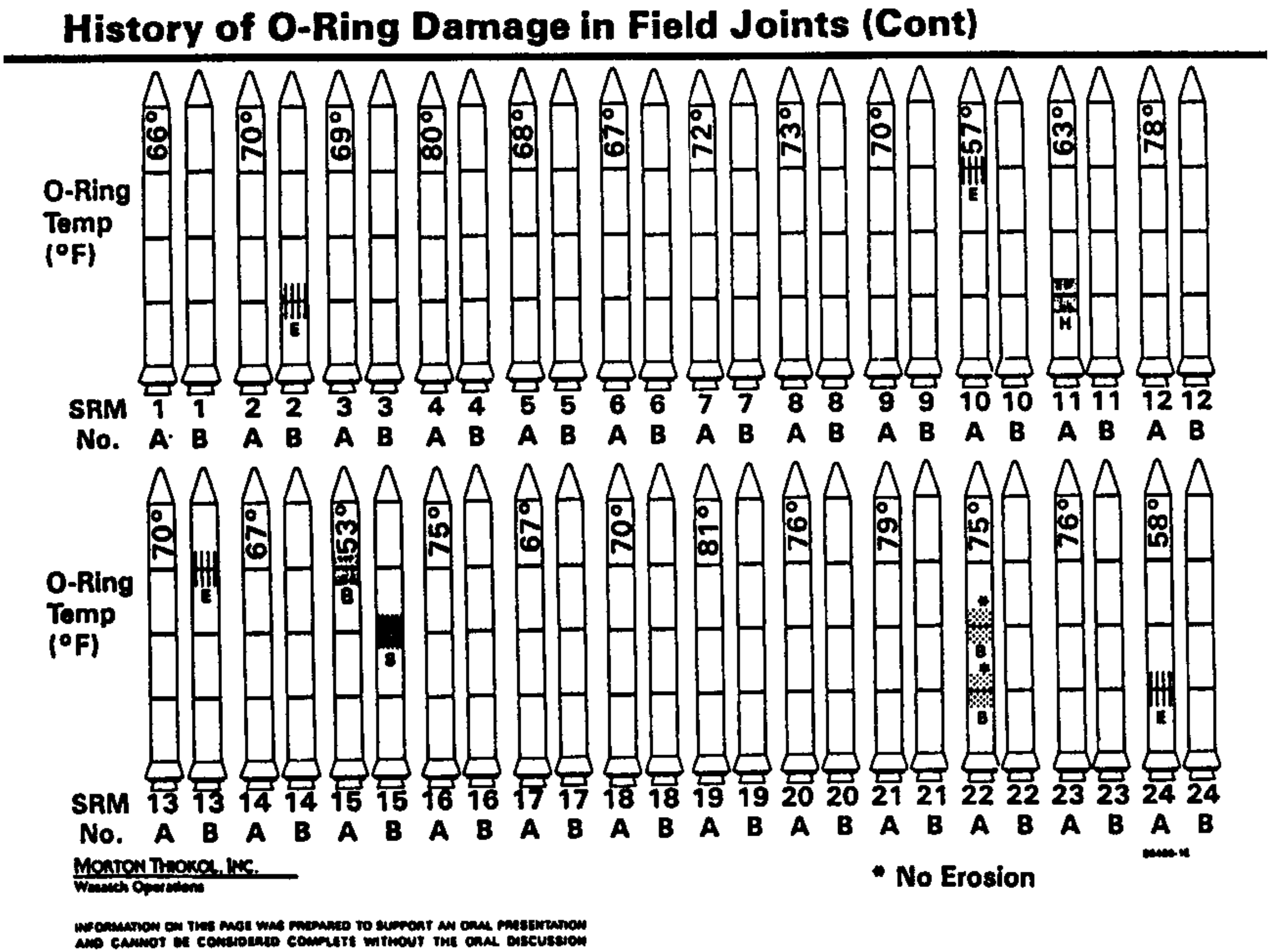
Tuesday / Thursday
10:30 to 11:50

Why do we do HCI in CSE?

Every engineering discipline includes the study of breakdowns and the design of improved solutions that address those breakdowns

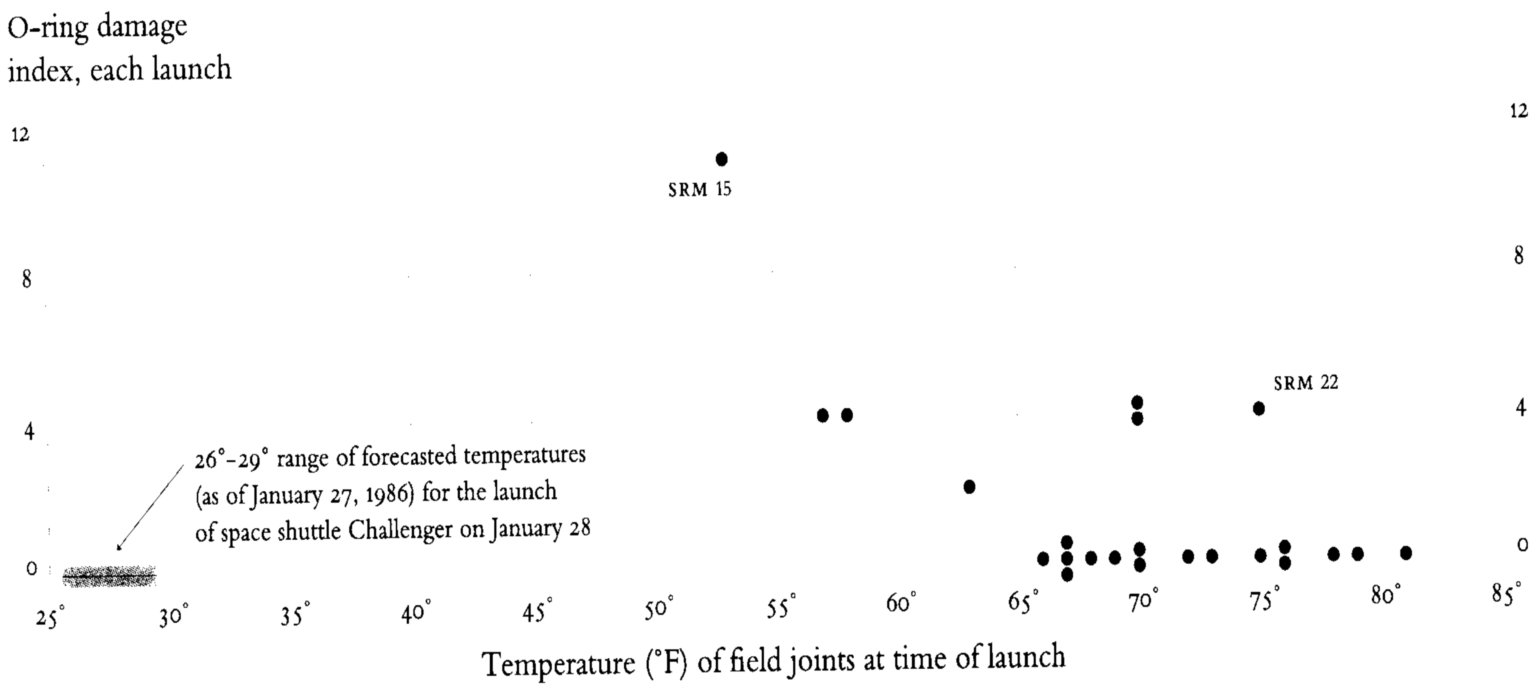
Tacoma Narrows

O-Rings



History of O-Ring Damage in Field Joints (Cont)
O-Ring Temp (°F)
66° 70° 69° 80° 68° 67° 72° 73° 70° 57° 63° 78°
SRM No.
1A 1B 2A 2B 3A 3B 4A 4B 5A 5B 6A 6B 7A 7B 8A 8B 9A 9B 10A 10B 11A 11B 12A 12B
70° 67° 53° 75° 67° 70° 81° 76° 79° 75° 76° 58°
13A 13B 14A 14B 15A 15B 16A 16B 17A 17B 18A 18B 19A 19B 20A 20B 21A 21B 22A 22B 23A 23B 24A 24B
* No Erosion
MORTON THIOKOL, INC.
Wasatch Operations
INFORMATION ON THIS PAGE WAS PREPARED TO SUPPORT AN ORAL PRESENTATION AND CANNOT BE CONSIDERED COMPLETE WITHOUT THE ORAL DISCUSSION

O-Rings


O-ring damage
index, each launch
12
8
4
0
SRM 15
SRM 22
26°–29° range of forecasted temperatures
(as of January 27, 1986) for the launch
of space shuttle Challenger on January 28
25° 30° 35° 40° 45° 50° 55° 60° 65° 70° 75° 80° 85°
Temperature (°F) of field joints at time of launch

Tractors

Tractors

Tractors

National Agricultural Safety Database Quotes

Older tractors with narrow front ends are easily upset

Tractor upsets cause more fatalities than other farm accidents

Injuries often include a broken or crushed pelvis

Tractors

Tractor upsets used to be dismissed as driver error

But such accidents
are less frequent because
modern designs have:

- roll cage
- low center of gravity
- wider wheel bases

Human Factors Tradition

Emerges during and after WWII, as highly trained people are failing to effectively control the machinery they operate

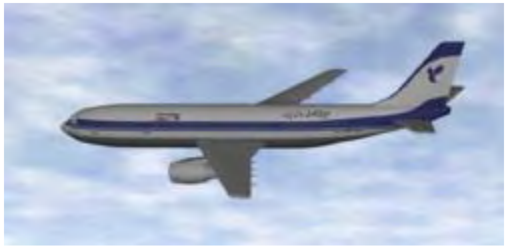
(pilots are crashing planes)

The phrase “human factors” now often has a connotation of studying factory workers, ergonomics, or other physical tasks

(ask me about Grudin article if interested)

1988: Iran Air Flight 655

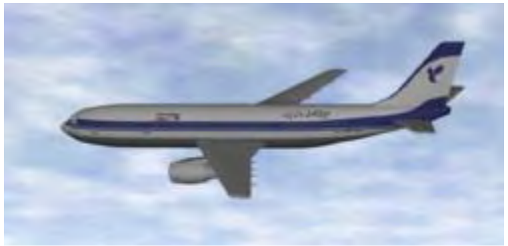
In 1987, *USS Stark* was struck by two missiles launched by an Iraqi Mirage F-1, killing 37 with no weapons fired in self-defense during the attack.



In 1988, crew of the *USS Vincennes* Combat Information Center confusingly reported the plane as ascending and descending at the same time (there were two "camps").

1988: Iran Air Flight 655

The Airbus's original track, number 4474, had been replaced by the *USS Sides* track, number 4131, when the computer briefly recognized them as one and the same. Shortly thereafter, track 4474 was re-assigned by the system to an American A-6, several hundred miles away, following a descending course at the time. Apparently not all the crew in the CIC realized the track number had been switched on them.



Why do we do HCI in CSE?

Every engineering discipline includes the study of breakdowns and the design of improved solutions that address those breakdowns

Understanding how and why human interaction breaks down is fundamental to designing better computing systems

This study must include computer scientists, as we are the ones creating the technology

A History Question

Who invented hypertext? When?

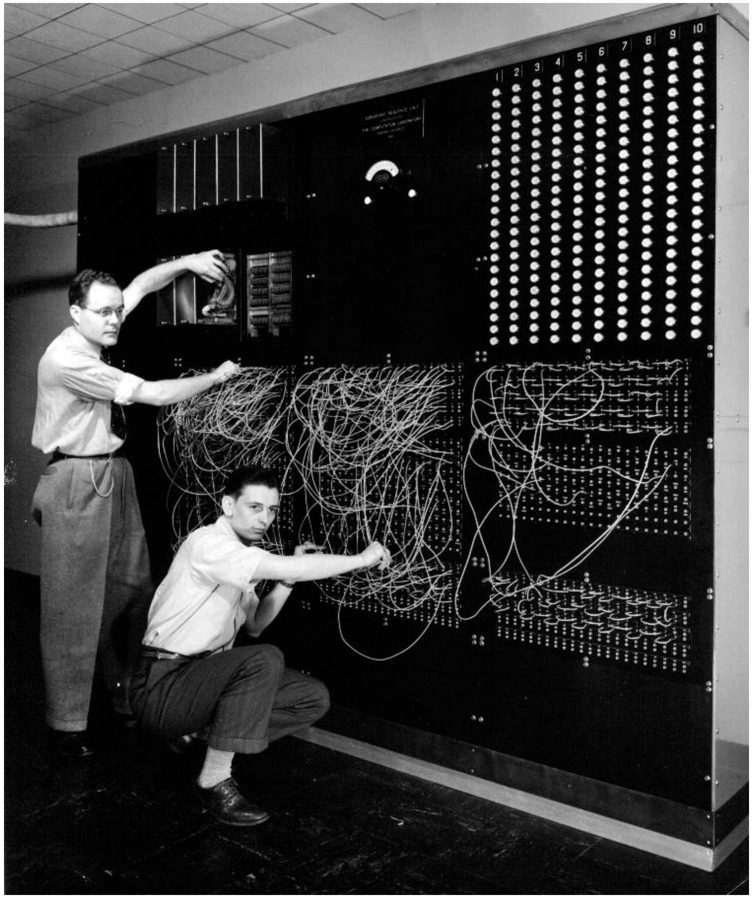
Computing in 1945

Harvard Mark I, 55 feet long, 8 feet high, 5 tons

The Harvard Mark I

Computing in 1945

Harvard Mark I, 55 feet long, 8 feet high, 5 tons



Computing in 1945

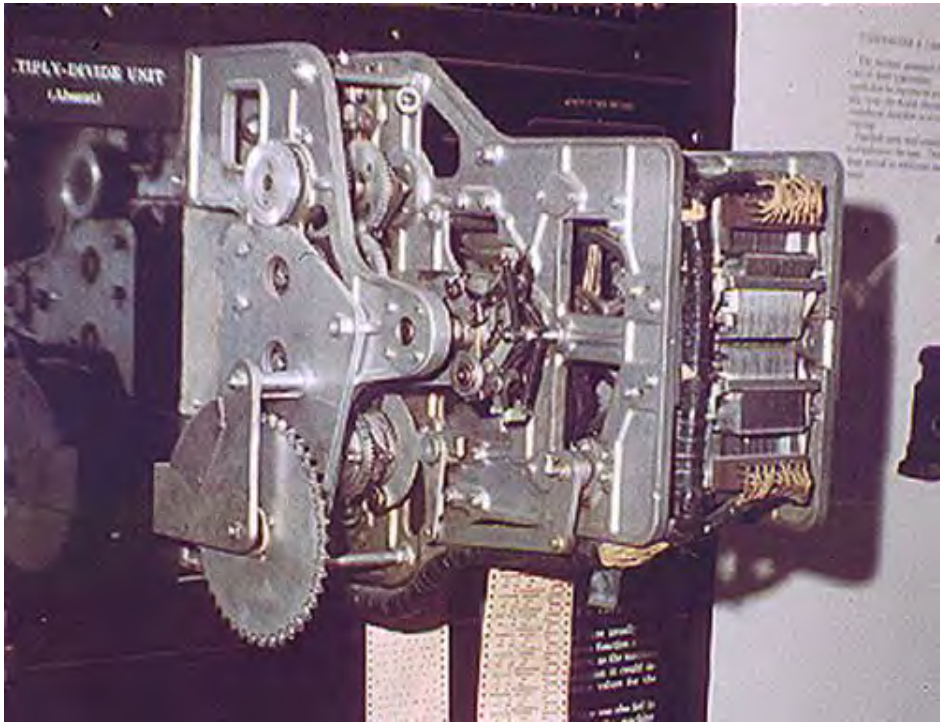
Ballistics calculations

Physical switches
(no microprocessor)

Paper tape

Simple arithmetic
& fixed calculations
(before programs)

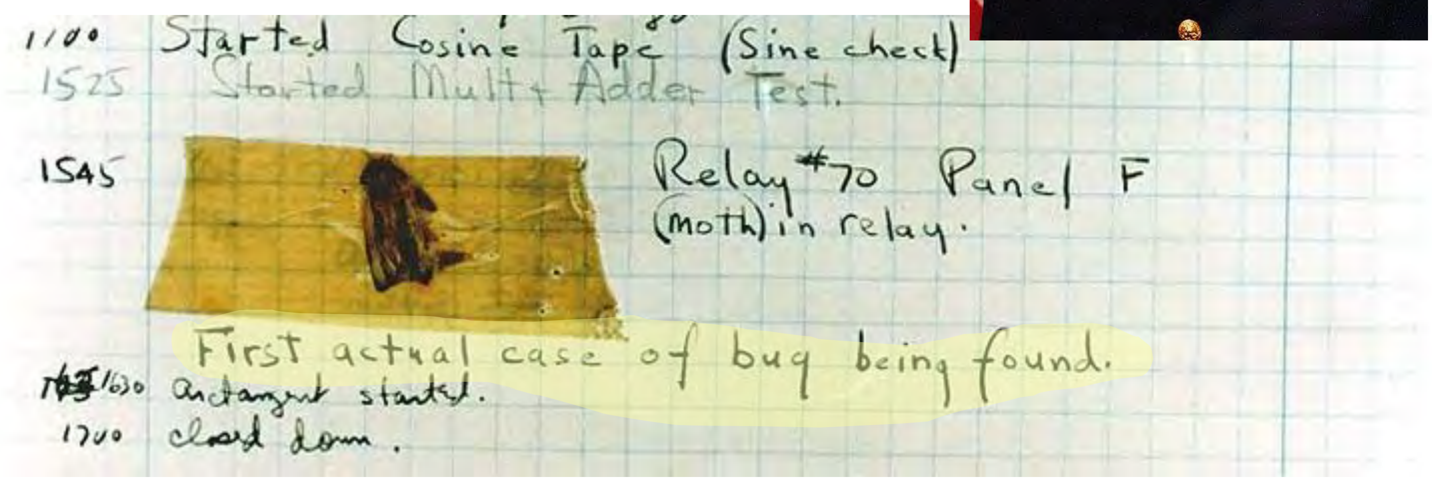
3 sec. to multiply



Computing in 1945

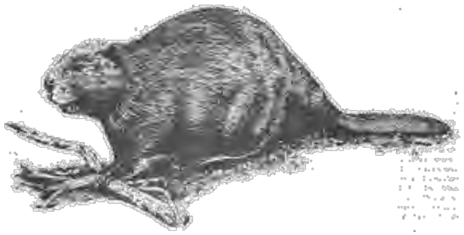
First computer bug
(Harvard Mark II)

Adm. Grace Murray Hopper



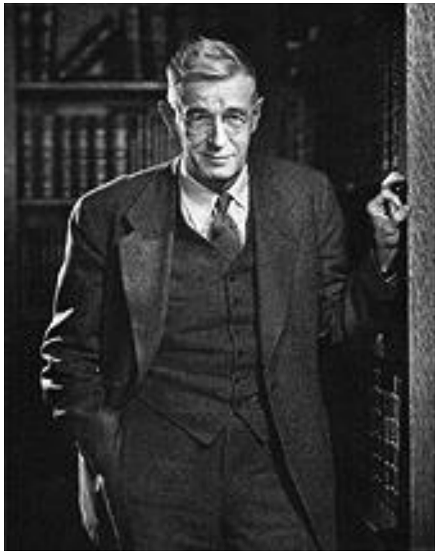
A Little About Vannevar Bush

Name rhymes with “Beaver”



Faculty member at MIT

Coordinated WWII effort with 6000 US scientists



Social contract for science

- Federal government funds universities
- Universities do basic research
- Research helps economy and defense

As We May Think

Published in the Atlantic Monthly in 1945

http://www.theatlantic.com/magazine/print/1945/07/as-we-may-think/3881/

Motivated in part by defining a scientific grand challenge as WWII was ending

As We May Think

"There is a growing mountain of research. … The investigator is staggered by the findings and conclusions of thousands of other workers—conclusions which he cannot find time to grasp, much less to remember, as they appear. Yet specialization becomes increasingly necessary for progress, and the effort to bridge between disciplines is correspondingly superficial."

As We May Think

“The world has arrived at an age of cheap complex devices of great reliability; and something is bound to come of it.”

“Had a Pharaoh been given detailed and explicit designs of an automobile, and had he understood them completely, it would have taxed the resources of his kingdom to have fashioned the thousands of parts for a single car, and that car would have broken down on the first trip to Giza.”

MicroPhotography

Describes a combination of photocells, facsimile transmission, and electron beam technology

Enables capturing a photograph into micro form

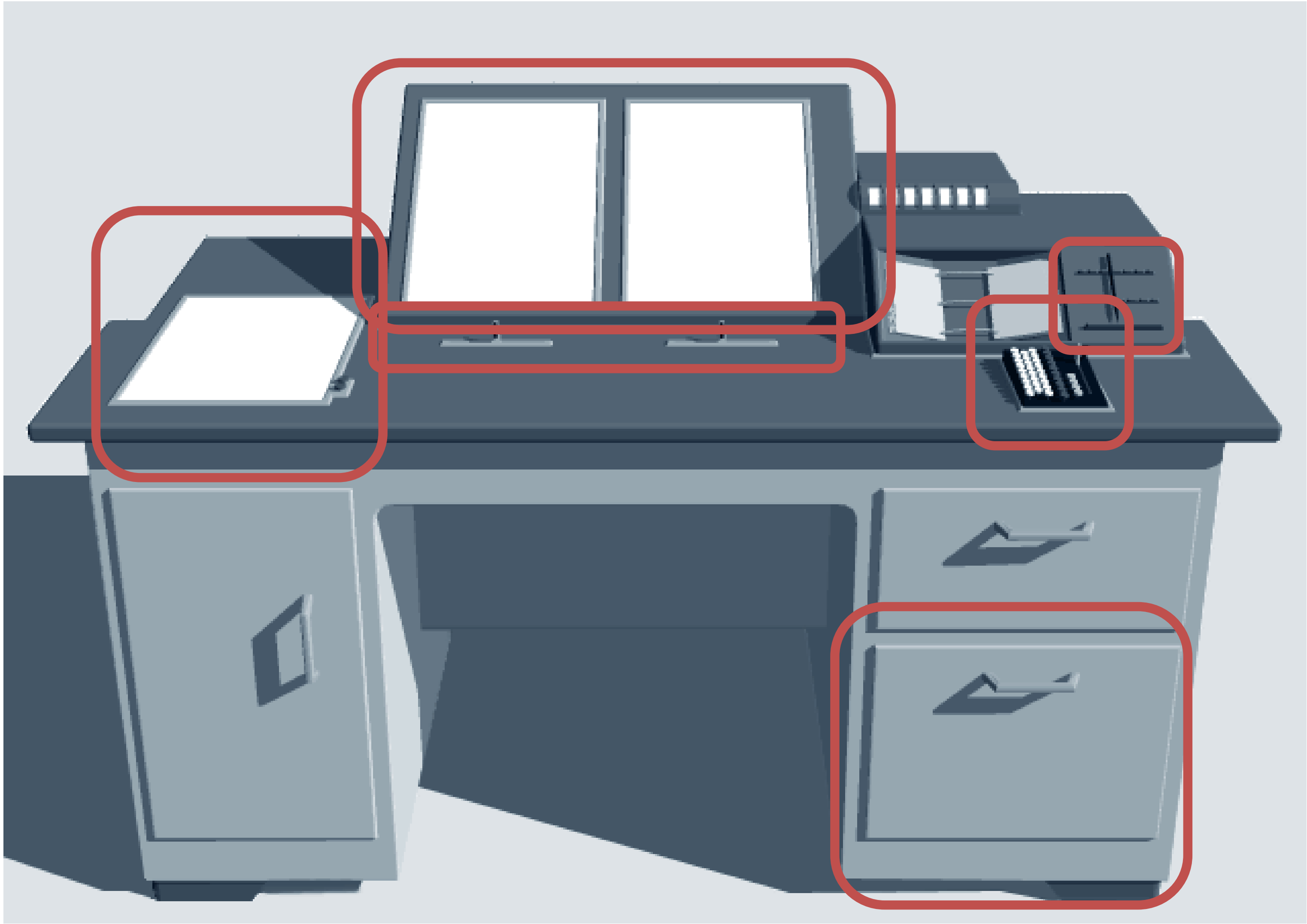
“It would be a brave man who would predict that such a process will always remain clumsy, slow, and faulty in detail.”

MicroPhotography

"Assume a linear ratio of 100 for future use. Consider film of the same thickness as paper, although thinner film will certainly be usable. Even under these conditions there would be a total factor of 10,000 between the bulk of the ordinary record on books, and its microfilm replica. The Encyclopedia Britannica could be reduced to the volume of a matchbox. A library of a million volumes could be compressed into one end of a desk."


FREE
ENCYCLOPEDIA
CD
ROM
plus 100
FREE
HOURS
AMERICA
Online
GROLIER
Multimedia Encyclopedia
SPECIAL EDITION
Complete
from A to Z
#1 in Schools
GOOD
CALCIUM
KRAFT
Singles
MADE FROM WHOLESOME MILK
AMERICAN

Memex



Memex

“If the user wishes to consult a certain book, he taps its code on the keyboard…”

“Frequently-used codes are mnemonic, so that he seldom consults his code book;”

“He can add marginal notes and comments … even … by a stylus scheme”

“All this is conventional…”

Memex

“It affords an immediate step, however,
to associative indexing”

“tying two items together is the important thing”

“Before him are the two items to be joined, projected onto adjacent viewing positions. At the bottom of each there are a number of blank code spaces, and a pointer is set to indicate one of these on each item. The user taps a single key, and the items are permanently joined.”

Memex

“Thereafter, at any time, when one of these items is in view, the other can be instantly recalled merely by tapping a button below the corresponding code space. Moreover, when numerous items have been thus joined together to form a trail, they can be reviewed in turn, rapidly or slowly, by deflecting a lever like that used for turning the pages of a book.”

Memex

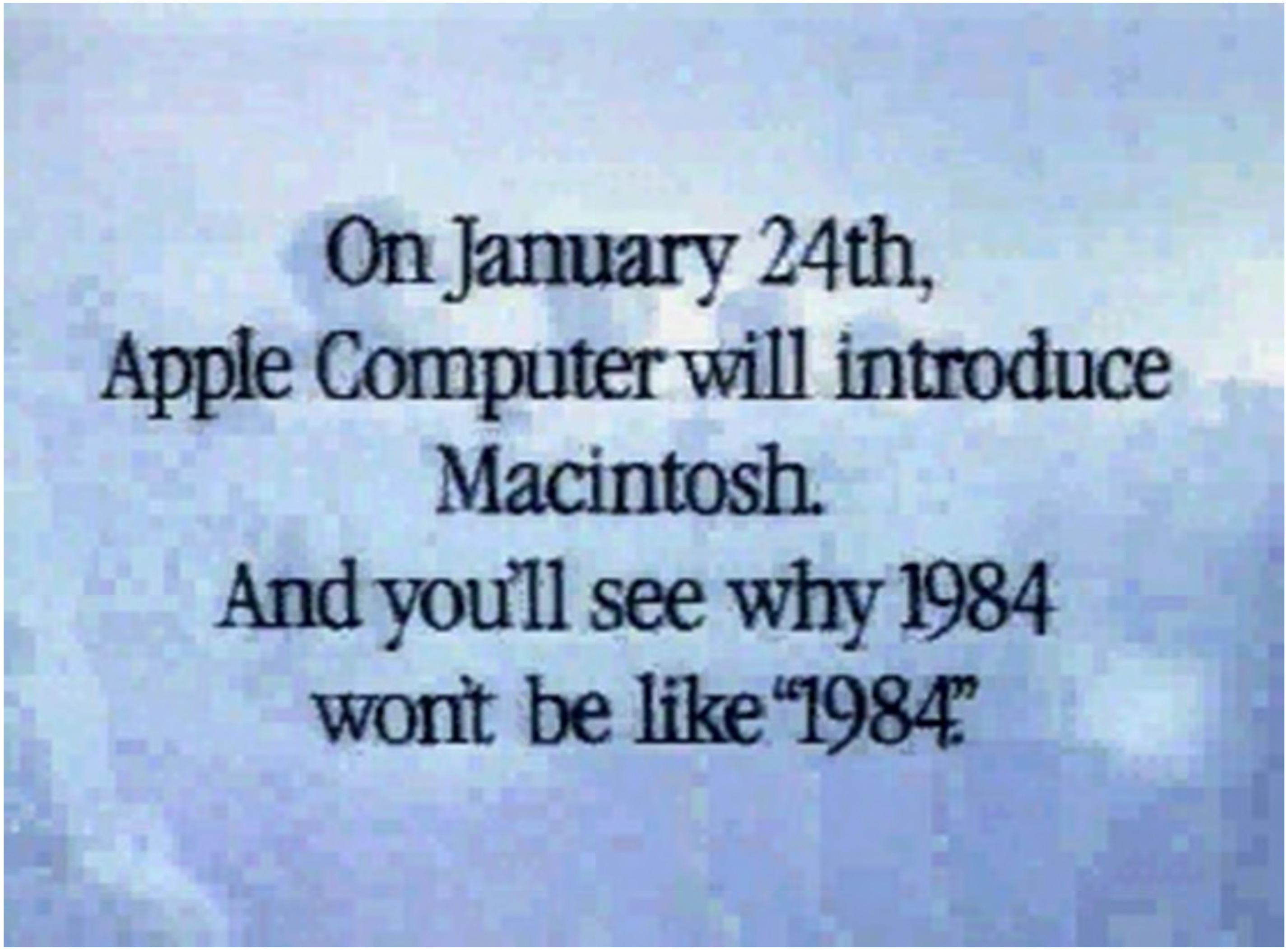
“Wholly new forms of encyclopedias will appear, ready made with a mesh of associative trails running through them, ready to be dropped into the memex and there amplified.”

Memex is the first proposed hypertext system

A History Question

Who invented desktop computing? When?

Macintosh in 1984 is well known



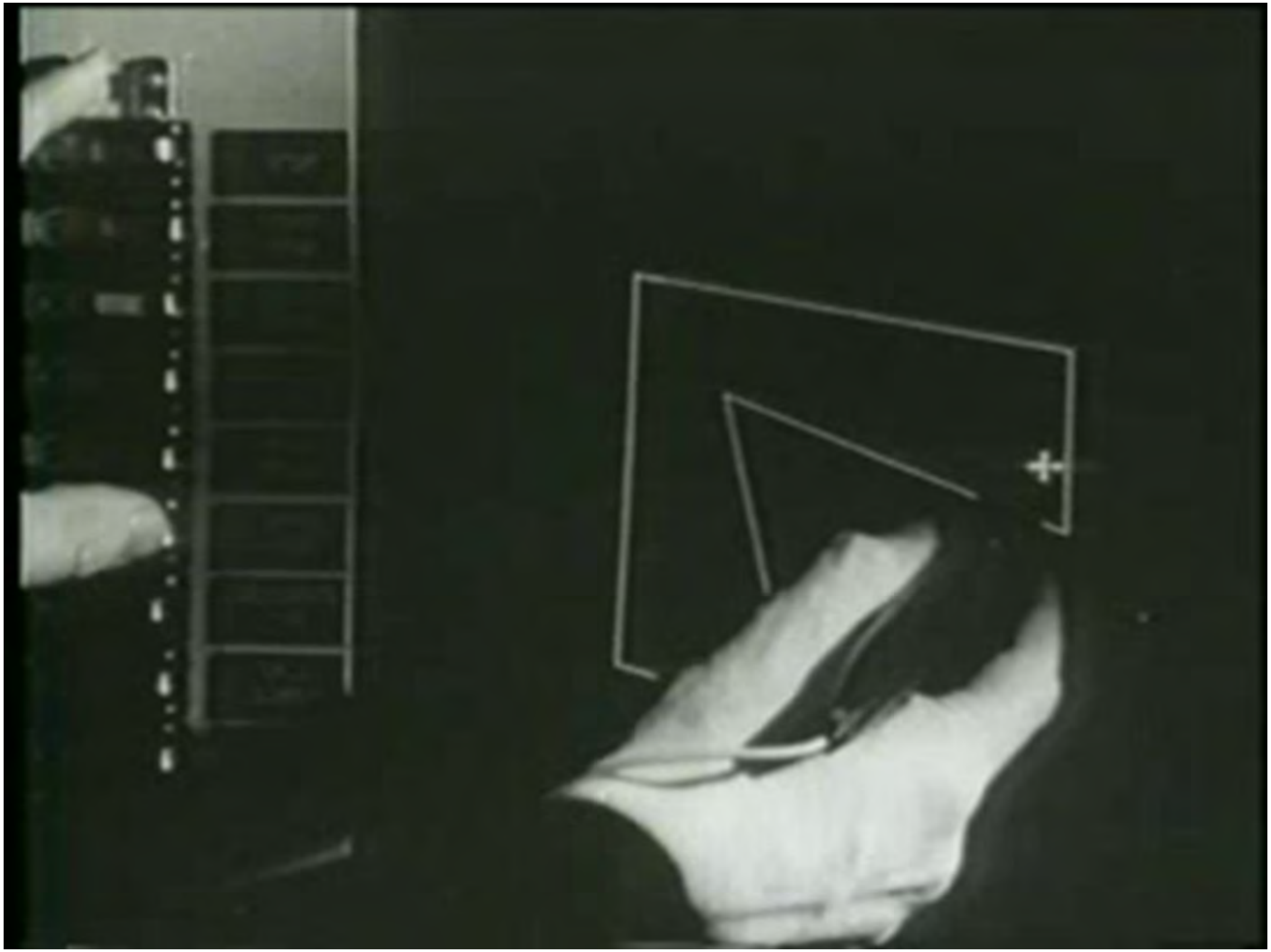
http://courses.cs.washington.edu/courses/cse440/videos/history/Apple1984.mp4

Alan Kay on Early Interface Work

- Narrator is Alan Kay, speaking in 1987
  - This video is almost 20 years old
  - It was a historical account when it was filmed
- Speaks to four sytems
  - Sketchpad
  - NLS
  - GRAIL
  - Dynabook

http://courses.cs.washington.edu/courses/cse440/videos/history/AlanKay1987.m4v

Ivan Sutherland's Sketchpad



http://courses.cs.washington.edu/courses/cse440/videos/history/AlanKay1987-Sketchpad.m4v

Ivan Sutherland's Sketchpad

When do we think this was done?

Ivan Sutherland's Sketchpad

When do we think this was done?

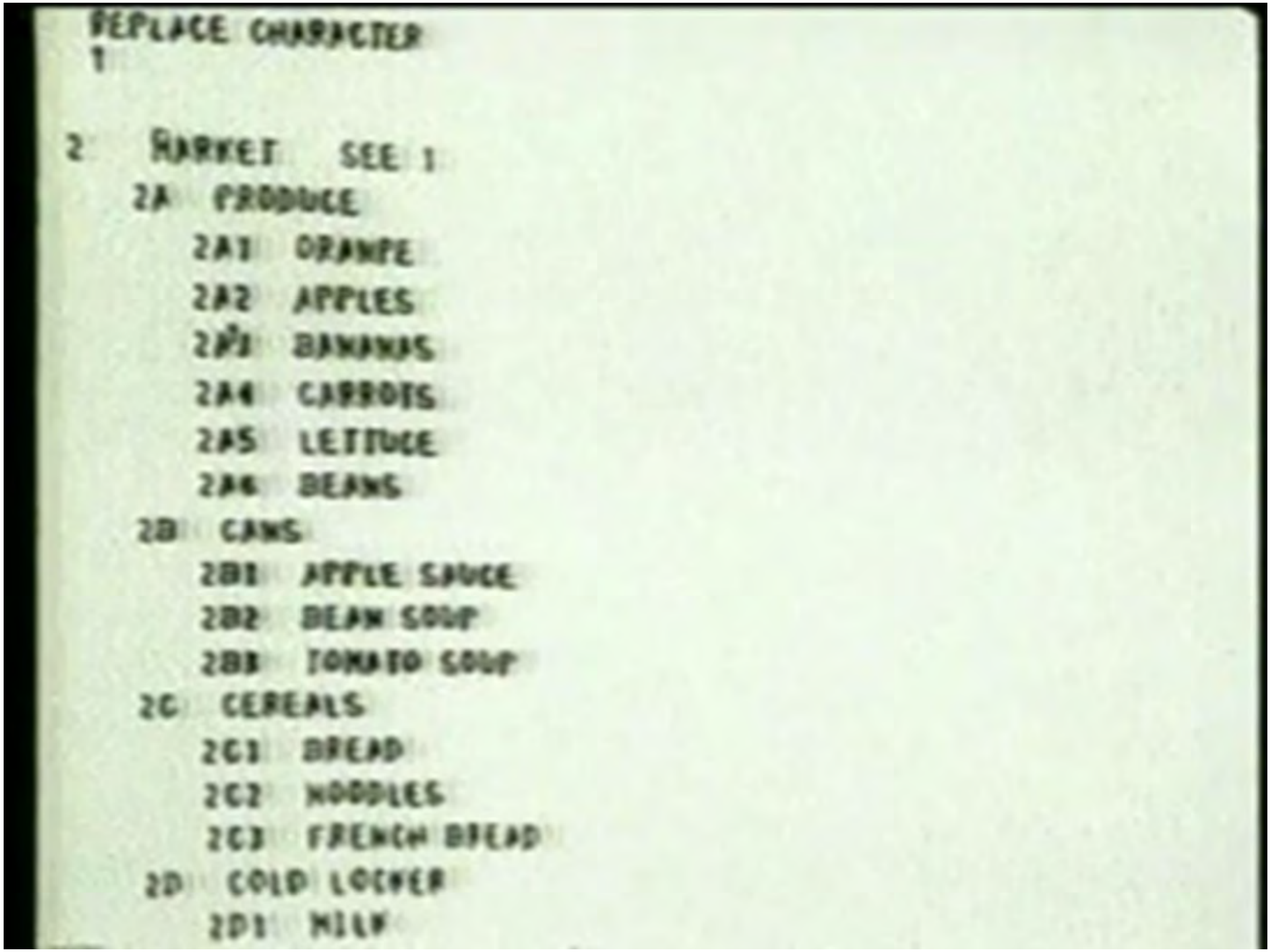
1962

Windows

Constraints
(i.e., non-procedural)

Prototype/Instance
Inheritance
(i.e., object-oriented)

Doug Engelbart’s NLS (Online System)



http://courses.cs.washington.edu/courses/cse440/videos/history/AlanKay1987-NLS.m4v

Doug Engelbart’s NLS (Online System)

When do we think this was done?

Doug Engelbart’s NLS (Online System)

When do we think this was done? 1968

Invention of the mouse

First working hypertext system

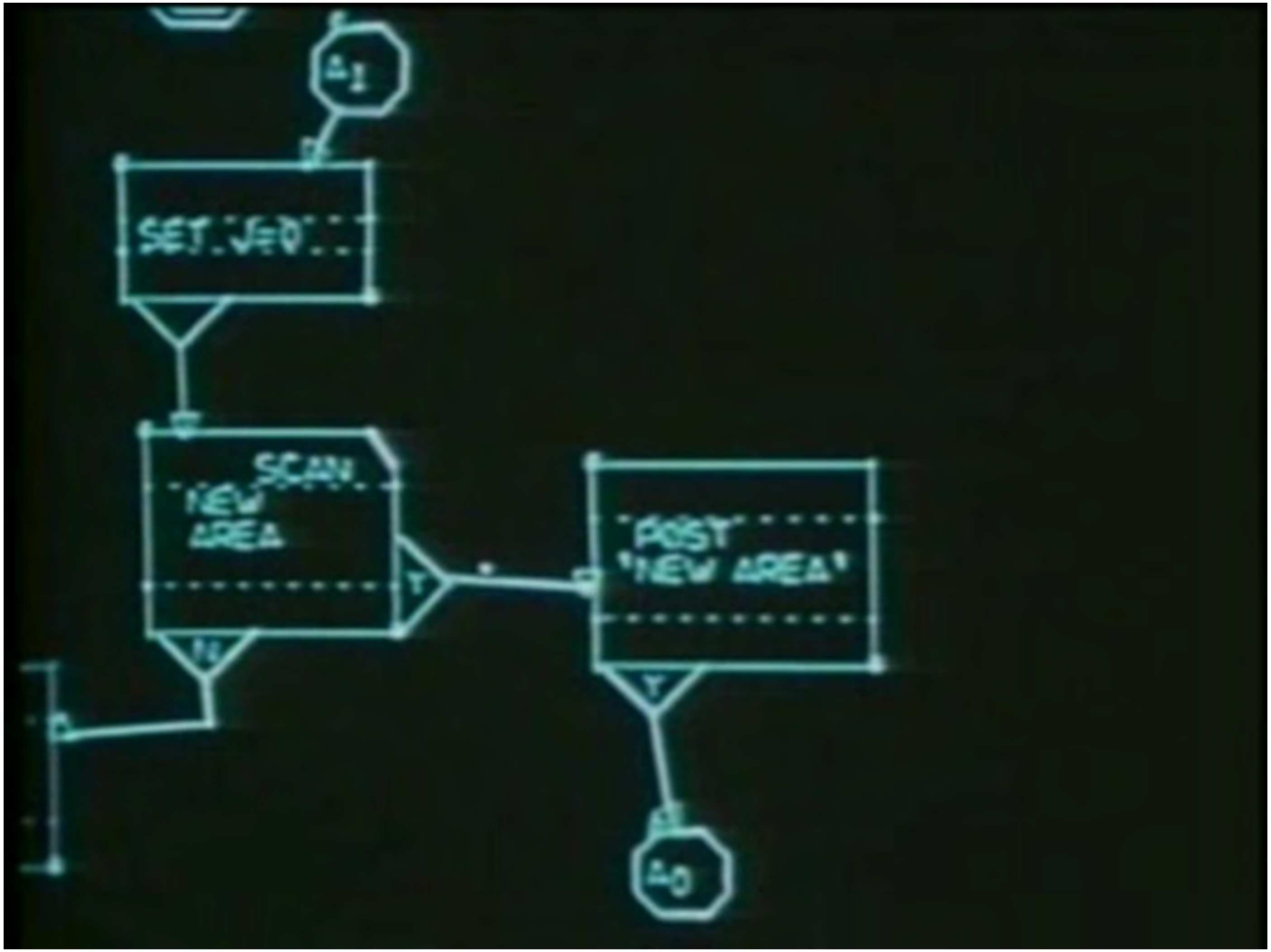
Chording keyboard to reduce hand movement

Remote collaboration

Analog Mouse leads to heavy moding

Reactions include accusations of “faking it” and claims of irrelevance because “terminal can do that”

GRAIL



http://courses.cs.washington.edu/courses/cse440/videos/history/AlanKay1987-GRAIL.m4v

GRAIL

When do we think this was done?

GRAIL

When do we think this was done? 1968

Window handles

Modeless interaction via direct action

Gesture recognition

Proposed for end-user programming via flow charts

Dynabook

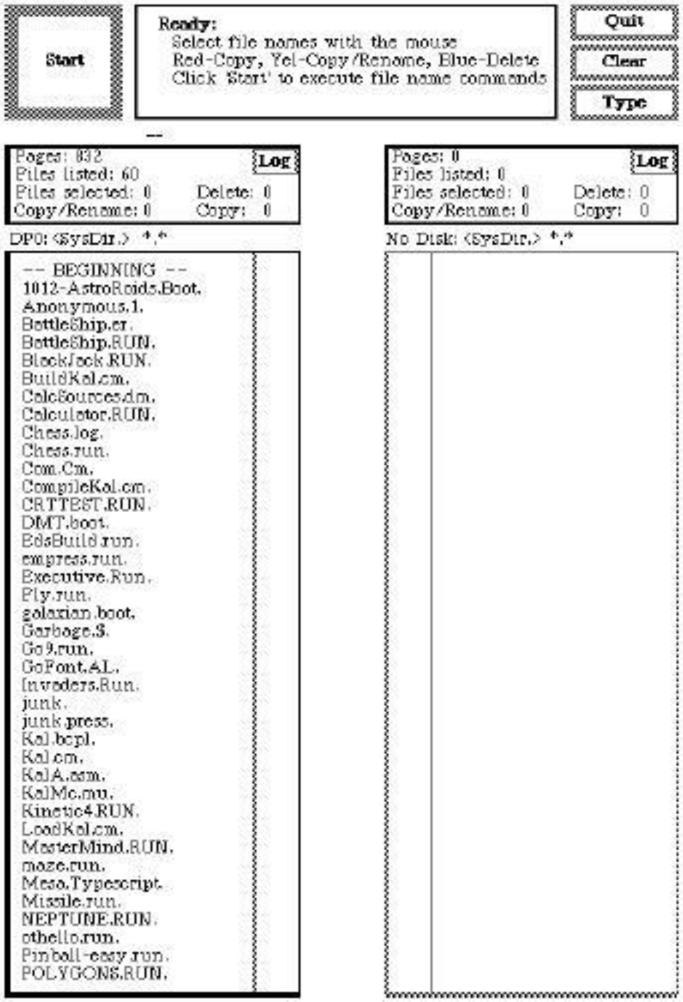
http://courses.cs.washington.edu/courses/cse440/videos/history/AlanKay1987-Dynabook.m4v

Xerox to Apple and Microsoft

XEROX Alto 1973

Xerox Alto

Xerox Alto



Start
Ready:
Select file names with the mouse
Red-Copy, Yel-Copy/Rename, Blue-Delete
Click 'Start' to execute file name commands
Quit
Clear
Type
Pages: 832
Log
Files listed: 60
Files selected: 0
Delete: 0
Copy/Rename: 0
Copy: 0
DP0: <SysDir.> *.*
Pages: 0
Log
Files listed: 0
Files selected: 0
Delete: 0
Copy/Rename: 0
Copy: 0
No Disk: <SysDir.> *.*
-- BEGINNING --
1012-AstroRoids.Boot.
Anonymous.1.
BattleShip.cr.
BattleShip.RUN.
BlackJack.RUN.
BuildKal.cm.
CalcSources.dm.
Calculator.RUN.
Chess.log.
Chess.run.
Com.Cm.
CompileKal.cm.
CRTTEST.RUN.
DMT.boot.
EdsBuild.run.
empress.run.
Executive.Run.
Fly.run.
galaxian.boot.
Garbage.$.
Go9.run.
GoFont.AL.
Invaders.Run.
junk.
junk.press.
Kal.bcpl.
Kal.cm.
KalA.asm.
KalMc.mu.
Kinetic4.RUN.
LoadKal.cm.
MasterMind.RUN.
maze.run.
Mesa.Typescript.
Missile.run.
NEPTUNE.RUN.
othello.run.
Pinball-easy.run.
POLYGONS.RUN.

Xerox to Apple and Microsoft

XEROX Alto 1973

Steve Jobs visits PARC in 1979

Xerox to Apple and Microsoft

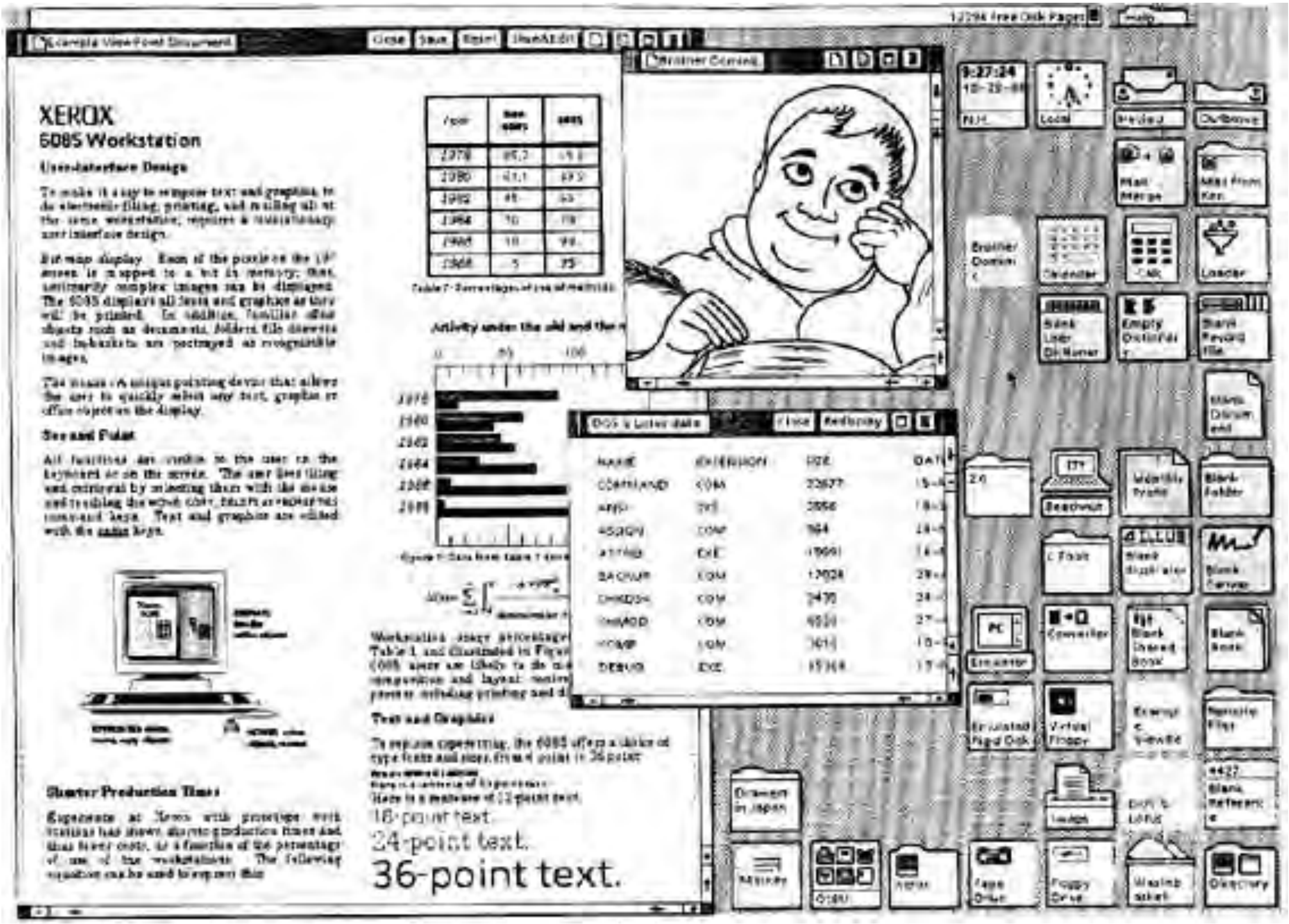
XEROX Alto 1973

Steve Jobs visits PARC in 1979

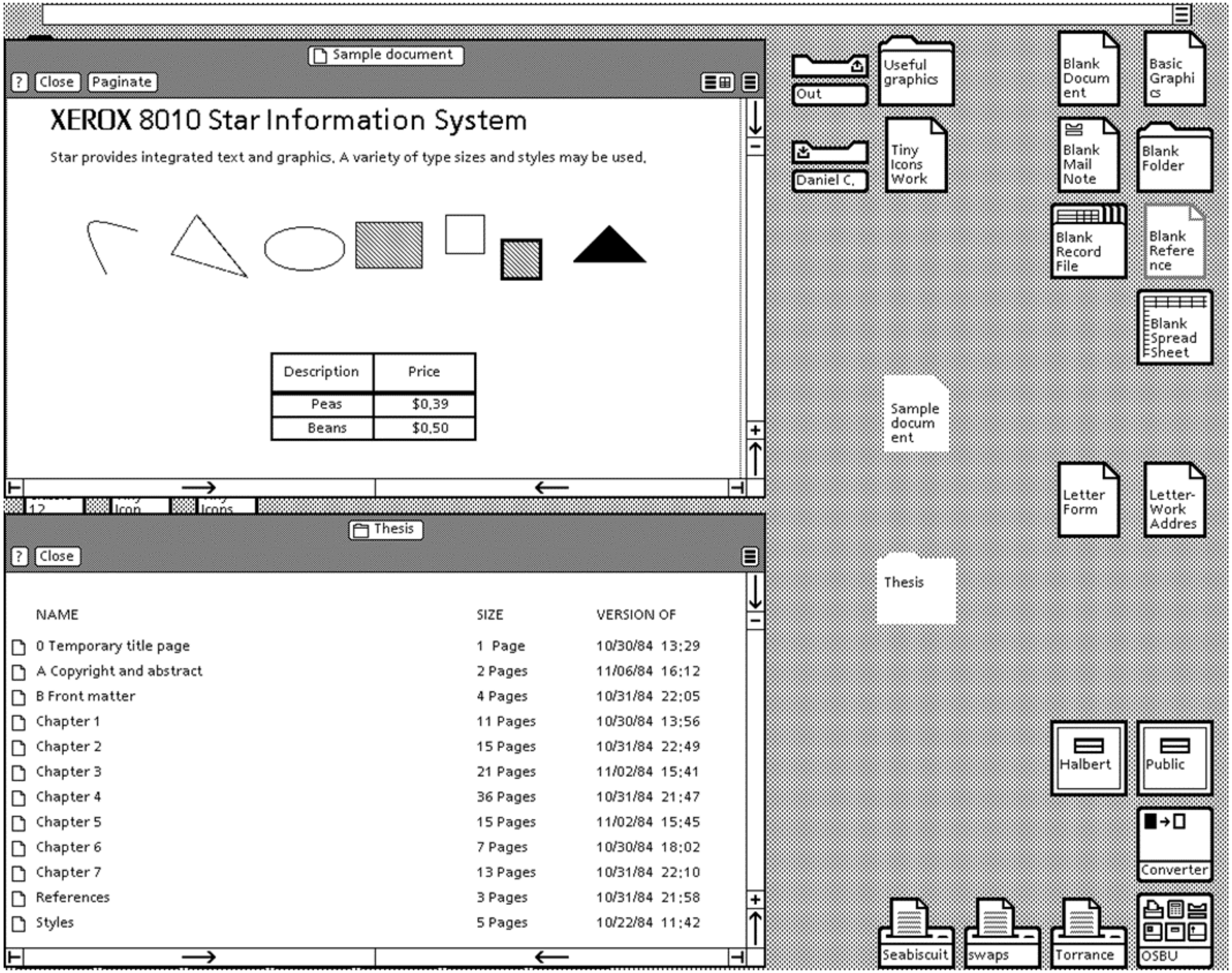
XEROX STAR 1981

Xerox Star

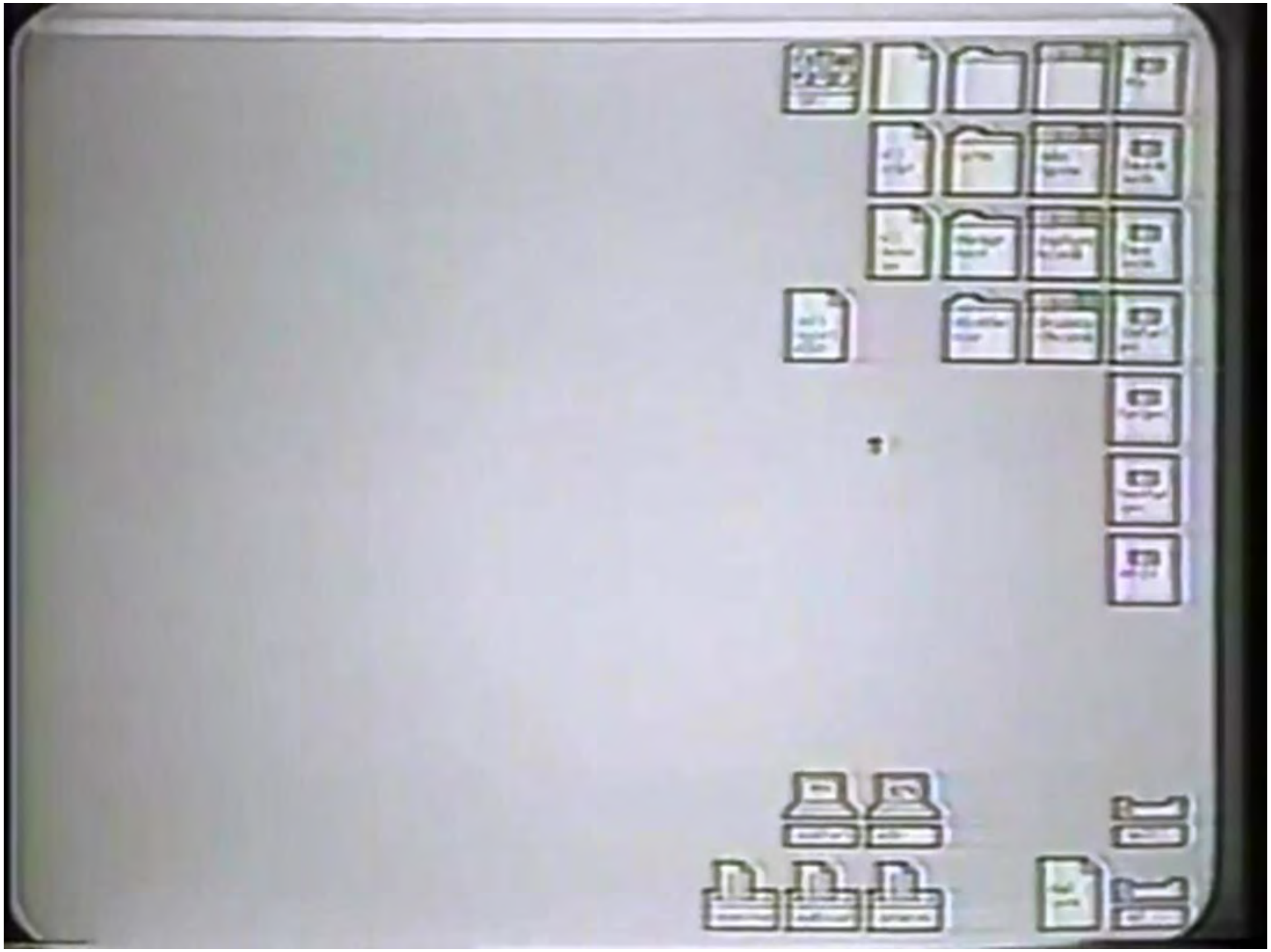
Xerox Star


XEROX
6085 Workstation
18-point text.
24-point text.
36-point text.

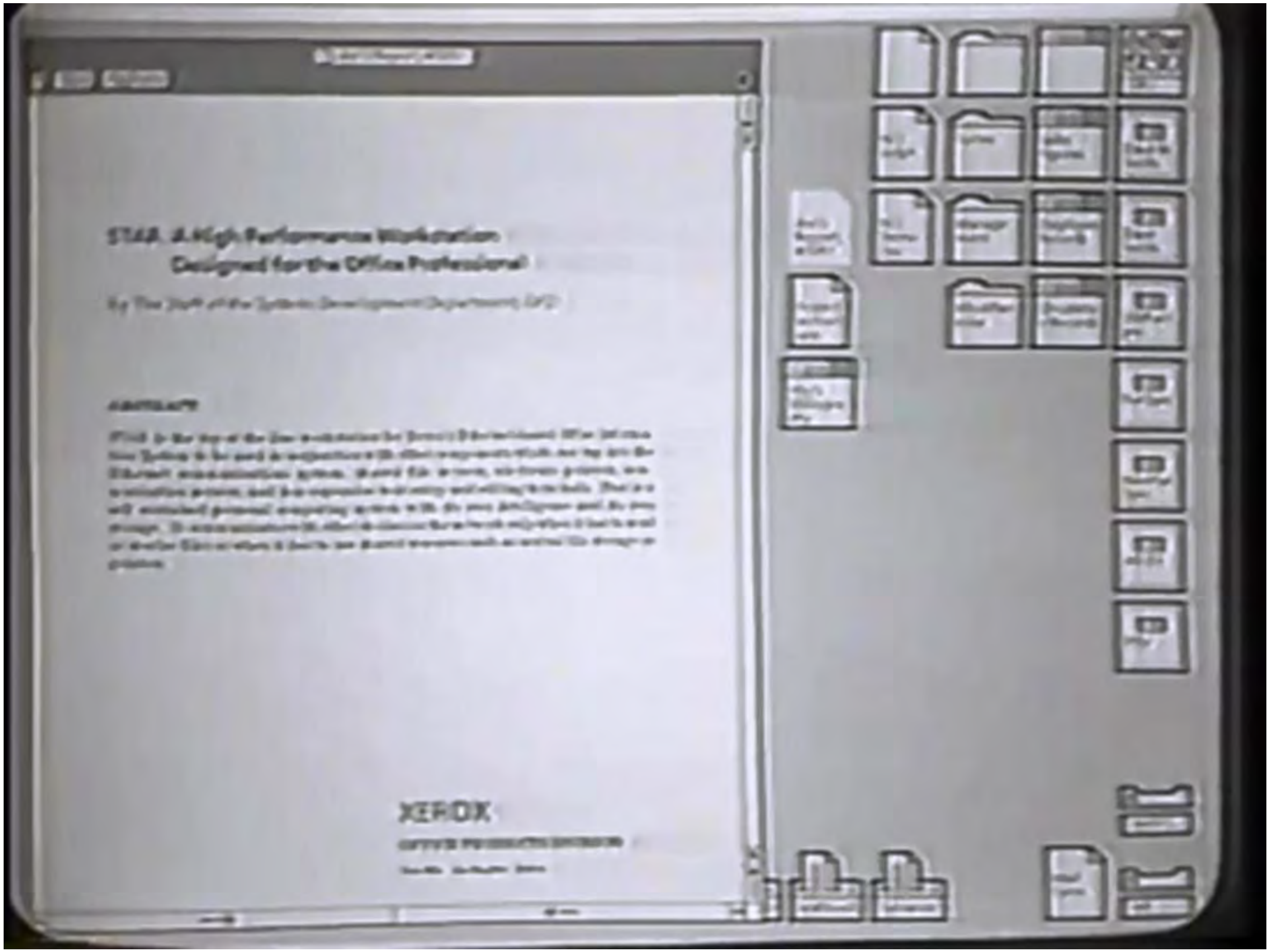
Xerox Star


Sample document
?
Close
Paginate
XEROX 8010 Star Information System
Star provides integrated text and graphics. A variety of type sizes and styles may be used.
Description
Price
Peas
$0.39
Beans
$0.50
Thesis
?
Close
NAME
SIZE
VERSION OF
0 Temporary title page 1 Page 10/30/84 13:29
A Copyright and abstract 2 Pages 11/06/84 16:12
B Front matter 4 Pages 10/31/84 22:05
Chapter 1 11 Pages 10/30/84 13:56
Chapter 2 15 Pages 10/31/84 22:49
Chapter 3 21 Pages 11/02/84 15:41
Chapter 4 36 Pages 10/31/84 21:47
Chapter 5 15 Pages 11/02/84 15:45
Chapter 6 7 Pages 10/30/84 18:02
Chapter 7 13 Pages 10/31/84 22:10
References 3 Pages 10/31/84 21:58
Styles 5 Pages 10/22/84 11:42
Out
Useful graphics
Daniel C.
Tiny Icons Work
Blank Docum ent
Basic Graphi cs
Blank Mail Note
Blank Folder
Blank Record File
Blank Refere nce
Blank Spread Sheet
Sample docum ent
Letter Form
Letter-Work Addres
Thesis
Halbert
Public
Converter
Seabiscuit
swaps
Torrance
OSBU

Xerox Star

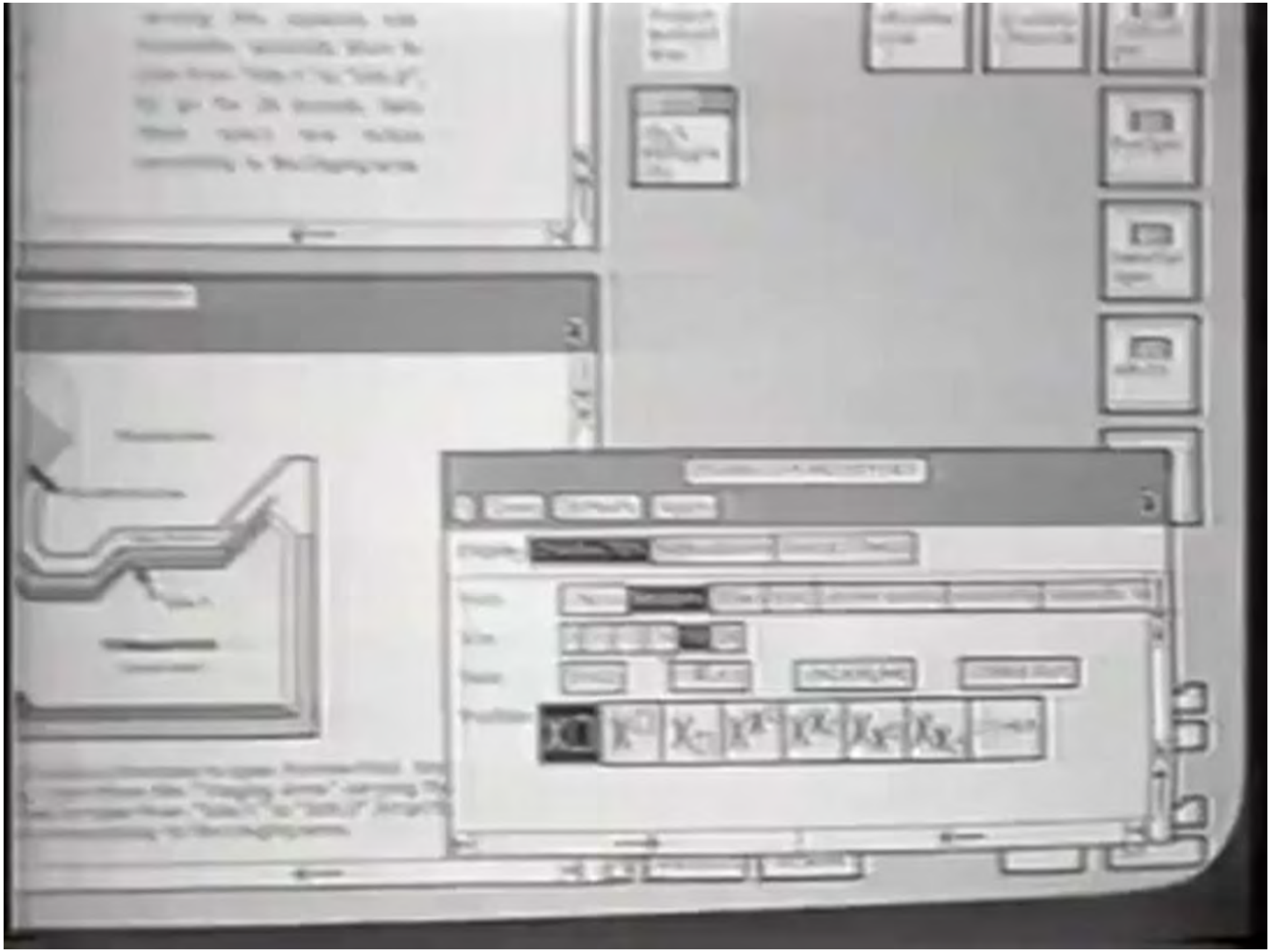


Xerox Star



STAR: A High Performance Workstation
Designed for the Office Professional
XEROX

Xerox Star



Xerox to Apple and Microsoft

XEROX Alto 1973

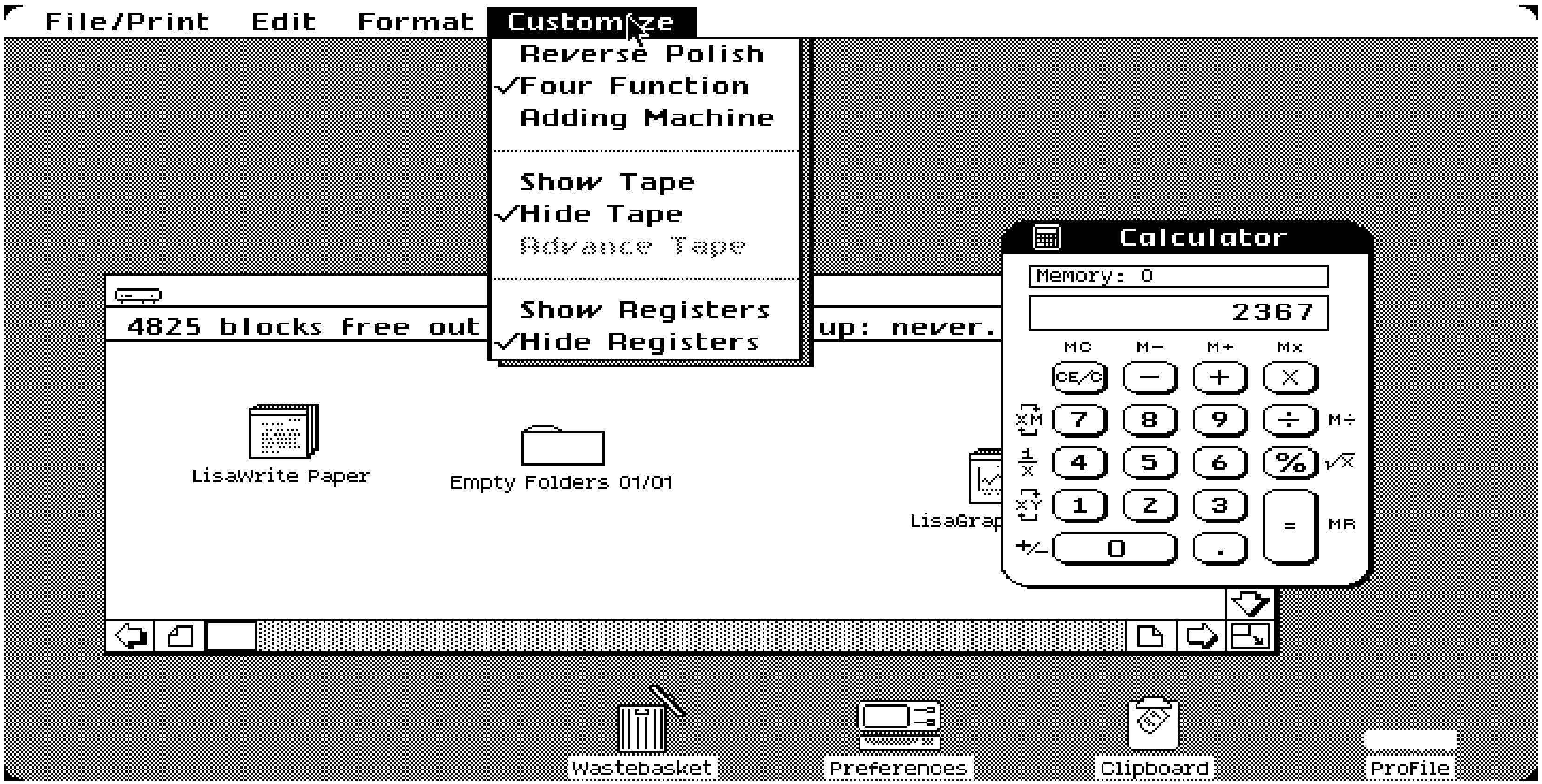
Steve Jobs visits PARC in 1979

XEROX STAR 1981

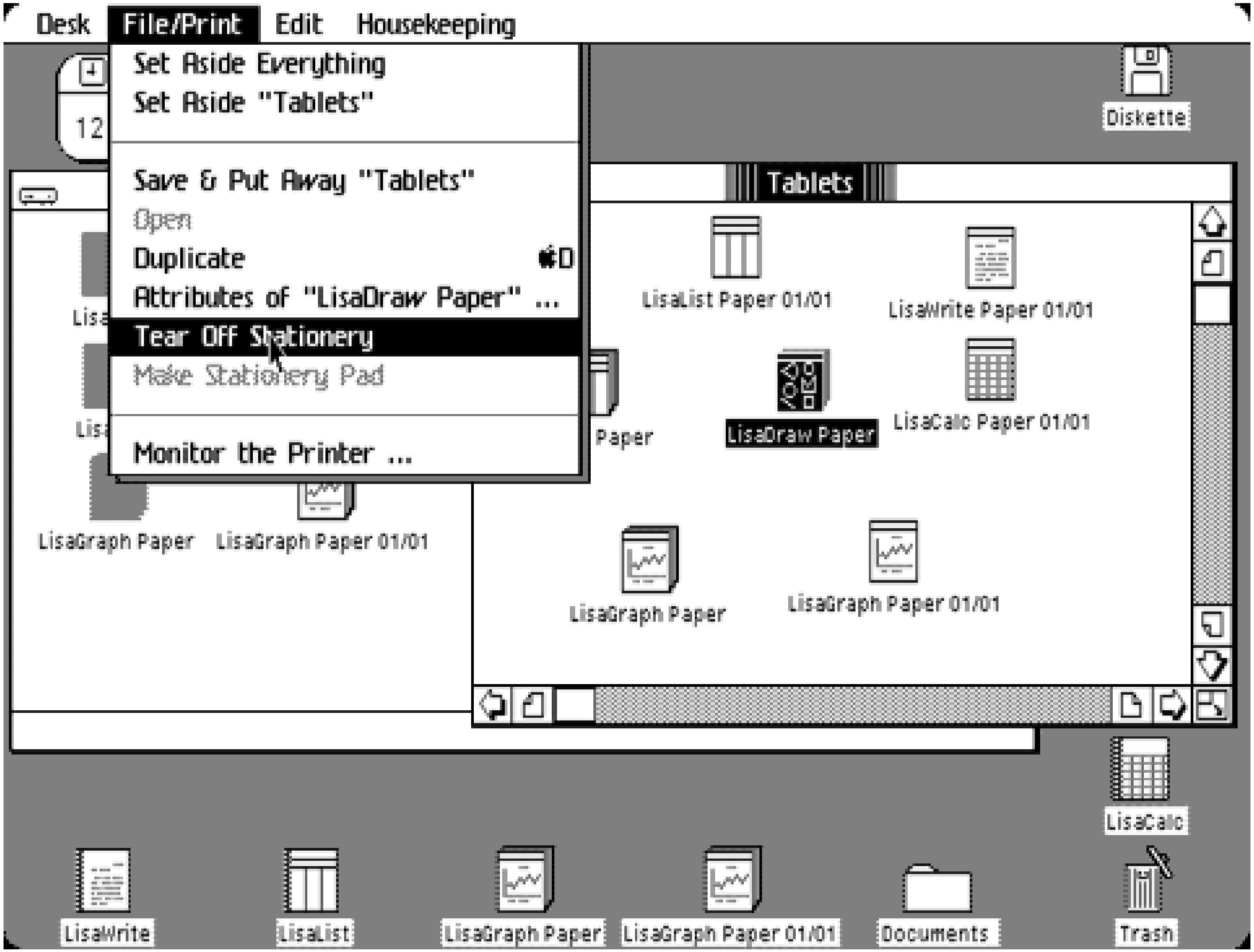
Apple Lisa 1981

Apple Lisa

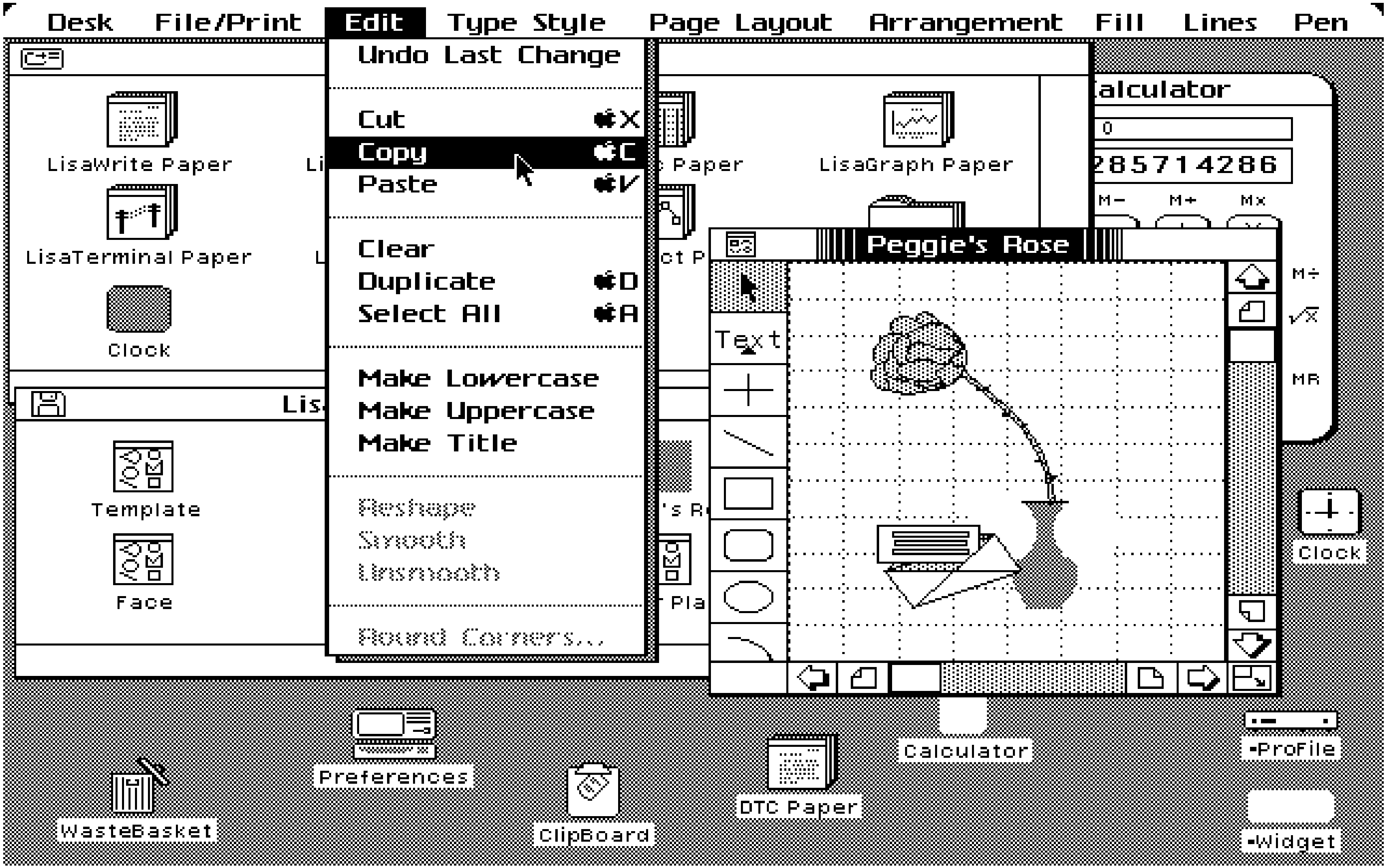
Apple Lisa


File/Print
Edit
Format
Customize
Reverse Polish
✓Four Function
Adding Machine
Show Tape
✓Hide Tape
Advance Tape
Show Registers
✓Hide Registers
4825 blocks free out
up: never.
Calculator
Memory: 0
2367
MC
M−
M+
Mx
CE/C
M÷
MR
LisaWrite Paper
Empty Folders 01/01
Wastebasket
Preferences
Clipboard
ProFile

Apple Lisa


Desk
File/Print
Edit
Housekeeping
Set Aside Everything
Set Aside "Tablets"
Save & Put Away "Tablets"
Open
Duplicate
Attributes of "LisaDraw Paper" ...
Tear Off Stationery
Make Stationery Pad
Monitor the Printer ...
Diskette
Tablets
LisaList Paper 01/01
LisaWrite Paper 01/01
LisaDraw Paper
LisaCalc Paper 01/01
Paper
LisaGraph Paper
LisaGraph Paper 01/01
LisaGraph Paper
LisaGraph Paper 01/01
LisaCalc
LisaWrite
LisaList
LisaGraph Paper
LisaGraph Paper 01/01
Documents
Trash

Apple Lisa



Desk
File/Print
Edit
Type Style
Page Layout
Arrangement
Fill
Lines
Pen
Undo Last Change
Cut
Copy
Paste
Clear
Duplicate
Select All
Make Lowercase
Make Uppercase
Make Title
Reshape
Smooth
Unsmooth
Round Corners...
LisaWrite Paper
LisaTerminal Paper
Clock
LisaGraph Paper
Template
Face
Peggie's Rose
Text
Calculator
Preferences
WasteBasket
ClipBoard
DTC Paper
ProFile
Widget

Xerox to Apple and Microsoft

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XEROX STAR 1981

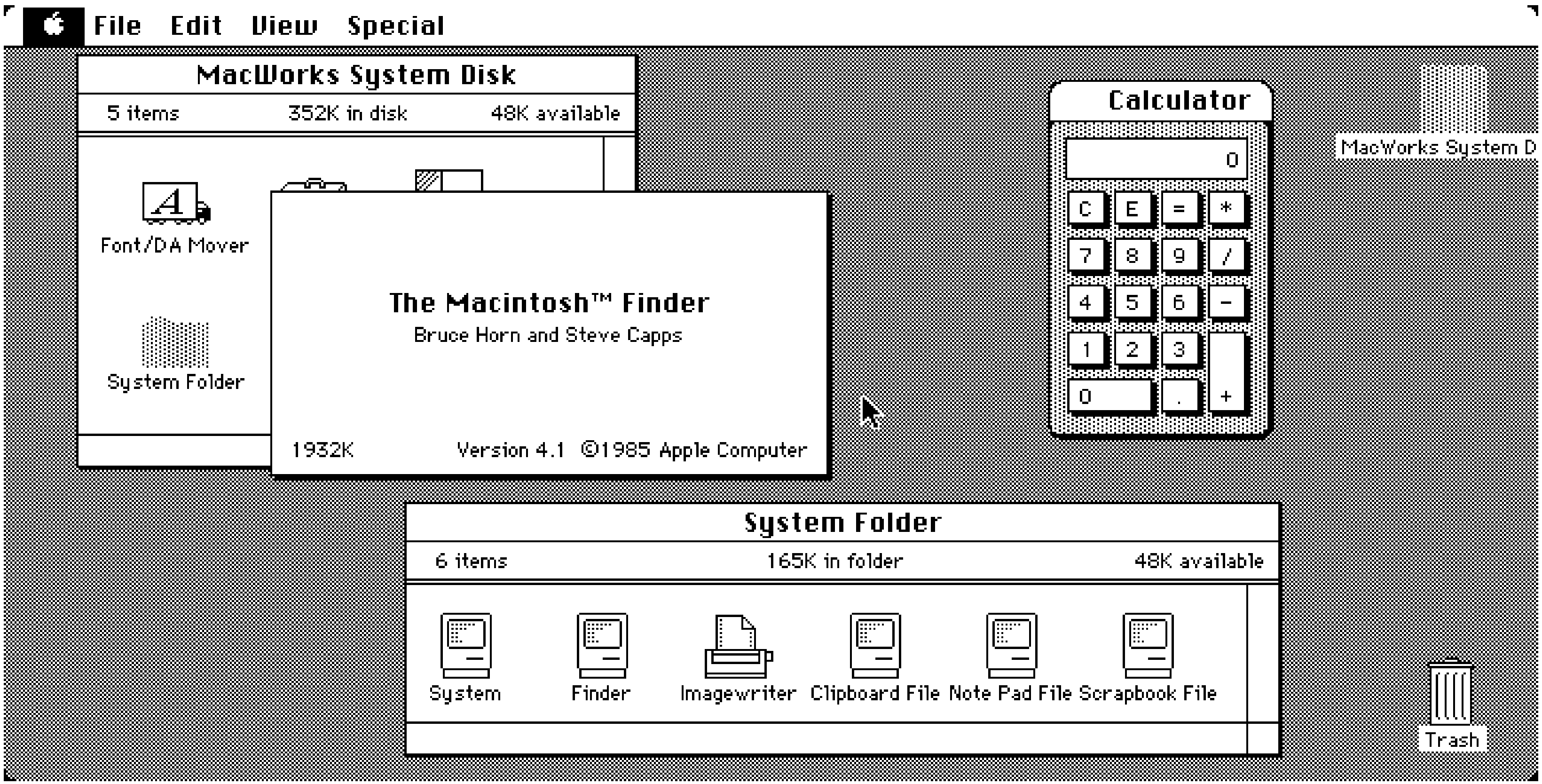
Apple Lisa 1981

Apple Macintosh 1984

Macintosh

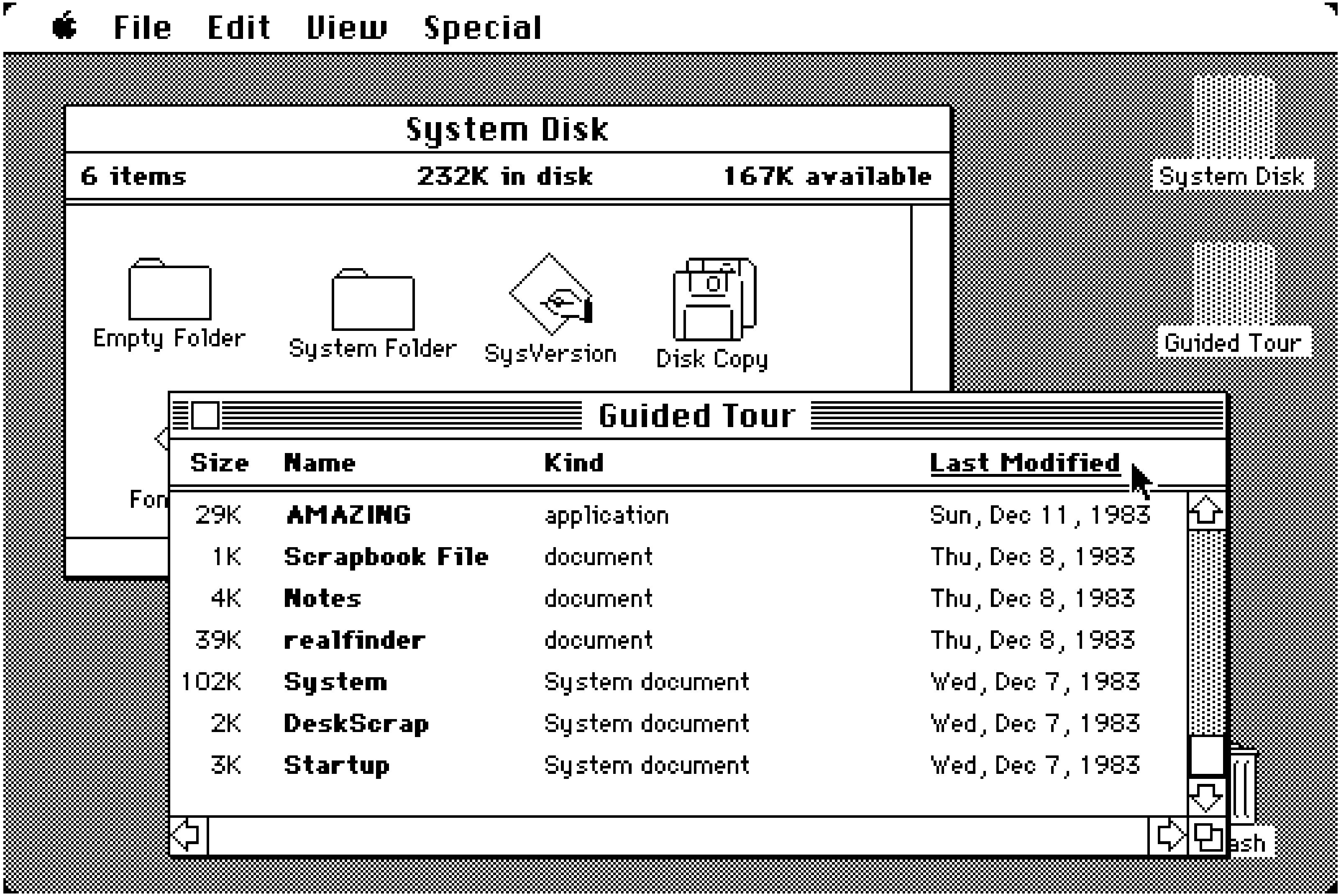

Archivio Composizione Esposizione Strumenti
The Macintosh™ Finder
512K

Macintosh



File
Edit
View
Special
MacWorks System Disk
5 items
352K in disk
48K available
Font/DA Mover
System Folder
The Macintosh™ Finder
Bruce Horn and Steve Capps
1932K
Version 4.1
©1985 Apple Computer
Calculator
0
C
E
=
*
7
8
9
/
4
5
6
-
1
2
3
0
.
+
MacWorks System D
System Folder
6 items
165K in folder
48K available
System
Finder
Imagewriter
Clipboard File
Note Pad File
Scrapbook File
Trash

Macintosh


File Edit View Special
System Disk
6 items 232K in disk 167K available
Empty Folder
System Folder
SysVersion
Disk Copy
System Disk
Guided Tour
Guided Tour
Size Name Kind Last Modified
29K AMAZING application Sun, Dec 11, 1983
1K Scrapbook File document Thu, Dec 8, 1983
4K Notes document Thu, Dec 8, 1983
39K realfinder document Thu, Dec 8, 1983
102K System System document Wed, Dec 7, 1983
2K DeskScrap System document Wed, Dec 7, 1983
3K Startup System document Wed, Dec 7, 1983

Xerox to Apple and Microsoft

XEROX Alto 1973

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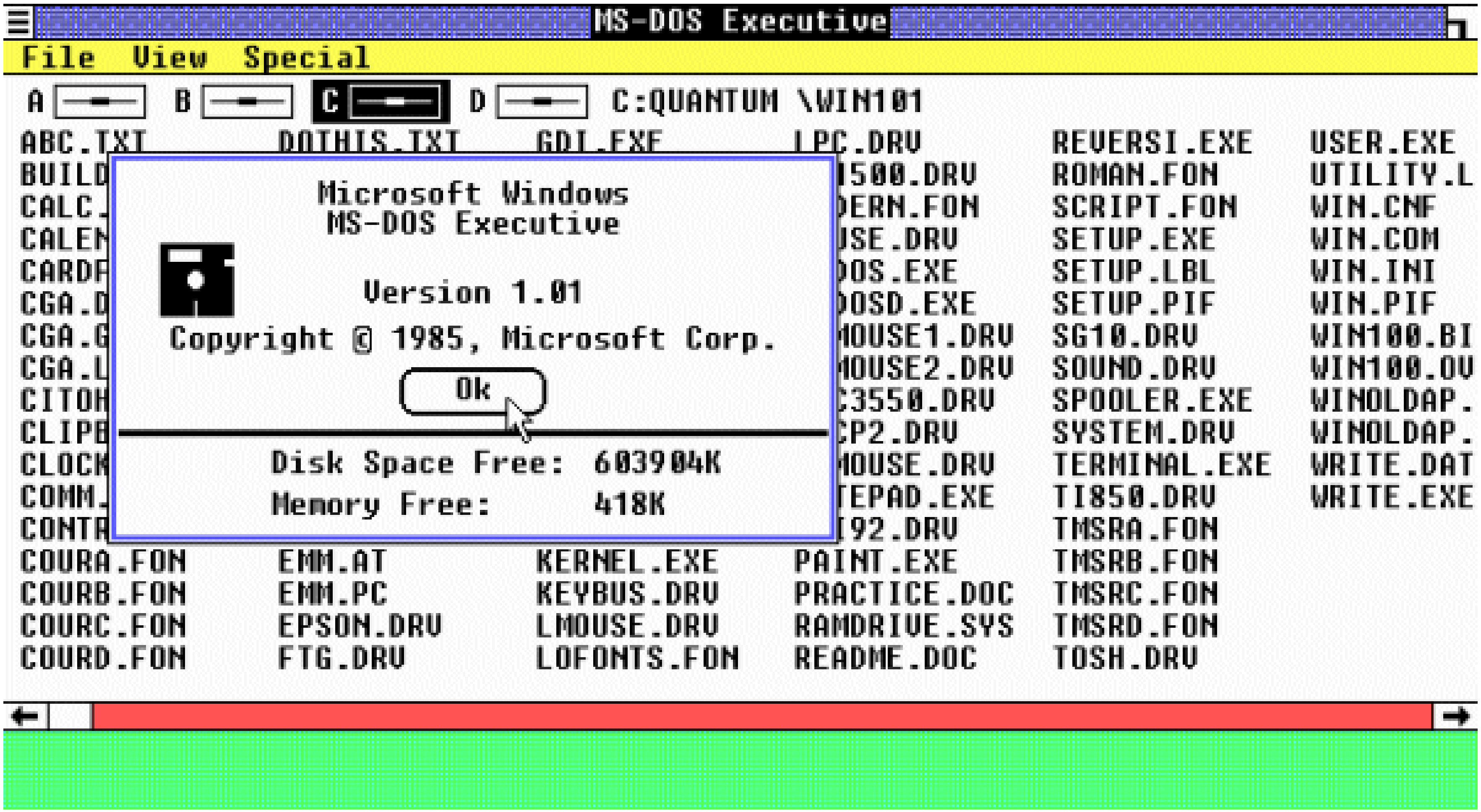
XEROX STAR 1981

Apple Lisa 1981

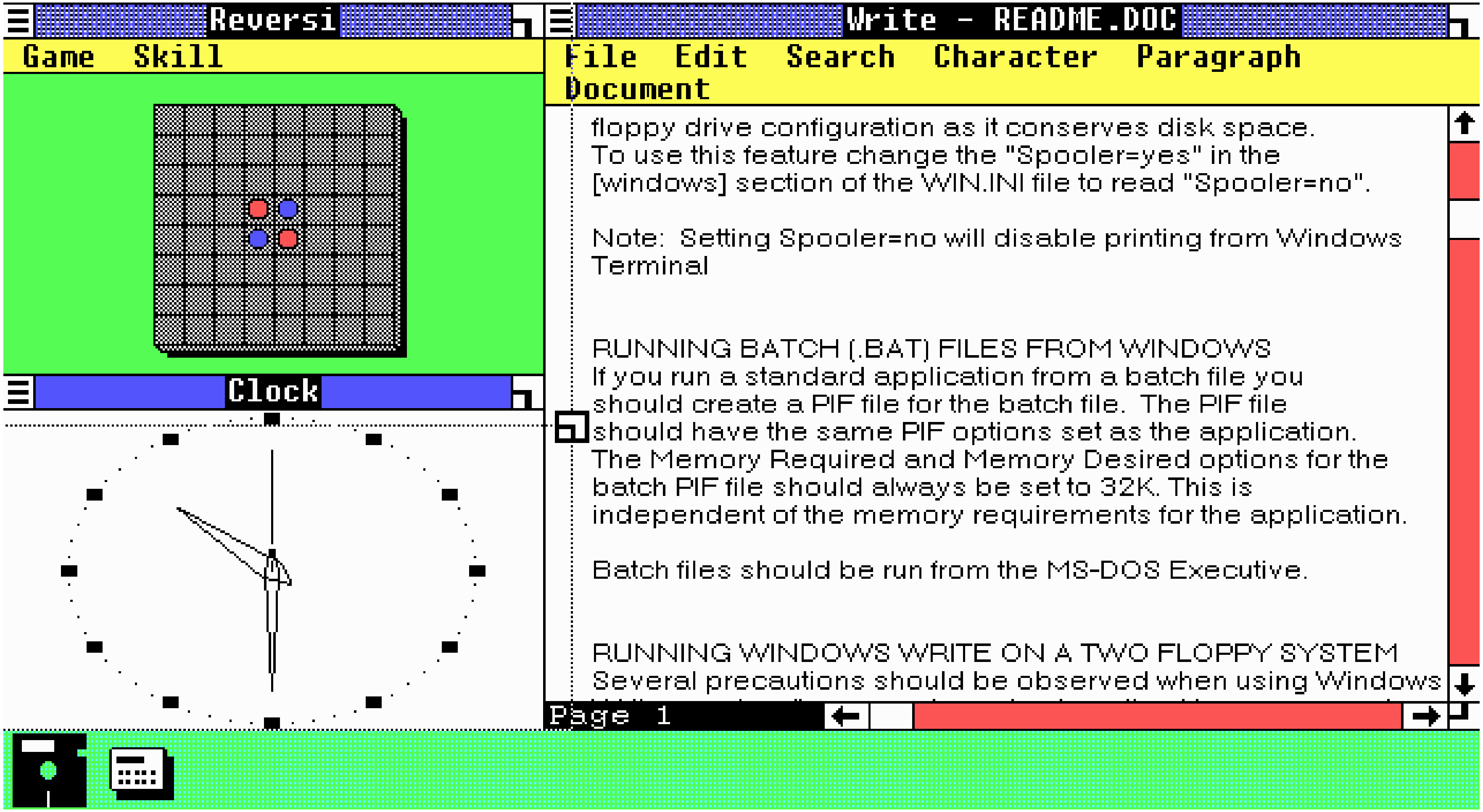
Apple Macintosh 1984

Windows 1.0 1985

Windows 1.0

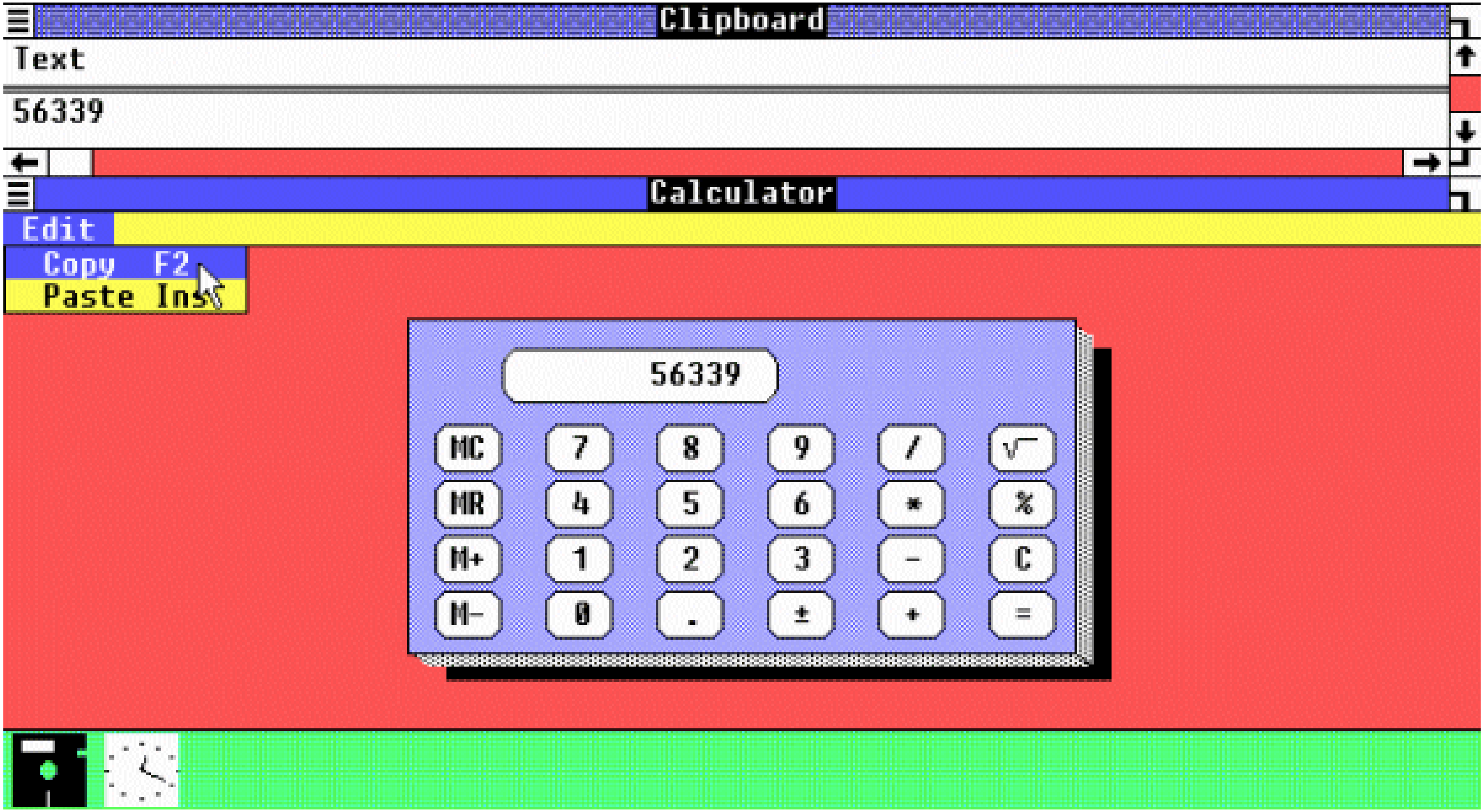

MS-DOS Executive
File View Special
A B C D C:QUANTUM \WIN101
ABC.TXT
DOTHIS.TXT
GDI.EXE
LPC.DRV
REVERSI.EXE
USER.EXE
ROMAN.FON
UTILITY.L
SCRIPT.FON
WIN.CNF
SETUP.EXE
WIN.COM
SETUP.LBL
WIN.INI
SETUP.PIF
WIN.PIF
SG10.DRV
WIN100.BI
SOUND.DRV
WIN100.OV
SPOOLER.EXE
WINOLDAP.
SYSTEM.DRV
WINOLDAP.
TERMINAL.EXE
WRITE.DAT
TI850.DRV
WRITE.EXE
TMSRA.FON
COURA.FON
EMM.AT
KERNEL.EXE
PAINT.EXE
TMSRB.FON
COURB.FON
EMM.PC
KEYBUS.DRV
PRACTICE.DOC
TMSRC.FON
COURC.FON
EPSON.DRV
LMOUSE.DRV
RAMDRIVE.SYS
TMSRD.FON
COURD.FON
FTG.DRV
LOFONTS.FON
README.DOC
TOSH.DRV
Microsoft Windows
MS-DOS Executive
Version 1.01
Copyright © 1985, Microsoft Corp.
Ok
Disk Space Free: 603904K
Memory Free: 418K

Windows 1.0



Reversi
Game Skill
Clock
Write - README.DOC
File Edit Search Character Paragraph Document
floppy drive configuration as it conserves disk space.
To use this feature change the "Spooler=yes" in the
[windows] section of the WIN.INI file to read "Spooler=no".
Note: Setting Spooler=no will disable printing from Windows Terminal
RUNNING BATCH (.BAT) FILES FROM WINDOWS
If you run a standard application from a batch file you should create a PIF file for the batch file. The PIF file should have the same PIF options set as the application. The Memory Required and Memory Desired options for the batch PIF file should always be set to 32K. This is independent of the memory requirements for the application.
Batch files should be run from the MS-DOS Executive.
RUNNING WINDOWS WRITE ON A TWO FLOPPY SYSTEM
Several precautions should be observed when using Windows
Page 1

Windows 1.0


Clipboard
Text
56339
Calculator
Edit
Copy F2
Paste Ins
56339
MC
7
8
9
/
MR
4
5
6
*
%
M+
1
2
3
-
C
M-
0
.
±
+
=

Xerox to Apple and Microsoft

XEROX Alto 1973

Steve Jobs visits PARC in 1979

XEROX STAR 1981

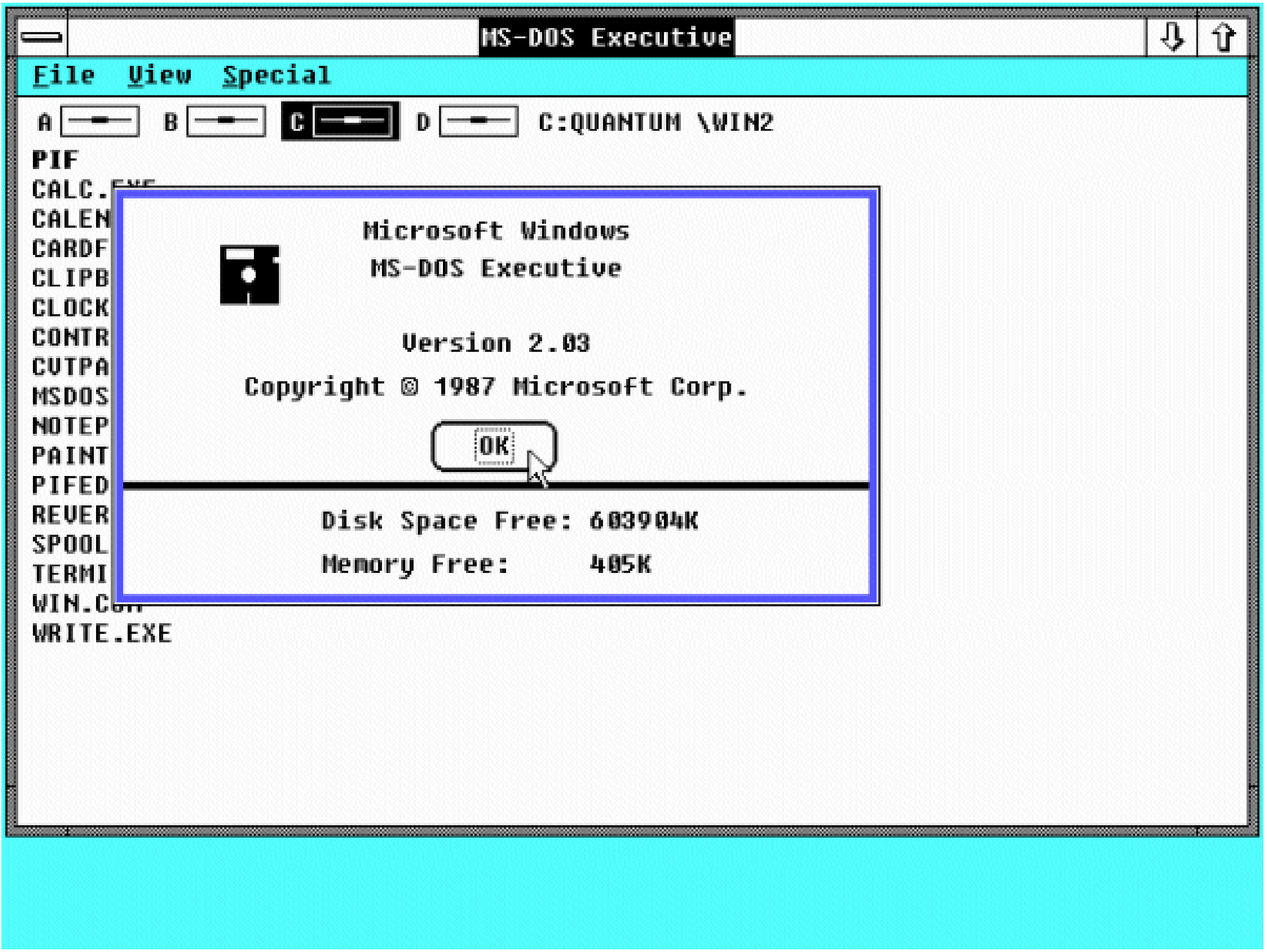
Apple Lisa 1981

Apple Macintosh 1984

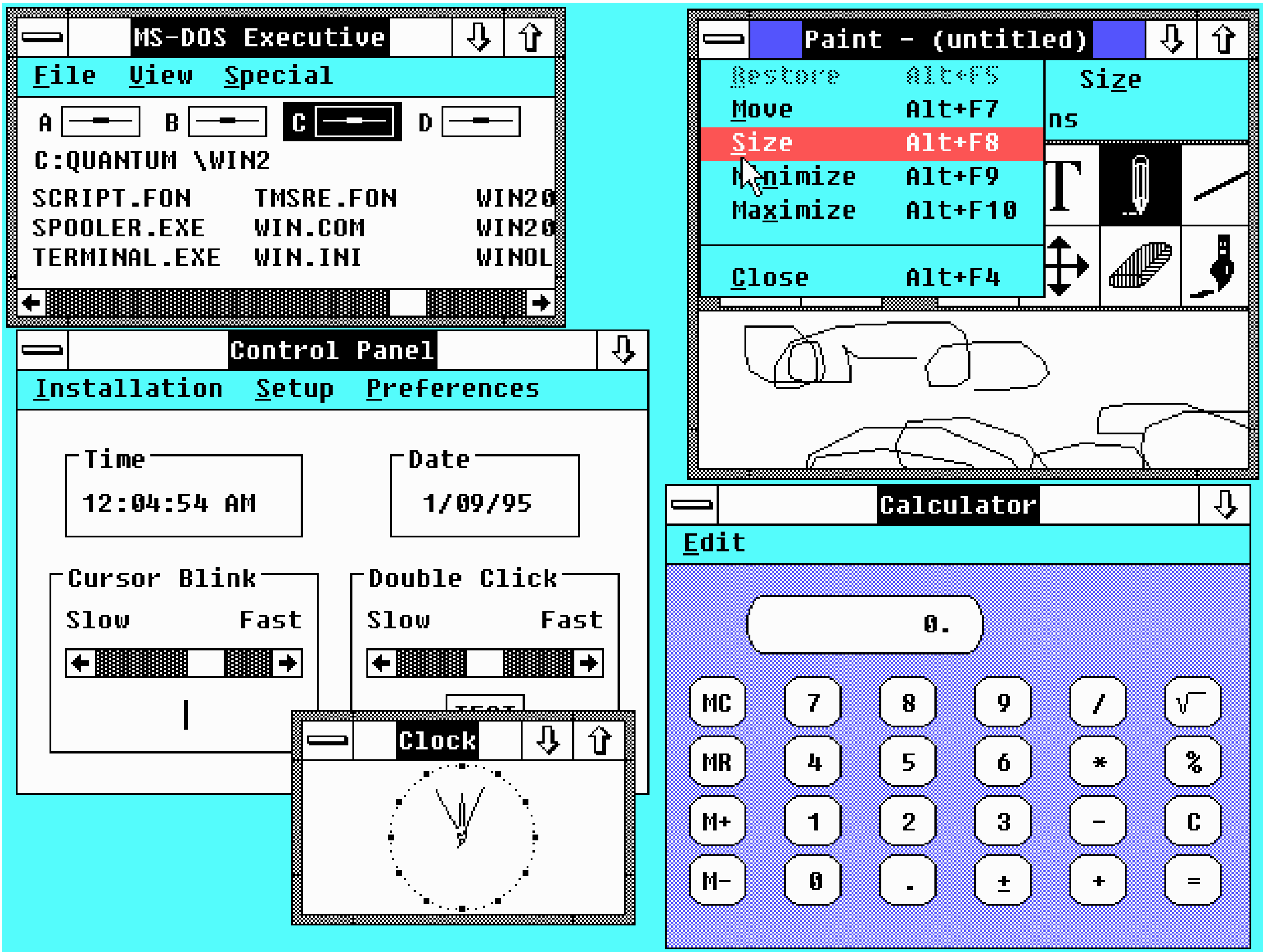
Windows 1.0 1985

Windows 2.0 1987

Windows 2.0 (1987)



Windows 2.0


MS-DOS Executive
File View Special
A B C D
C:QUANTUM \WIN2
SCRIPT.FON TMSRE.FON
SPOOLER.EXE WIN.COM
TERMINAL.EXE WIN.INI
Paint - (untitled)
Restore Alt+F5
Move Alt+F7
Size Alt+F8
Minimize Alt+F9
Maximize Alt+F10
Close Alt+F4
Size
Control Panel
Installation Setup Preferences
Time
12:04:54 AM
Date
1/09/95
Cursor Blink
Slow Fast
Double Click
Slow Fast
Clock
Calculator
Edit
0.
MC 7 8 9 / √
MR 4 5 6 * %
M+ 1 2 3 - C
M- 0 . ± + =

Xerox to Apple and Microsoft

XEROX Alto 1973

Steve Jobs visits PARC in 1979

XEROX STAR 1981

Apple Lisa 1981

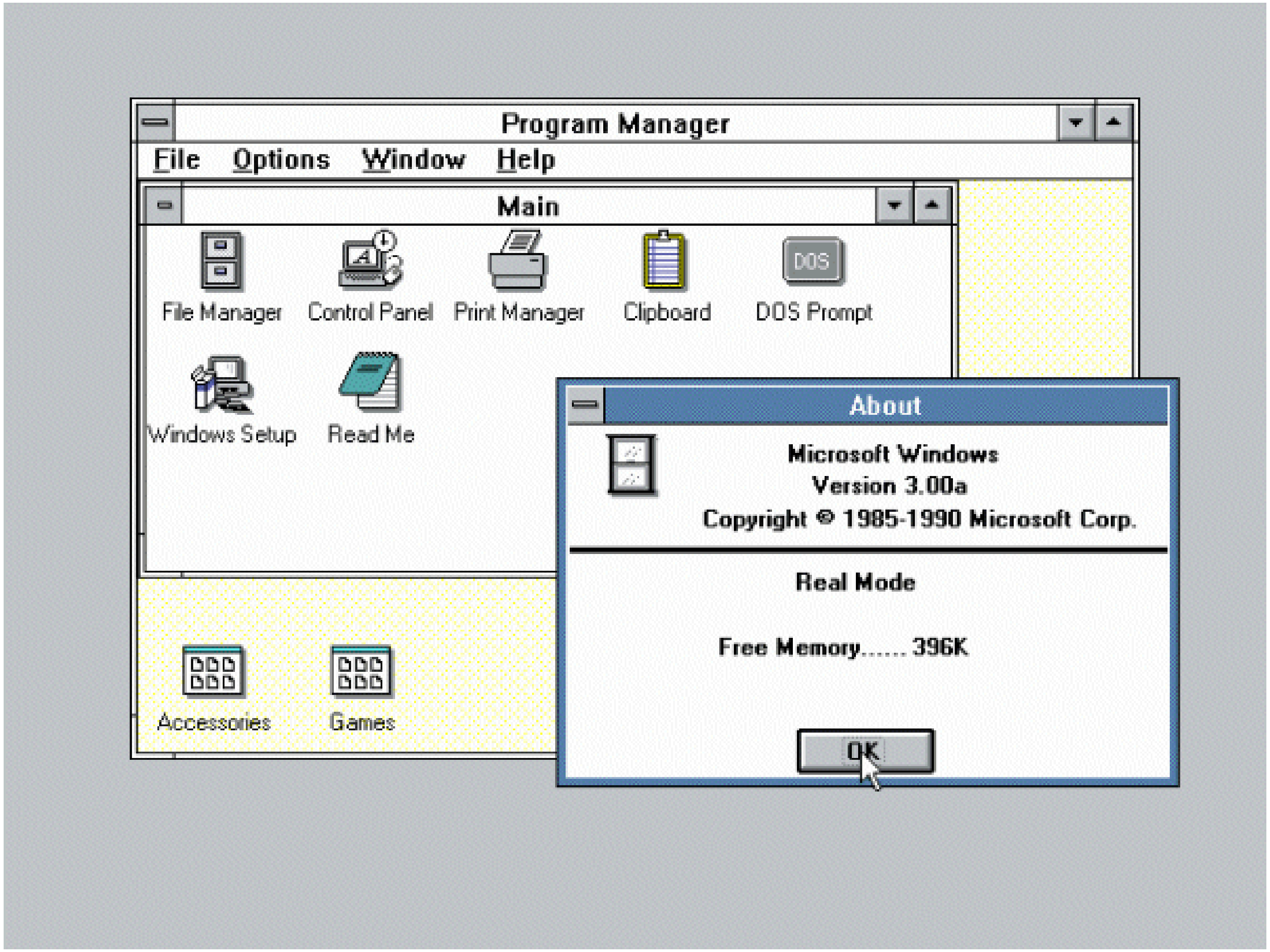
Apple Macintosh 1984

Windows 1.0 1985

Windows 2.0 1987

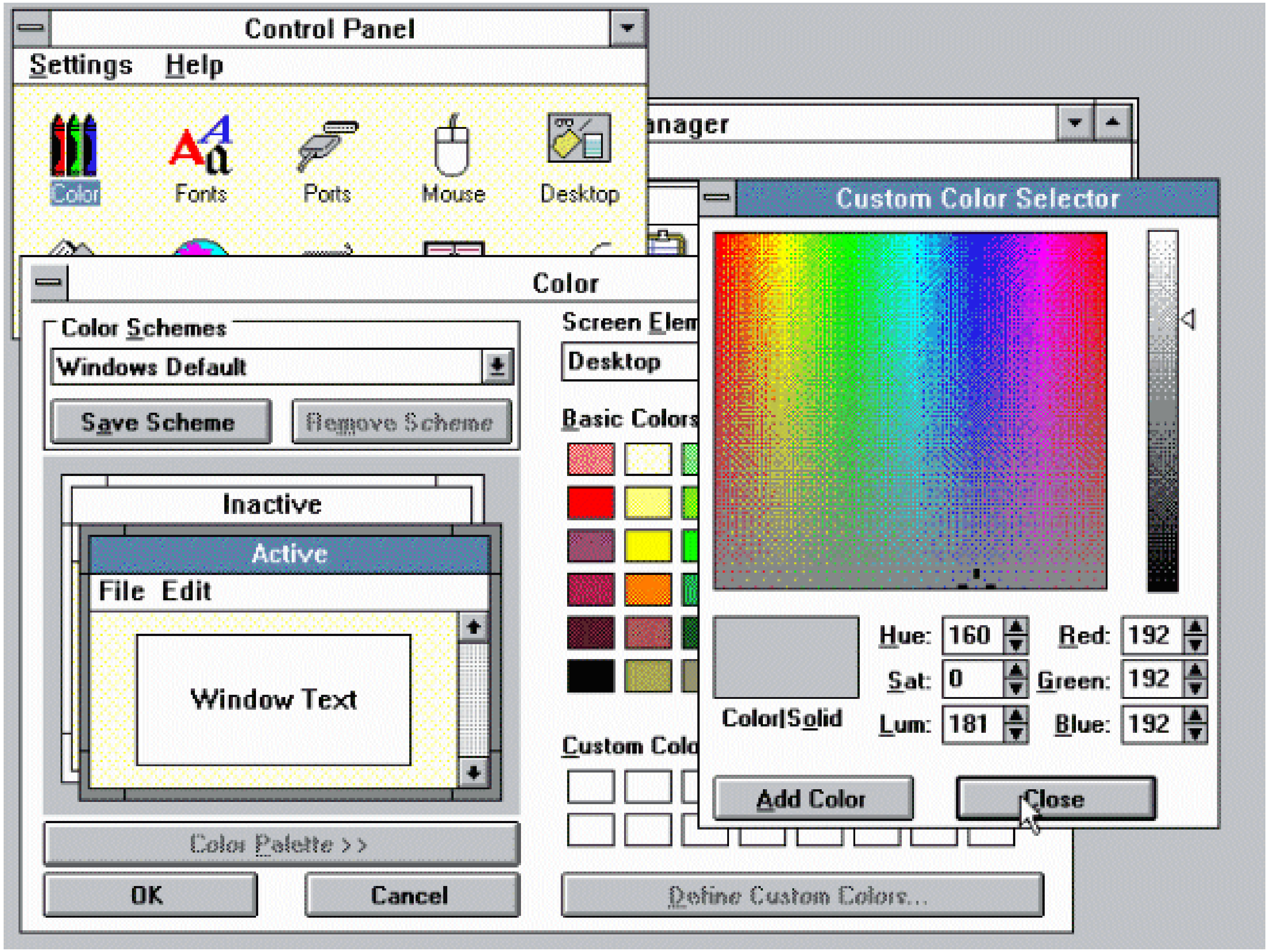
Windows 3.0 1990

Windows 3.0

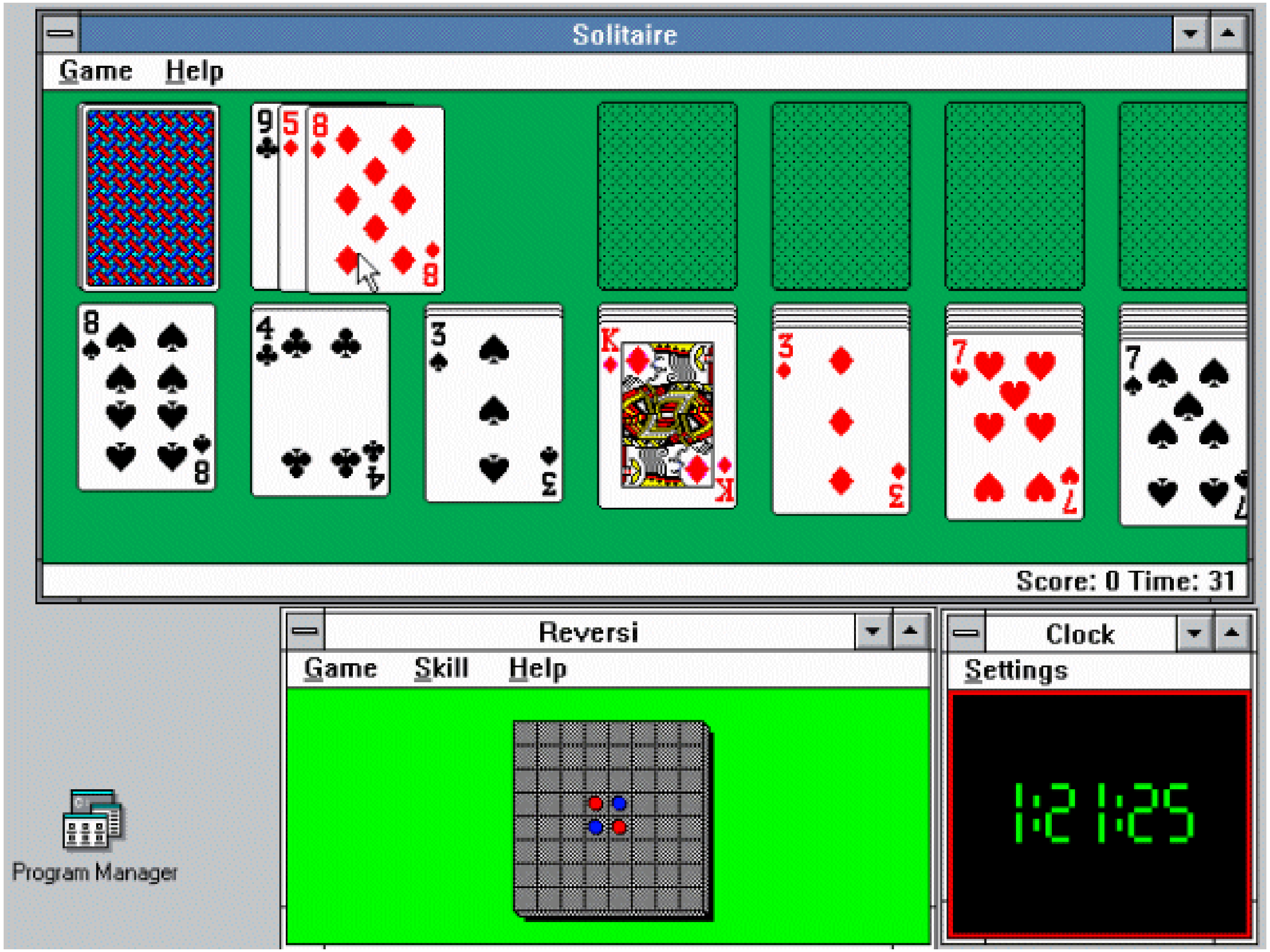


Program Manager
File
Options
Window
Help
Main
File Manager
Control Panel
Print Manager
Clipboard
DOS
DOS Prompt
Windows Setup
Read Me
Accessories
Games
About
Microsoft Windows
Version 3.00a
Copyright © 1985-1990 Microsoft Corp.
Real Mode
Free Memory...... 396K
OK

Windows 3.0


Control Panel
Settings Help
Color
Fonts
Ports
Mouse
Desktop
anager
Custom Color Selector
Color
Color Schemes
Windows Default
Save Scheme
Remove Scheme
Inactive
Active
File Edit
Window Text
Color Palette >>
OK
Cancel
Screen Elem
Desktop
Basic Colors
Custom Colo
Define Custom Colors...
Hue: 160
Sat: 0
Lum: 181
Red: 192
Green: 192
Blue: 192
Color|Solid
Add Color
Close

Windows 3.0


Solitaire
Game Help
Score: 0 Time: 31
Reversi
Game Skill Help
Clock
Settings
1:21:25
Program Manager

Xerox to Apple and Microsoft

XEROX Alto 1973

Steve Jobs visits PARC in 1979

XEROX STAR 1981

Apple Lisa 1981

Apple Macintosh 1984

Windows 1.0 1985

Windows 2.0 1987

Windows 3.0 1990

Bill Gates: "Hey, Steve, just because you broke into Xerox's house before I did and took the TV doesn't mean I can't go in later and take the stereo"

HCI Turing Awards

Sutherland wins 1988 Turing Award

Engelbart wins 1997 Turing Award

Alan Kay wins 2003 Turing Award

(in part for SmallTalk and OOP,
though he says OOP is linked to the GUI)

CSE 440: Introduction to HCI

User Interface Design, Prototyping, and Evaluation

Lecture 04:
HCI History

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

DESIGN
USE
BUILD

Tuesday / Thursday
10:30 to 11:50

CSE 440: Introduction to HCI

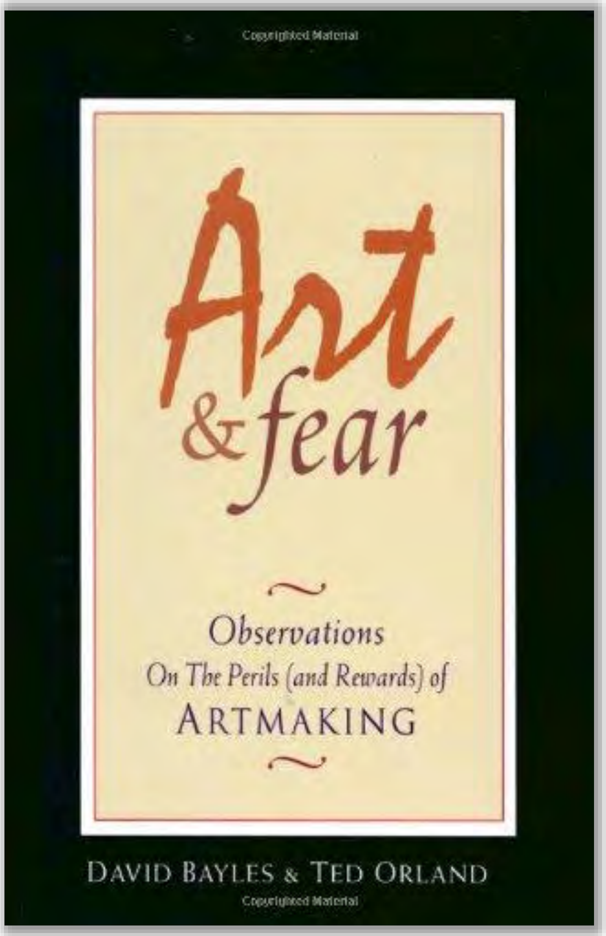
User Interface Design, Prototyping, and Evaluation

Lecture 05:
Design Diamond

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50

Quantity versus Quality



One class told they will be graded on quality, another on quantity

Bayles and Orland, 2001

Quantity versus Quality

The quantity class produces better pots. Why?

Bayles and Orland, 2001

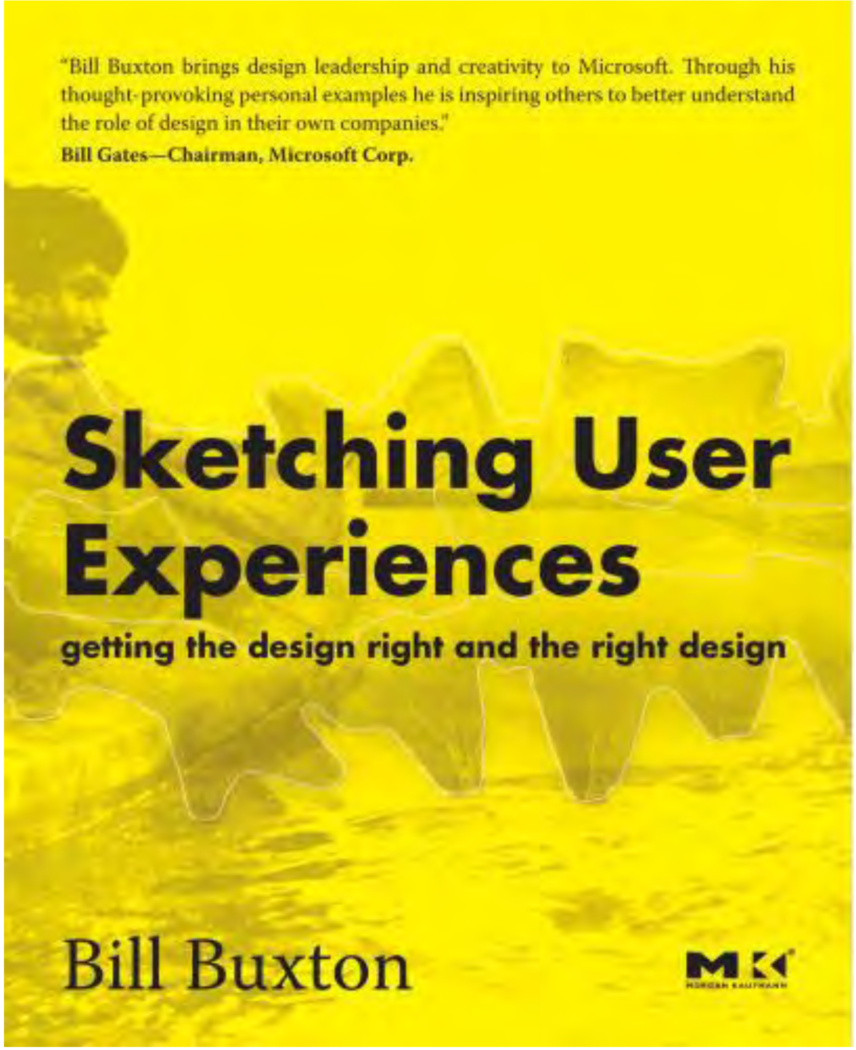
Quantity versus Quality

The quantity class produces better pots. Why?

"While the quantity group was busily churning out piles of work—and learning from their mistakes—the quality group had sat theorizing about perfection, and in the end had little more to show for their efforts than grandiose theories and a pile of dead clay"

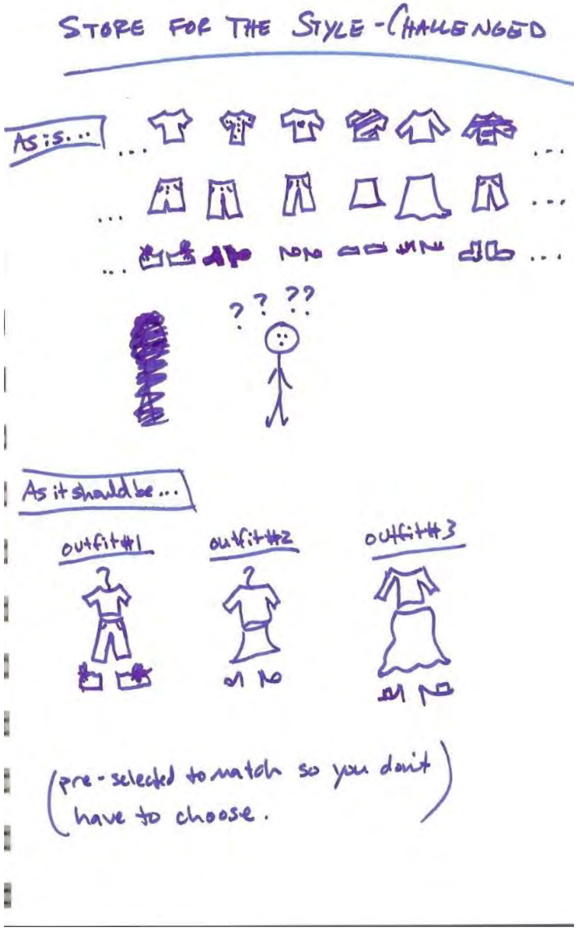
Bayles and Orland, 2001

Sketching User Experiences



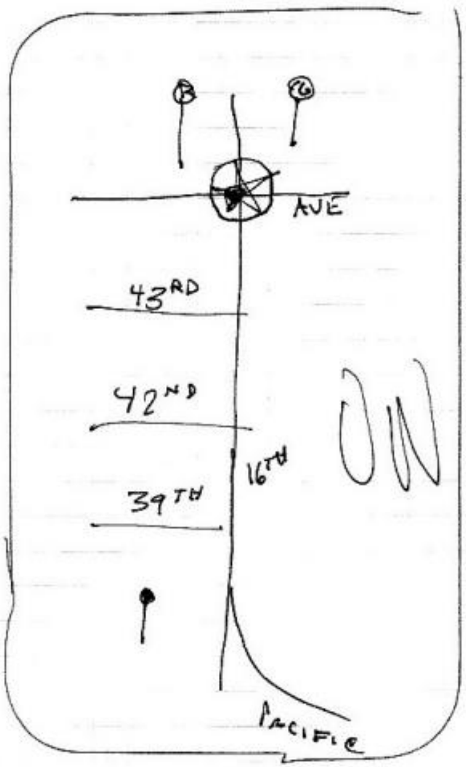
Sketching

Movies
Theater: Shattuck Cinemas
Phone: (510) 665-1342 Dist: 1.5 mi
Address: 2122 Shattuck Ave
Berkeley, 94709
Map-It
Art of War
Bittersweet Motel
Godzilla
The Cell

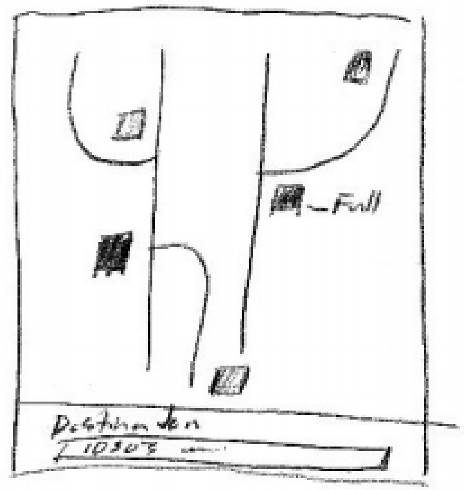


STORE FOR THE STYLE-CHALLENGED
As is...
As it should be...
outfit#1
outfit#2
outfit#3
(pre-selected to match so you don't have to choose.)

Sketching

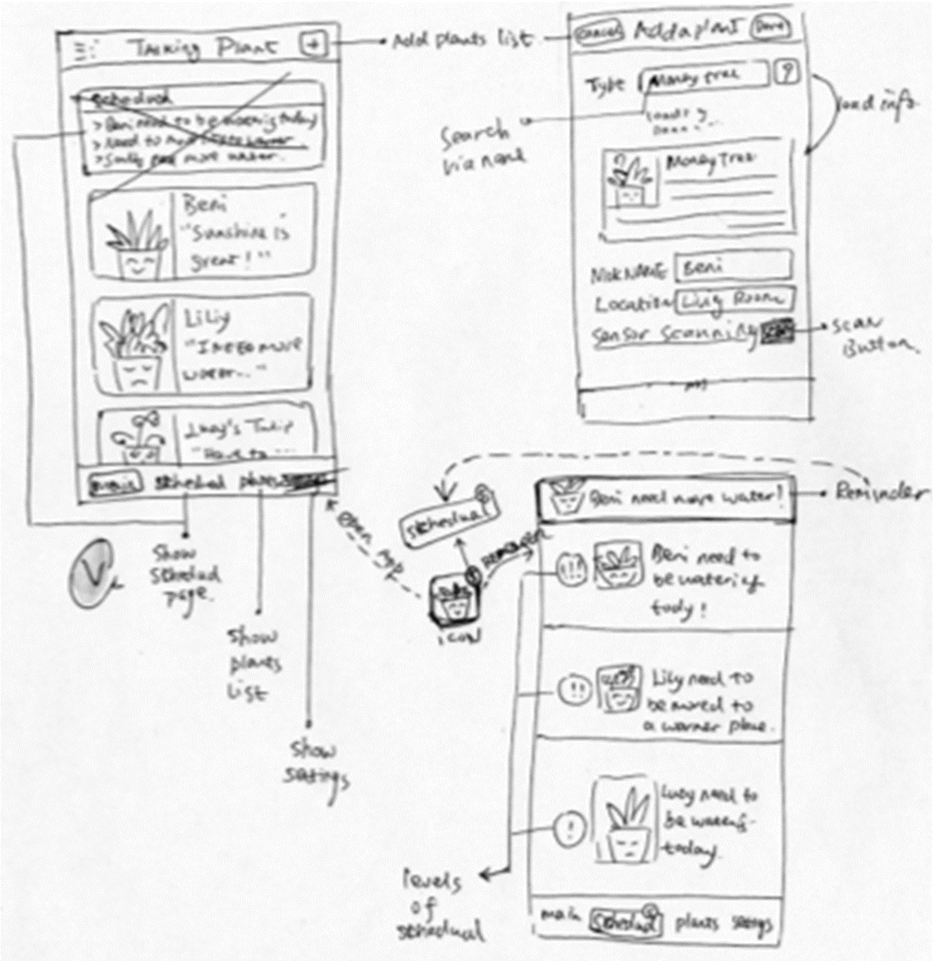


MAP SHOWING PARKING AVAILIBILITY BASED ON INPUTTED DATA, INPUTTED ON MAP

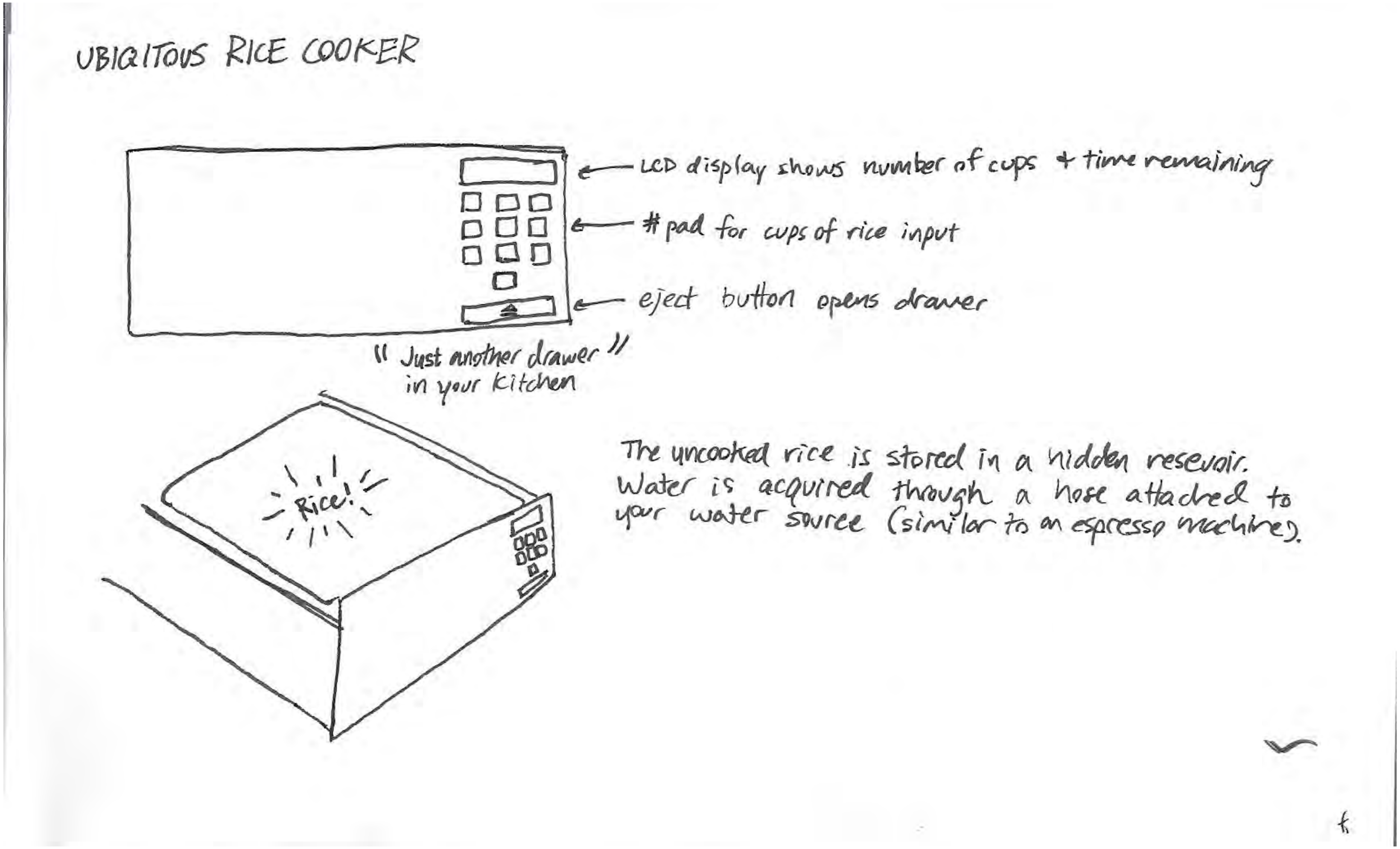


- Different colours
- highlights availability
-

Sketching



Sketching



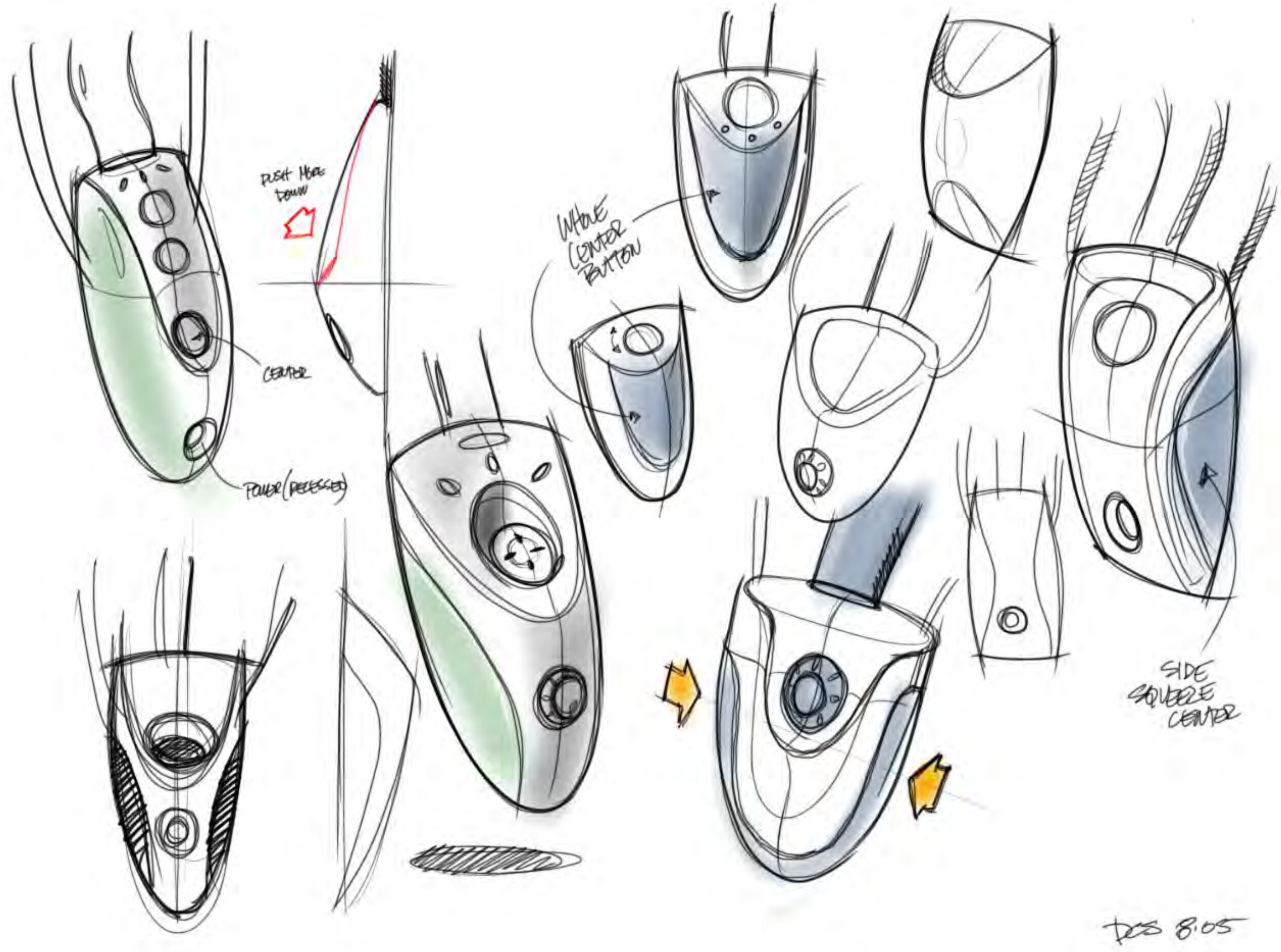
UBIQITOUS RICE COOKER
LCD display shows number of cups + time remaining
pad for cups of rice input
eject button opens drawer
" Just another drawer "
in your kitchen
Rice!
The uncooked rice is stored in a hidden reservoir.
Water is acquired through a hose attached to
your water source (similar to an espresso machine).

Sketching

A process that enables you to

- think through ideas and
- convey design ideas to others
- very early in the design phase

Quintessential Activity of Design



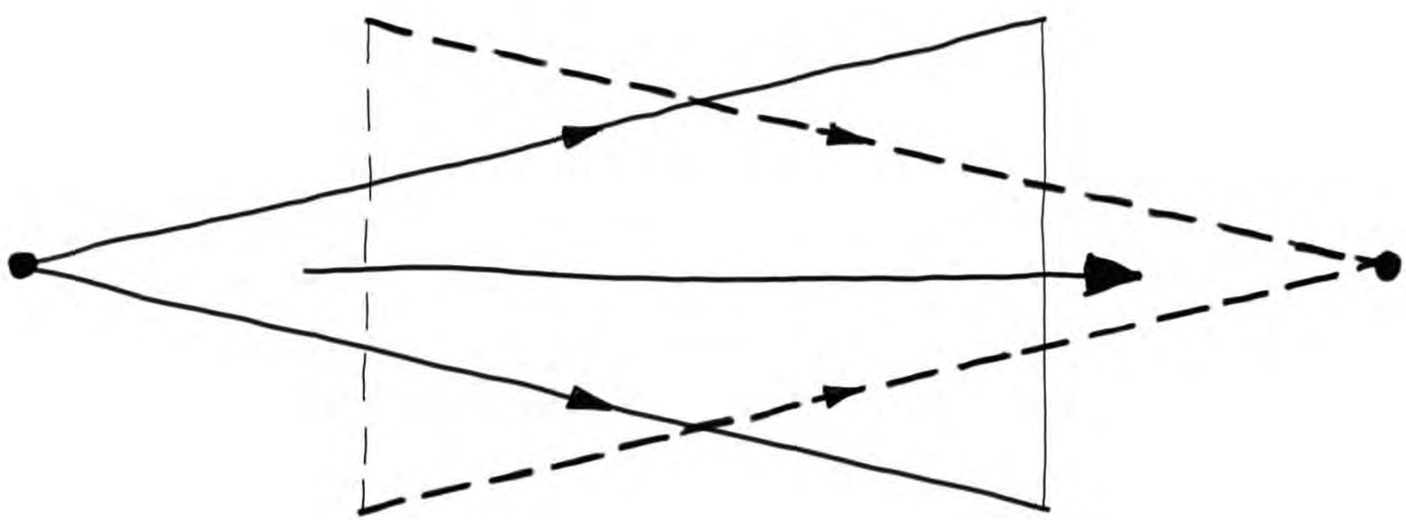
Design as Choice

Elaboration

palette of choices

Reduction

heuristics to choose



Design as Choice

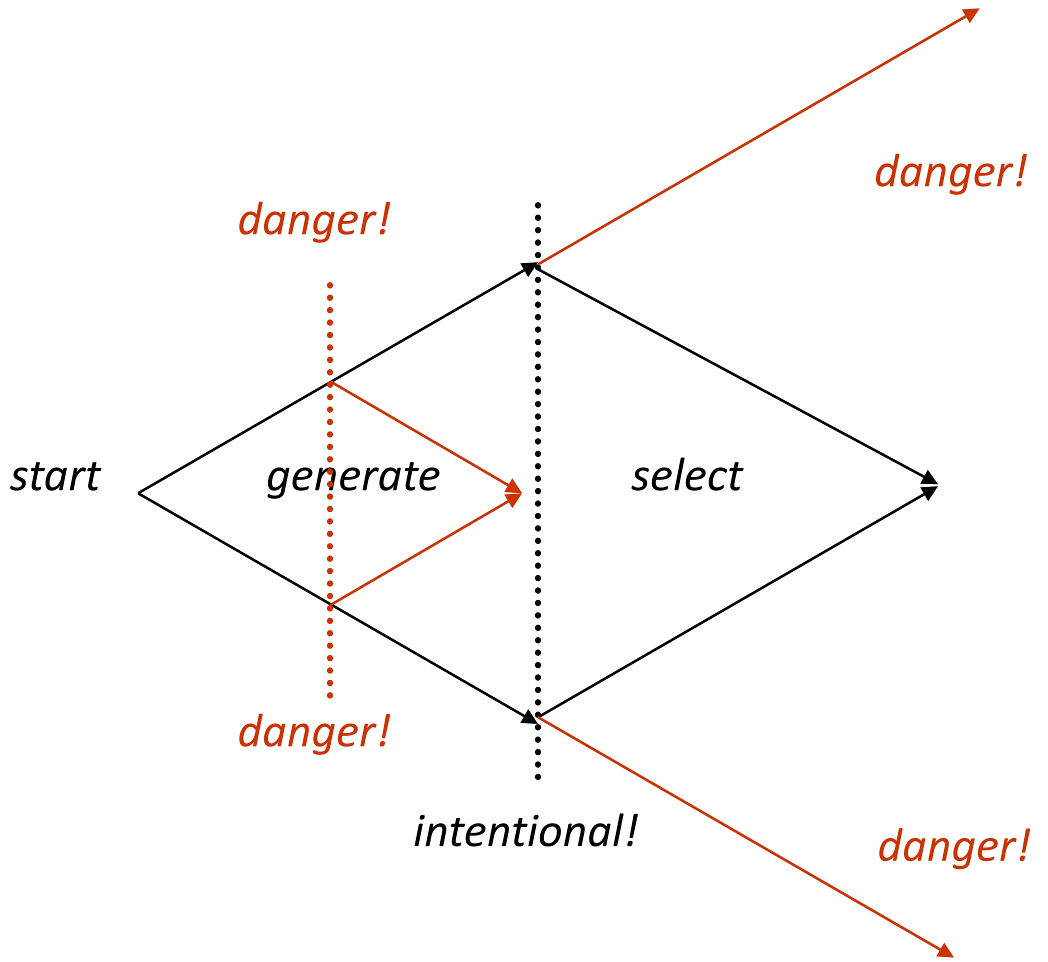
Two openings for creativity

- Palette of choices
- Heuristics used to choose

Why is your design research so important?

- What you learn directly informs both of these, shaping everything you do this entire quarter

The Design Diamond

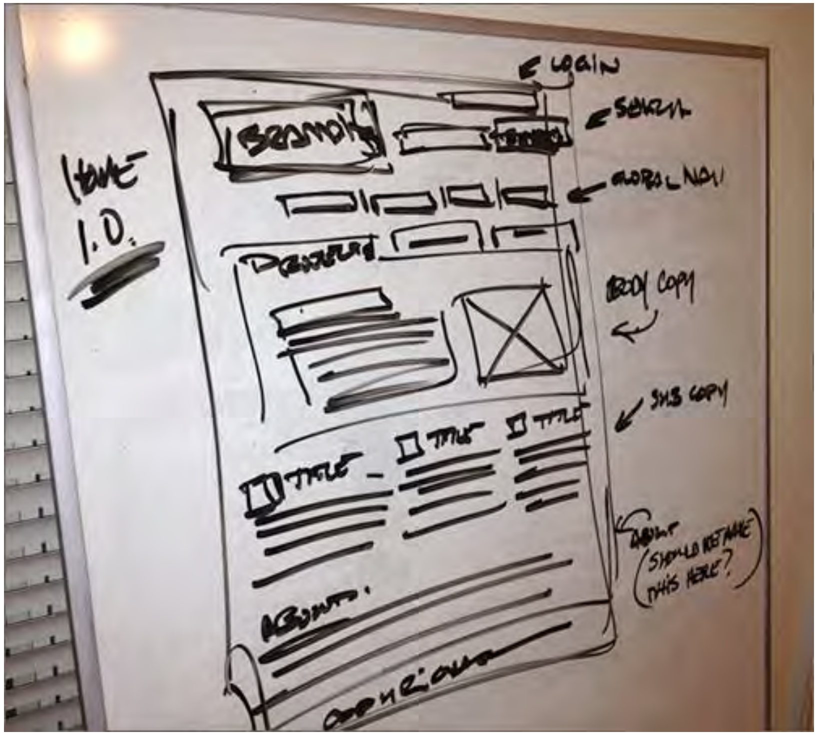


Properties of Sketches

Quick
Timely
Inexpensive
Disposable
Plentiful
Clear Vocabulary
Distinct Gesture
Minimal Detail
Appropriate Refinement
Suggest and Explore
Ambiguous

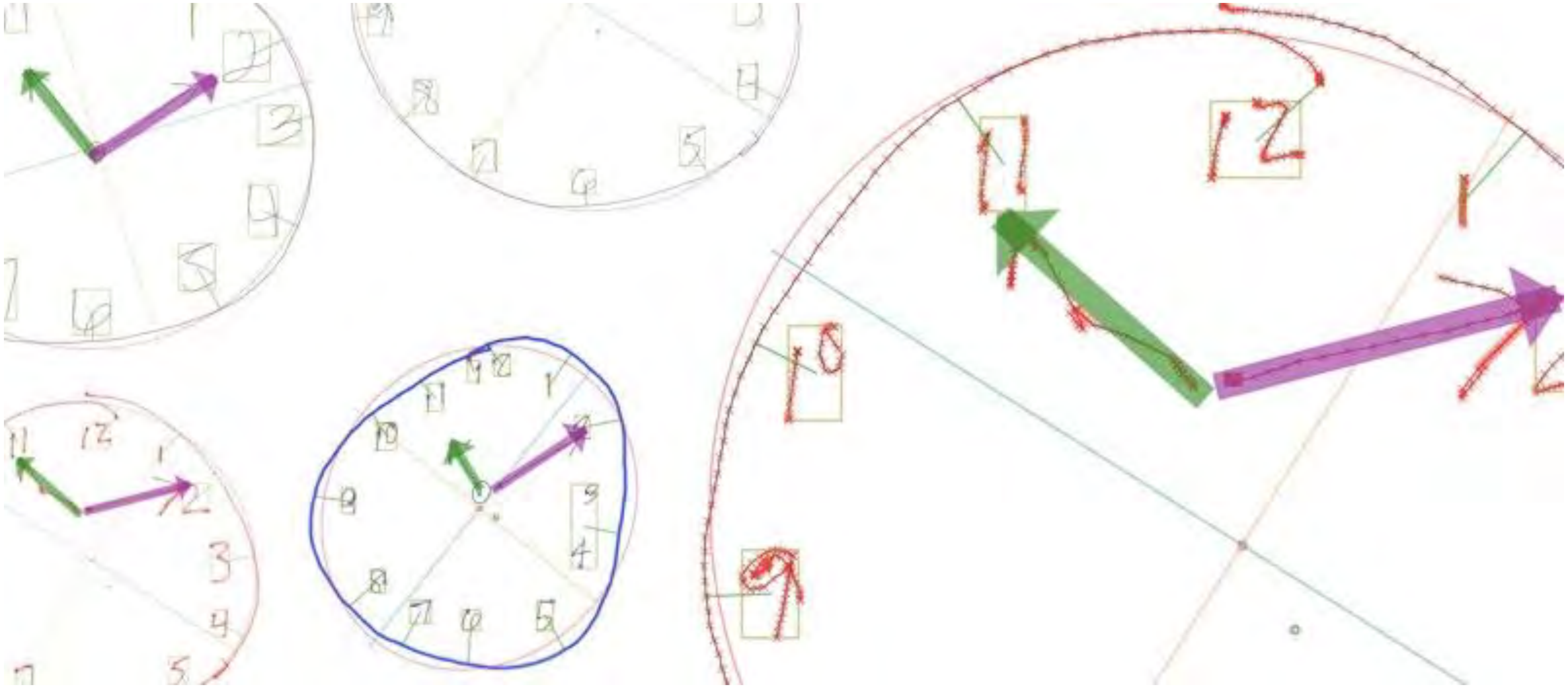
Quick

A sketch is quick to make,
or at least gives that impression



Timely

A sketch can be provided when needed



Inexpensive

Cost must not inhibit the ability to explore a concept, especially early in design

Disposable

If you cannot afford to throw it away,
then it is not a sketch

Investment is in the process,
not the physical sketch

But they are not "worthless"

Plentiful

Sketches do not exist in isolation

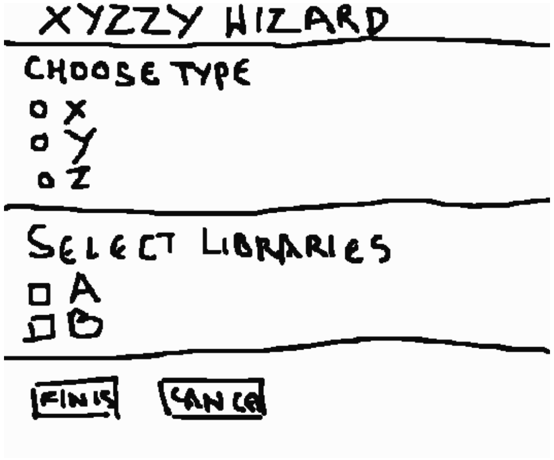
Meaning and relevance is in the context of a collection or series

Clear Vocabulary

The way it is rendered makes it distinctive that it is a sketch (e.g., style, form, signals)

Could be how a line extends through endpoints

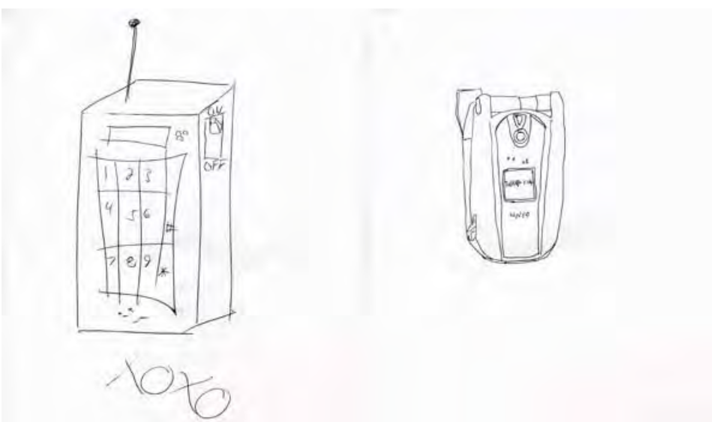
Physical sketches have their own vocabulary



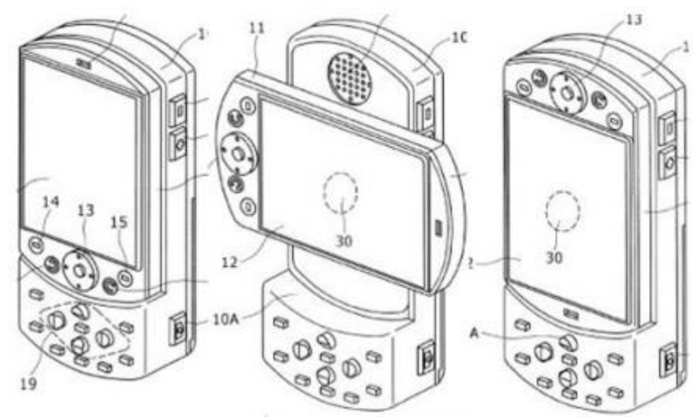
Distinct Gesture

Fluidity of sketches gives them a sense of openness and freedom

Opposite of engineering drawing, which is tight and precise

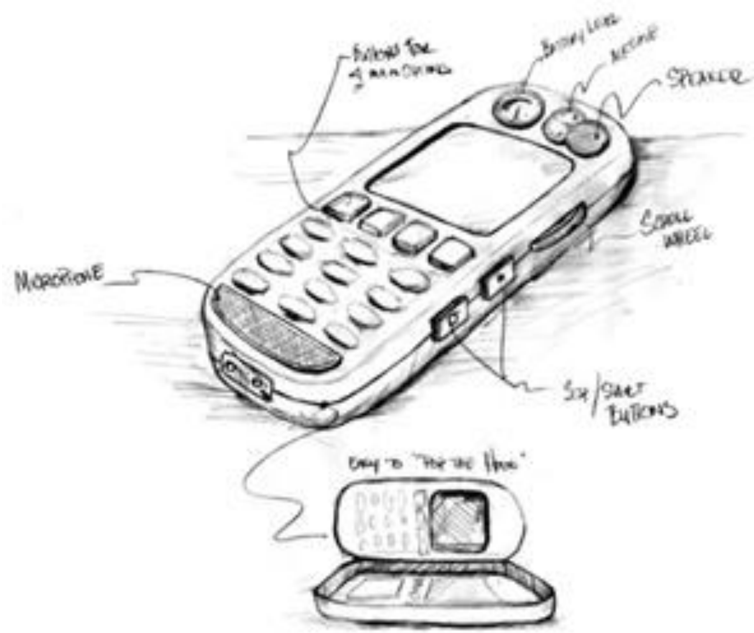


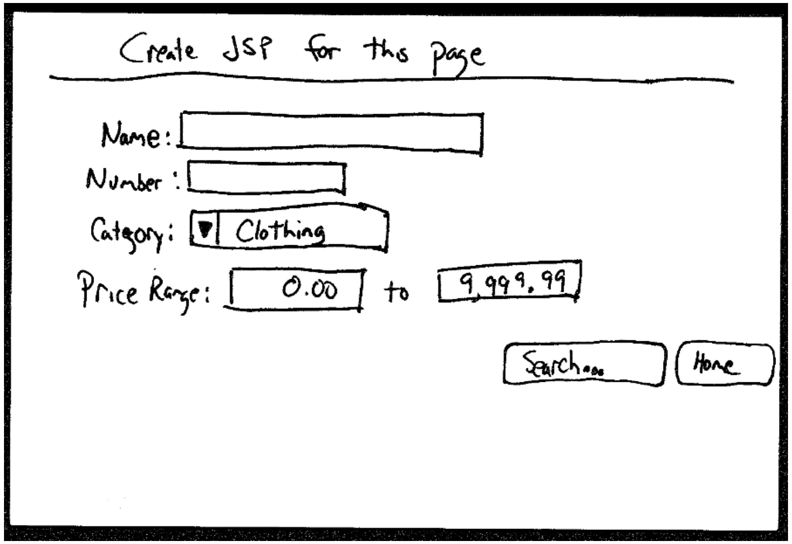
vs.



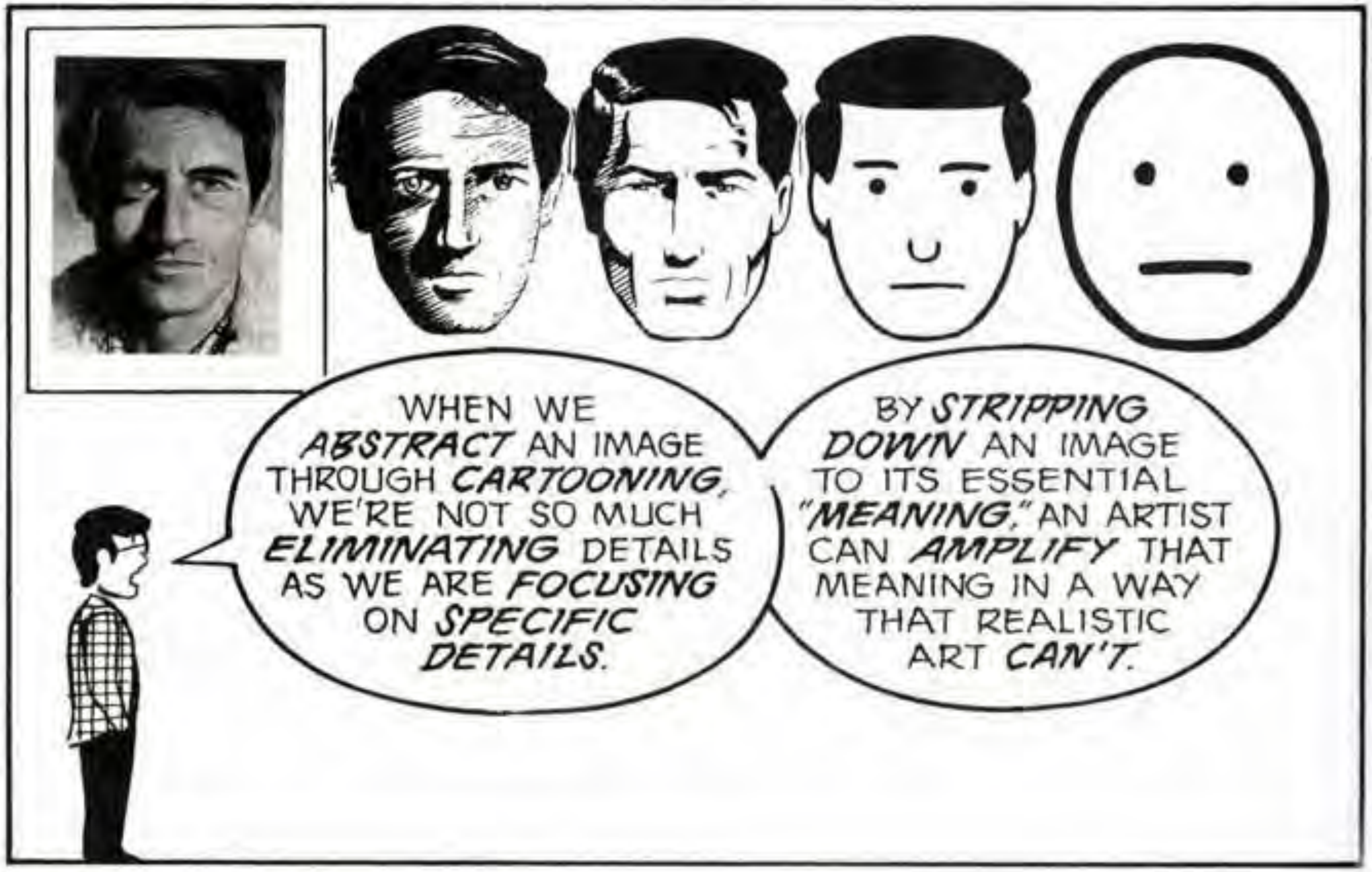
Minimal Detail

Include only what is required
to render the intended purpose or concept





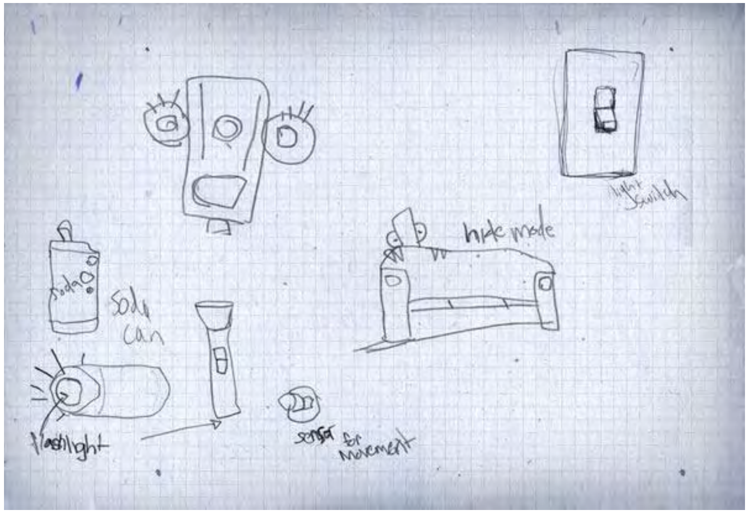
Minimal Detail



Appropriate Degree of Refinement

Make the sketch as refined as the idea

If you have a solid idea, make the sketch look more defined



If you have a hazy idea, make the sketch look rougher and less defined

Suggest and Explore Rather than Confirm

Sketch should act as a catalyst
to the desired and appropriate behaviors,
conversations, and interactions

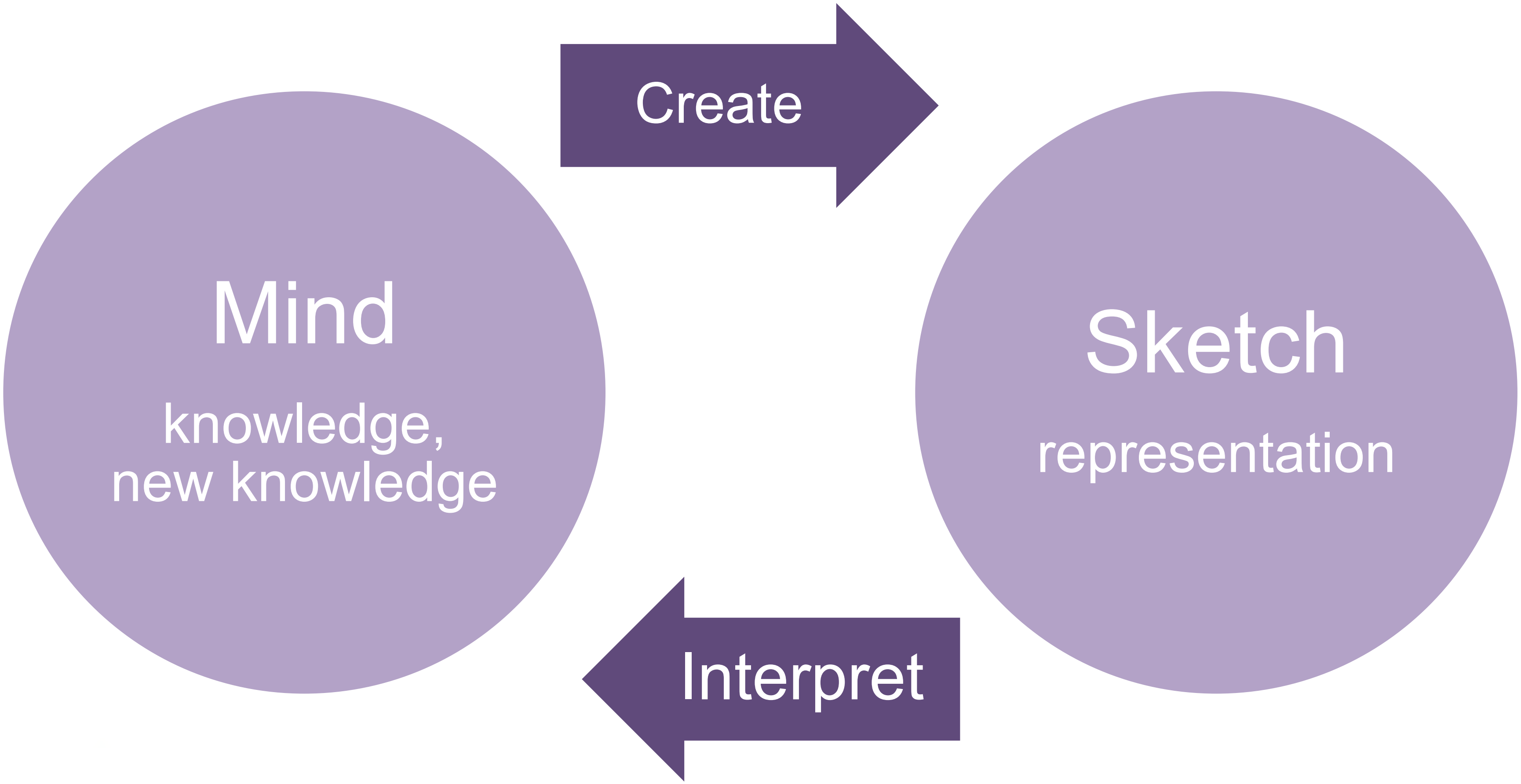
Ambiguity

Intentionally ambiguous

Value comes from being
able to be interpreted
in different ways, even by
the person who created them

Sketches have holes

Sketching as Conversation



Requires ambiguity

Sketch vs. Prototype

Sketch	Prototype
Invite	Attend
Suggest	Describe
Explore	Refine
Question	Answer
Propose	Test
Provoke	Resolve
Tentative, non committal	Specific Depiction

The primary differences are in the intent

ABC News and IDEO's Deep Dive

Sketching the Mouse

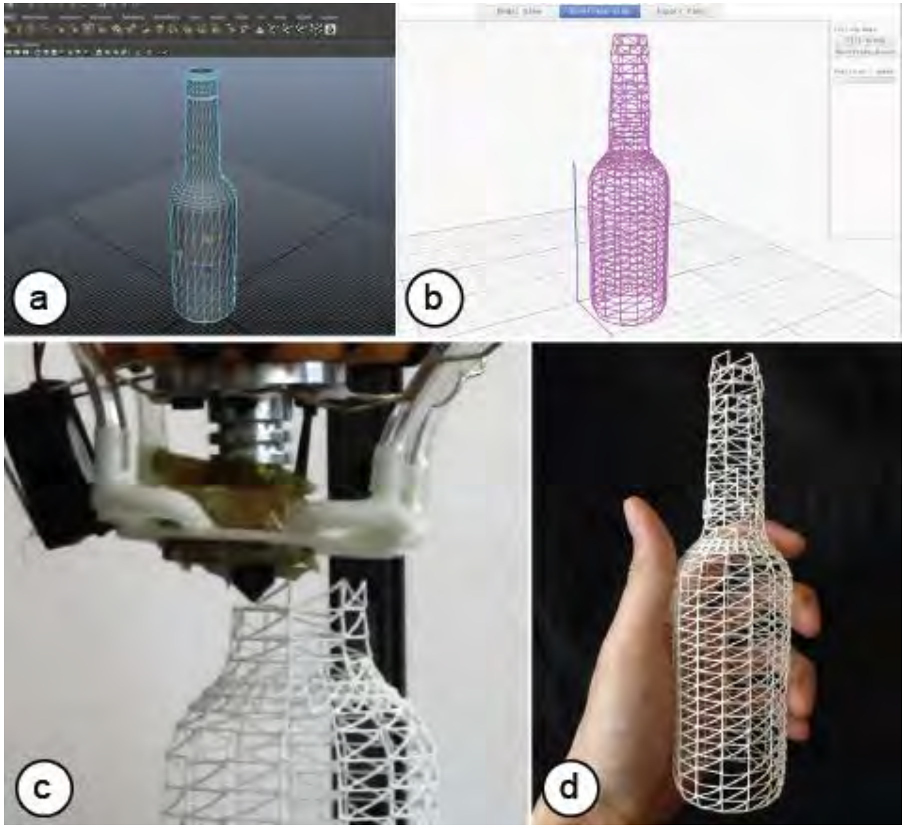
Making the Macintosh:
http://www-sul.stanford.edu/mac/index.html

Sketching the Mouse

Making the Macintosh:
http://www-sul.stanford.edu/mac/index.html

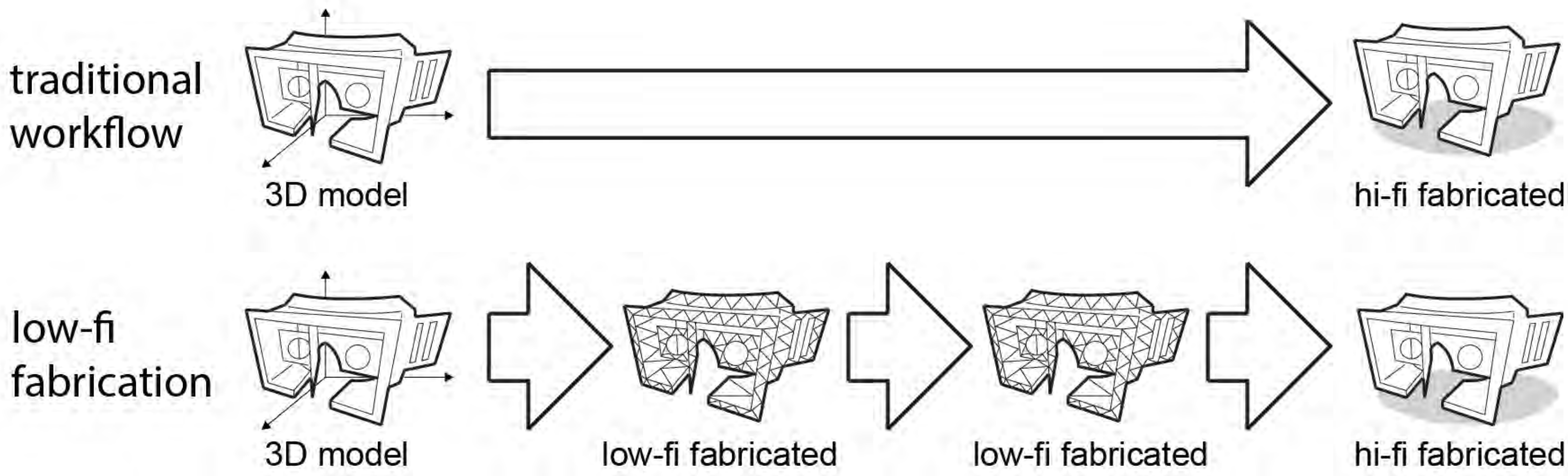
Physical Sketching

Physical Sketching



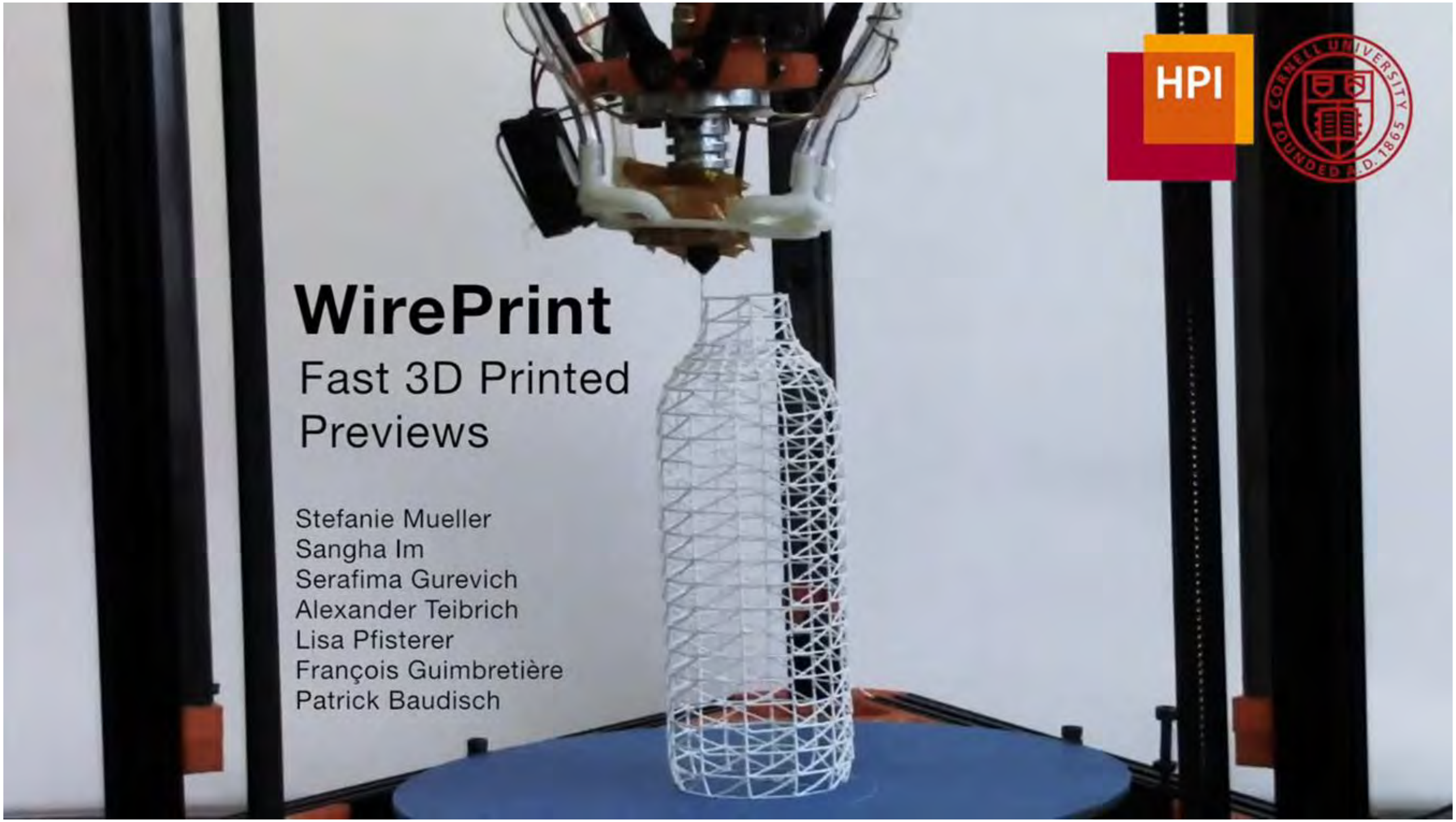
Mueller, WirePrint, UIST 2014

Physical Sketching



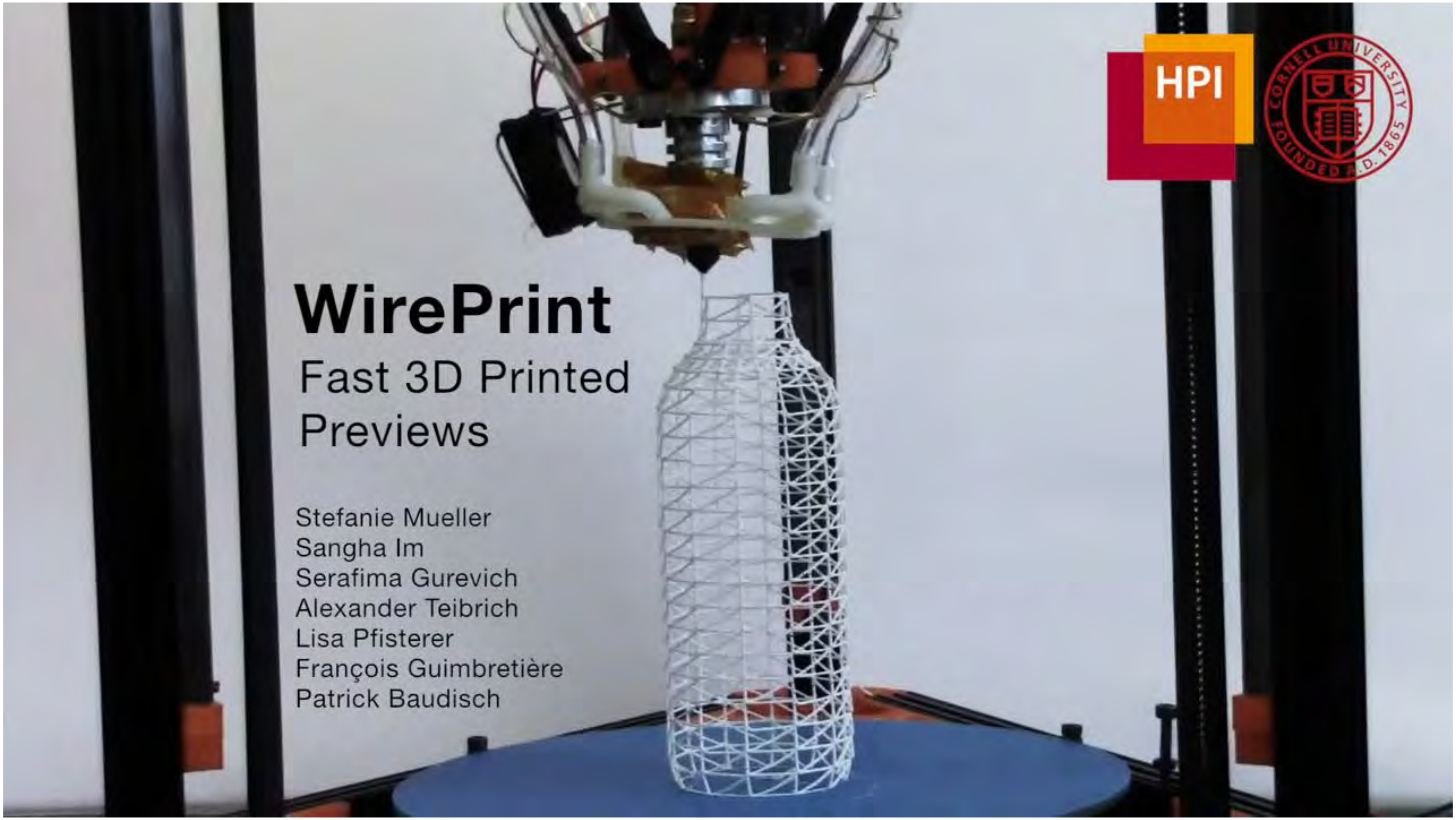
Mueller, WirePrint, UIST 2014

WirePrint (2014)

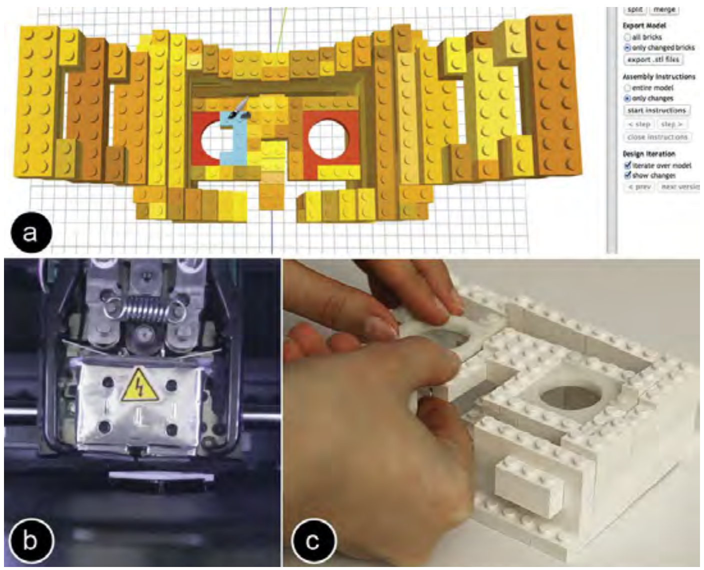


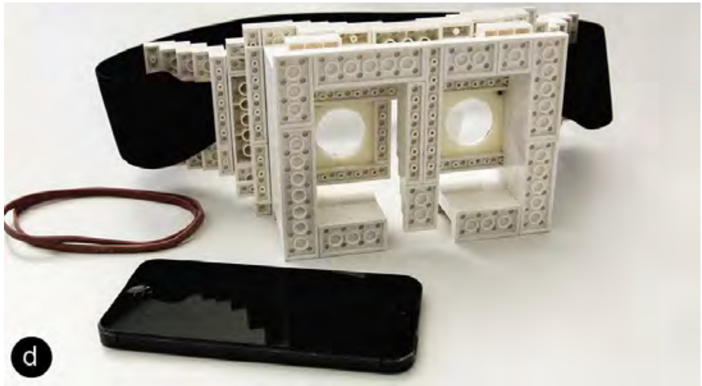
Mueller, WirePrint, UIST 2014

WirePrint (2014)



Physical Sketching





Mueller, Fabrickation, CHI 2014

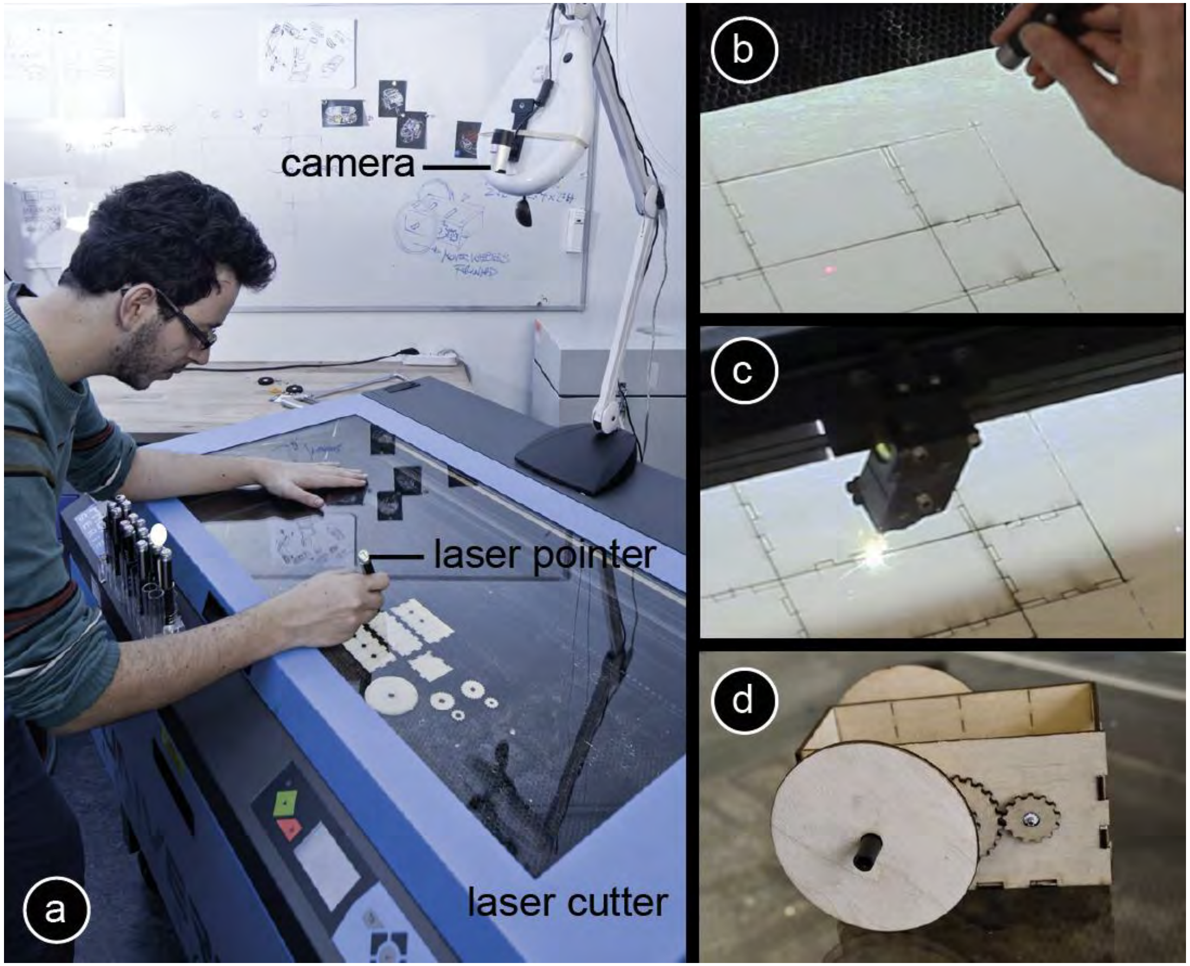
faBrickation (2014)

Mueller, Fabrickation, CHI 2014

faBrickation (2014)

Mueller, Fabrickation, CHI 2014

Physical Sketching



Mueller, Constructable, CHI 2012

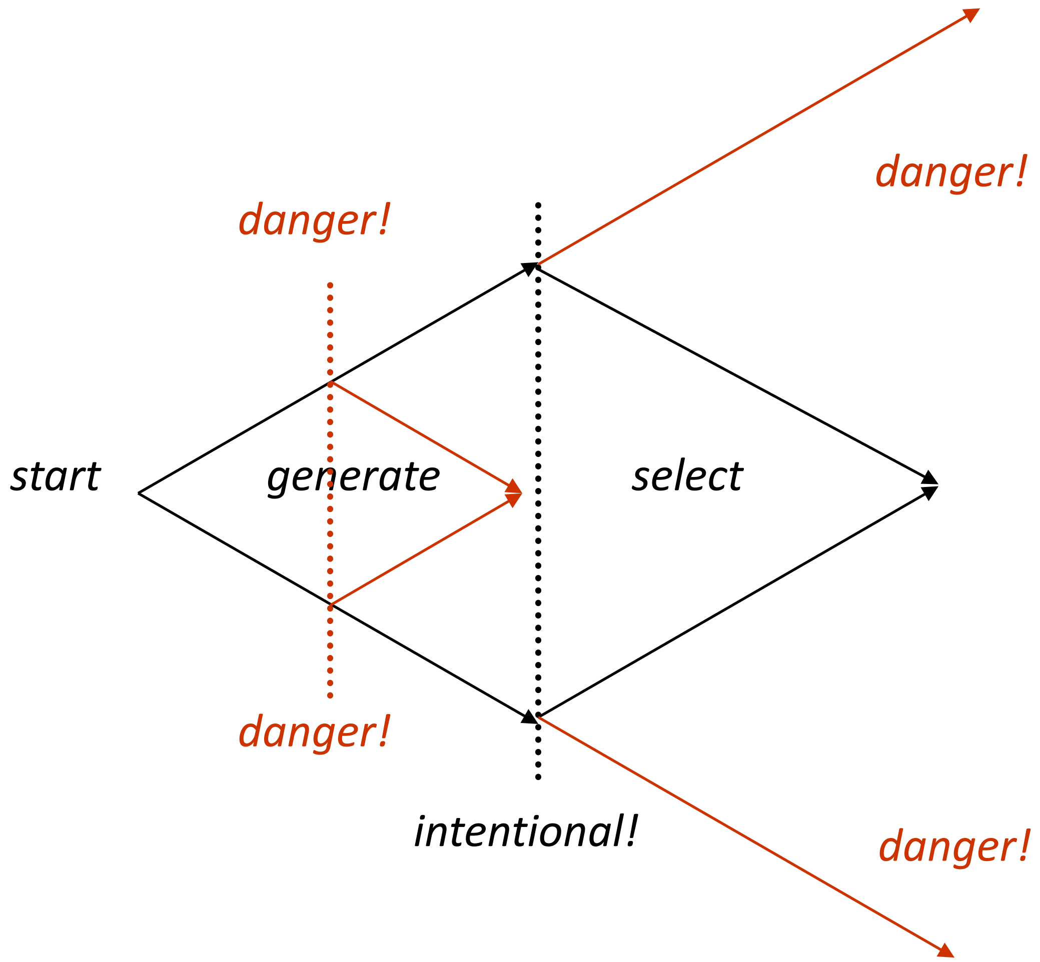
Constructable (2012)

Mueller, Constructable, CHI 2012

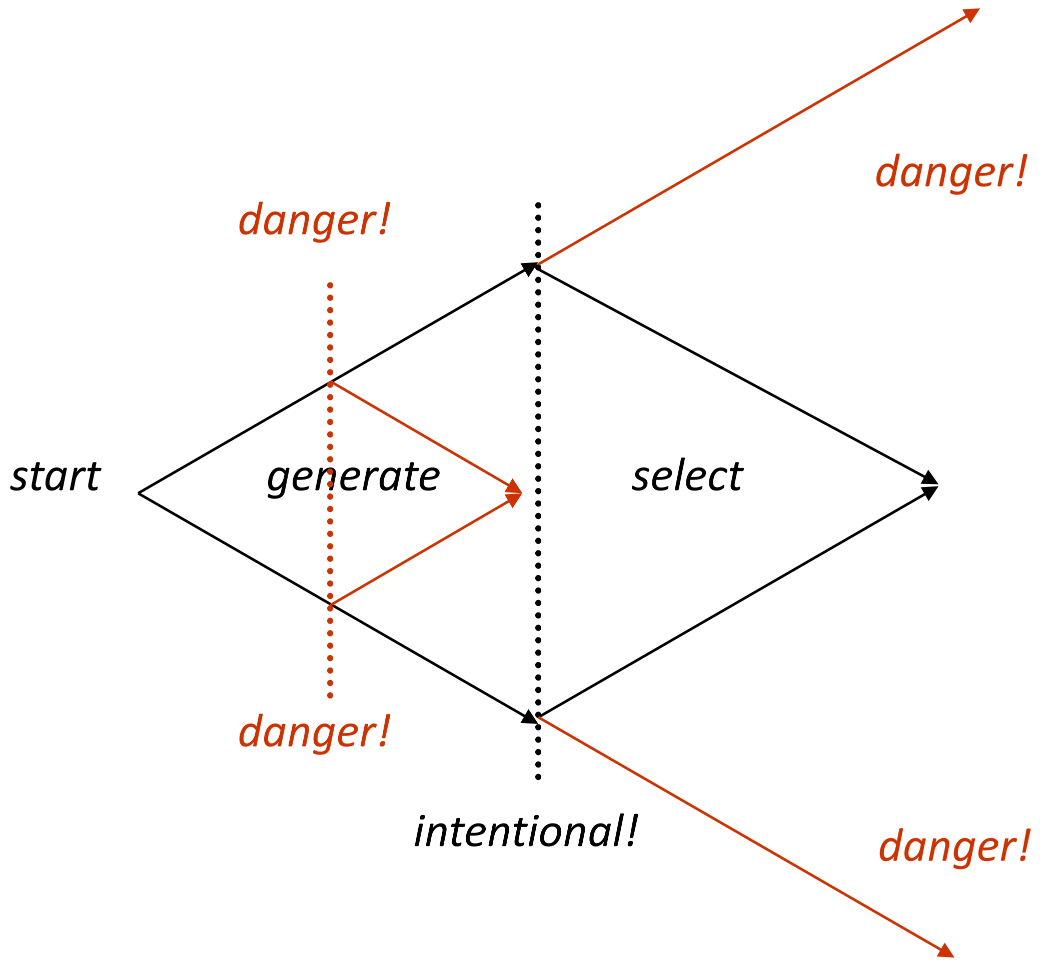
Constructable (2012)

Mueller, Constructable, CHI 2012

The Design Diamond



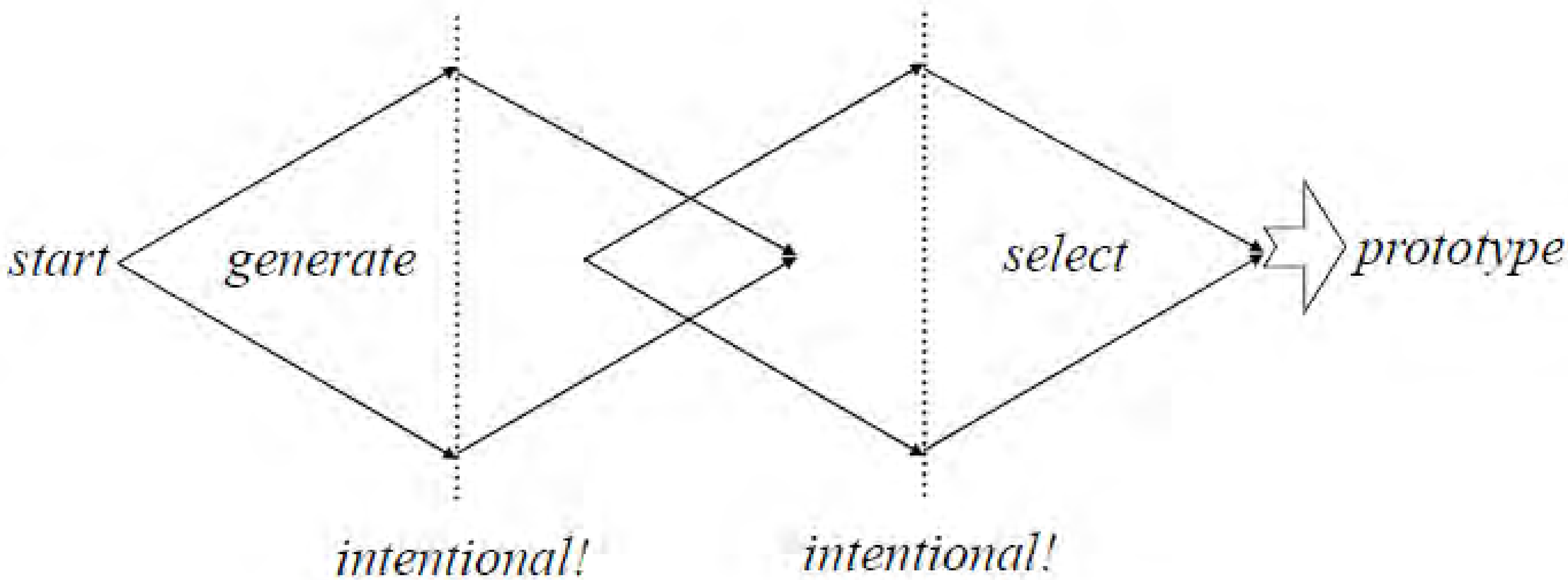
Idea Oscillation



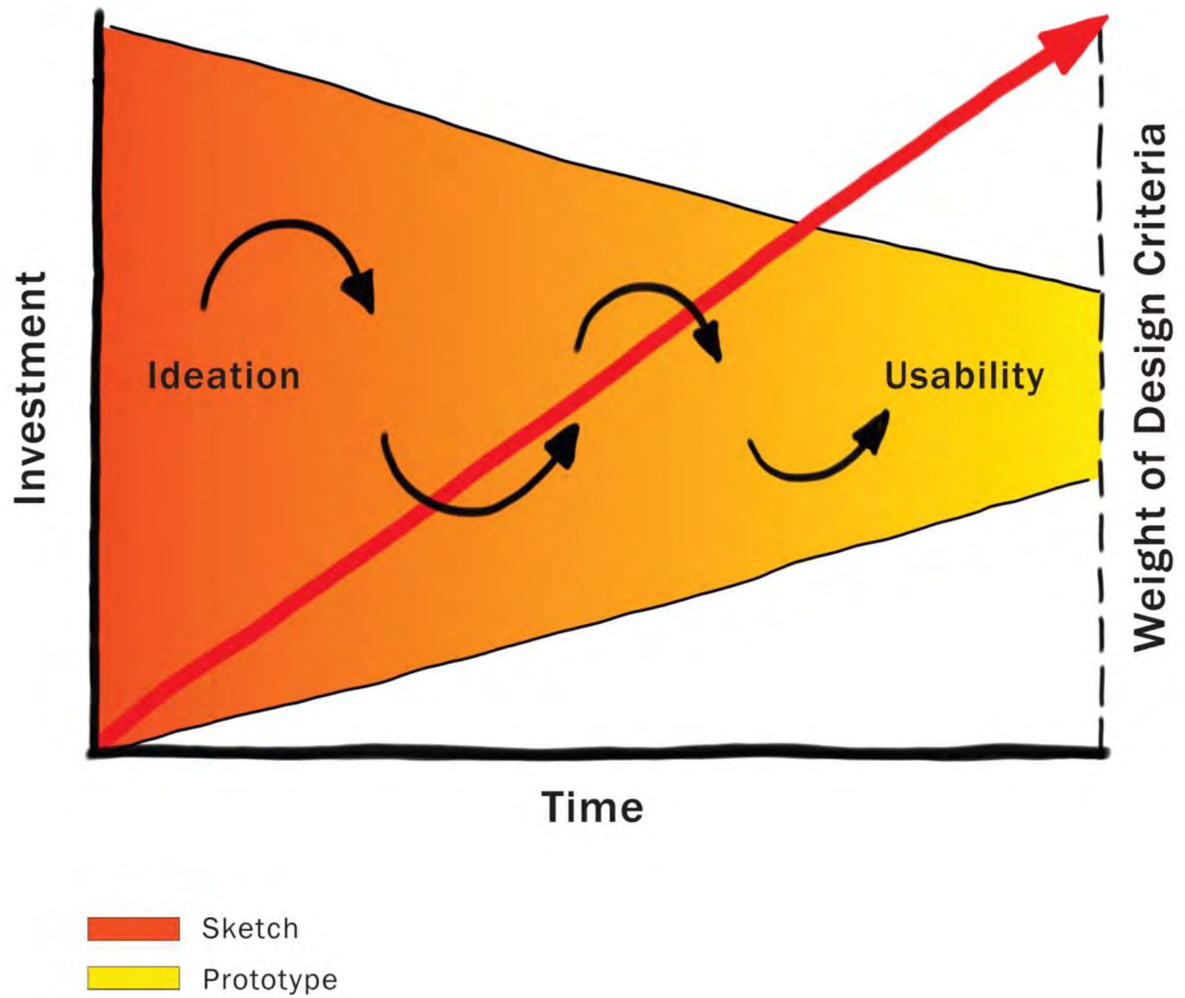
Critiquing Sketches is Important

- Ideas are both good and bad
  - Both are useful in design
  - By making clear what is a bad design, we can avoid actually implementing it
  - Bad ideas help you justify your good ideas
- Feedback can turn a good idea into a great idea
- Sketching generates too many ideas to implement

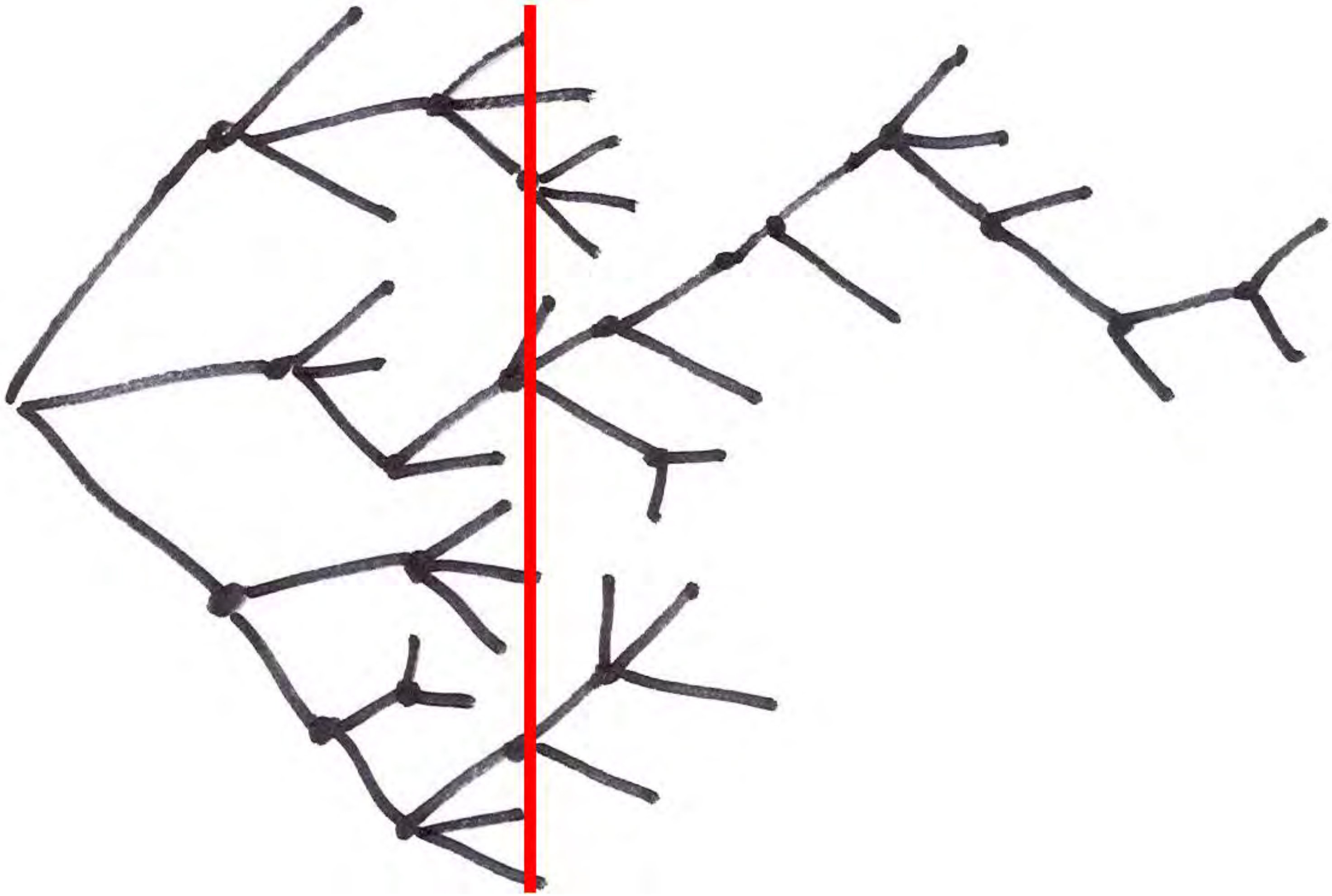
Idea Oscillation



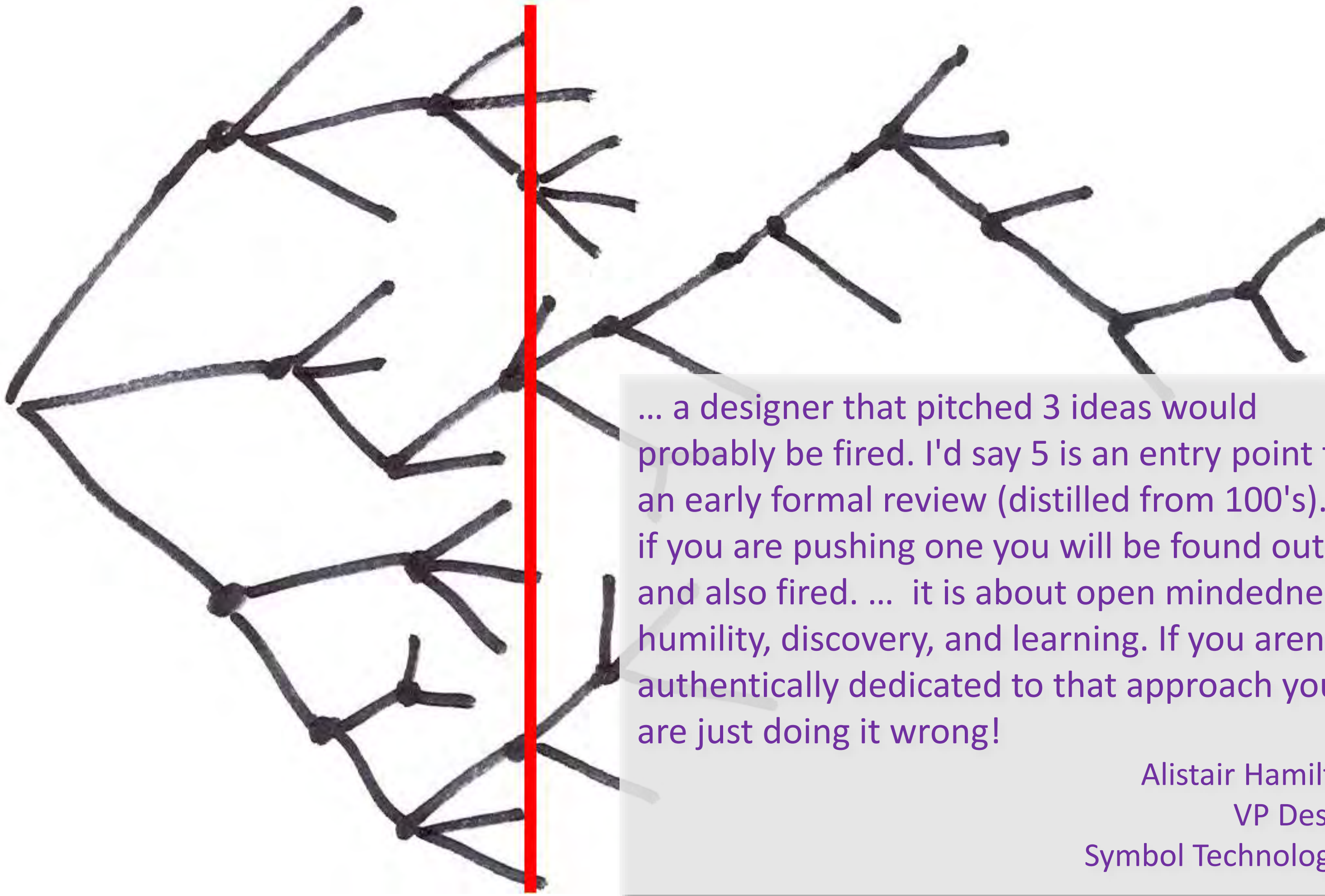
Iteration Toward a Design



Exploration of Alternatives



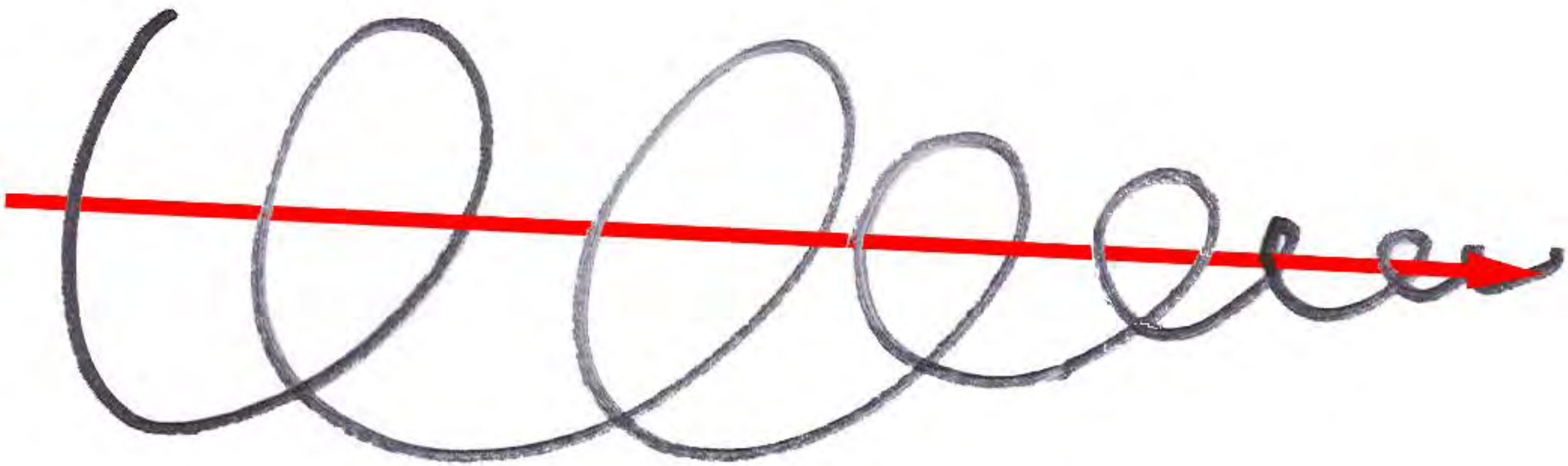
Exploration of Alternatives



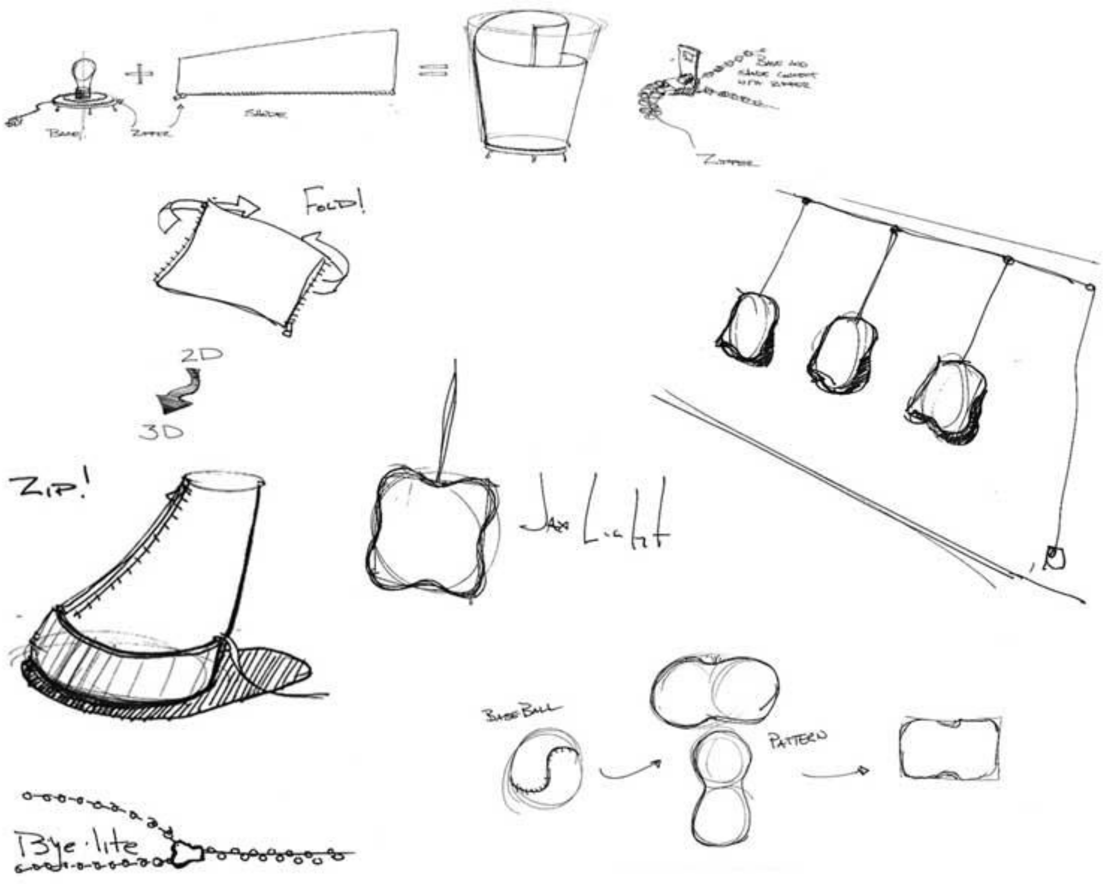
… a designer that pitched 3 ideas would probably be fired. I'd say 5 is an entry point for an early formal review (distilled from 100's). … if you are pushing one you will be found out, and also fired. … it is about open mindedness, humility, discovery, and learning. If you aren't authentically dedicated to that approach you are just doing it wrong!

Alistair Hamilton
VP Design
Symbol Technologies

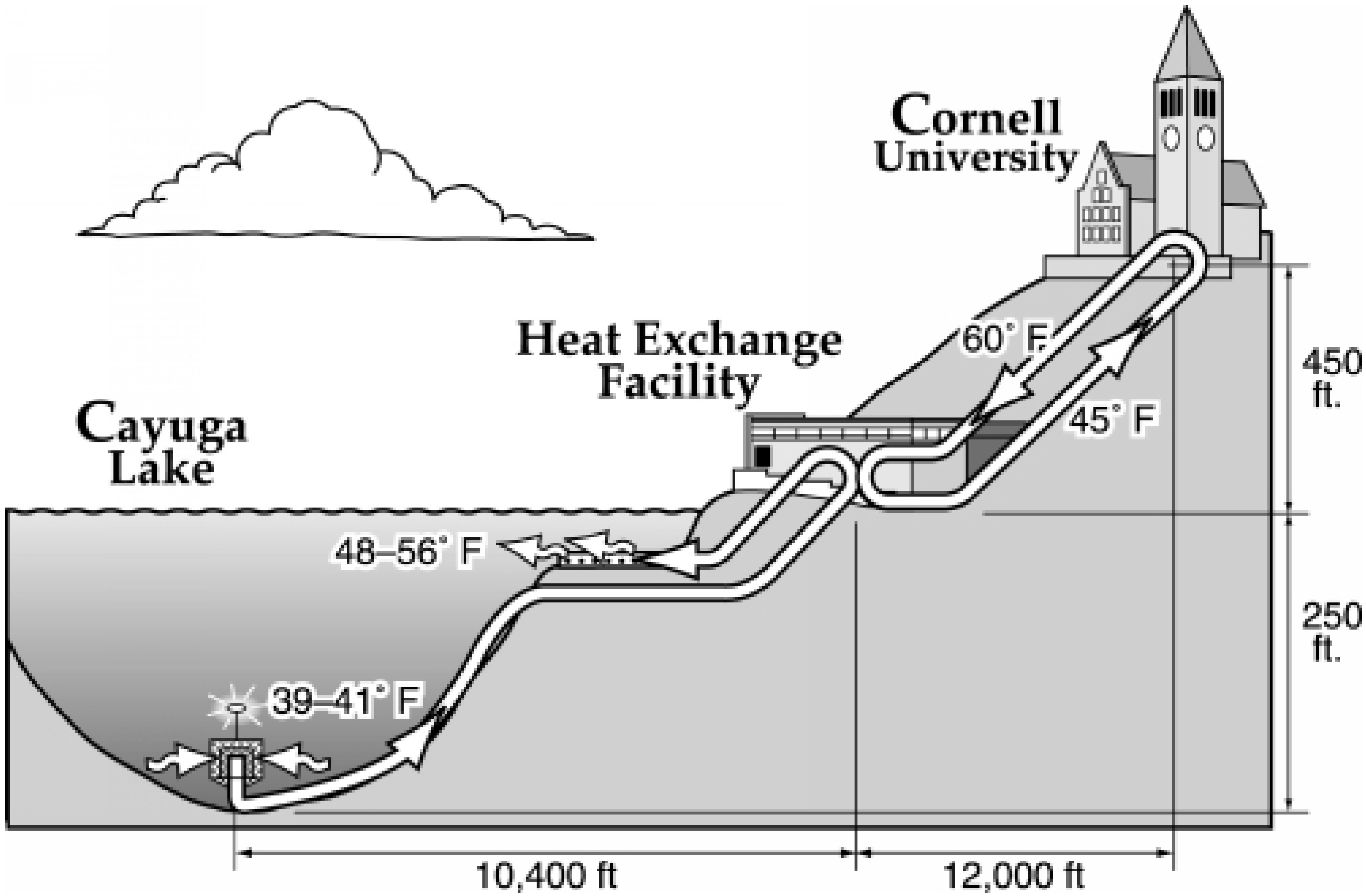
The Converging Path



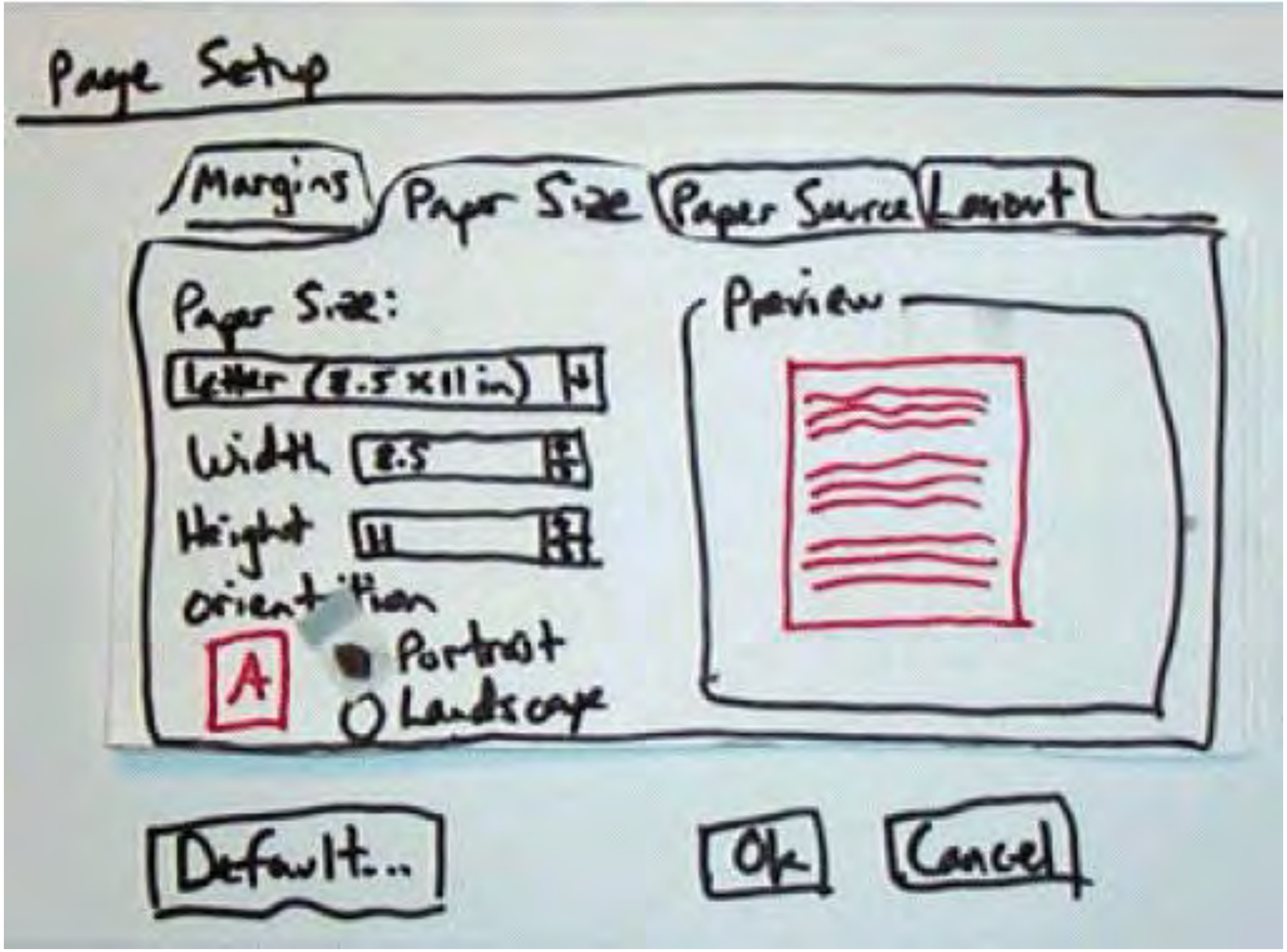
Is this a sketch? Why or why not?



Is this a sketch? Why or why not?



Is this a sketch? Why or why not?



Is this a sketch? Why or why not?

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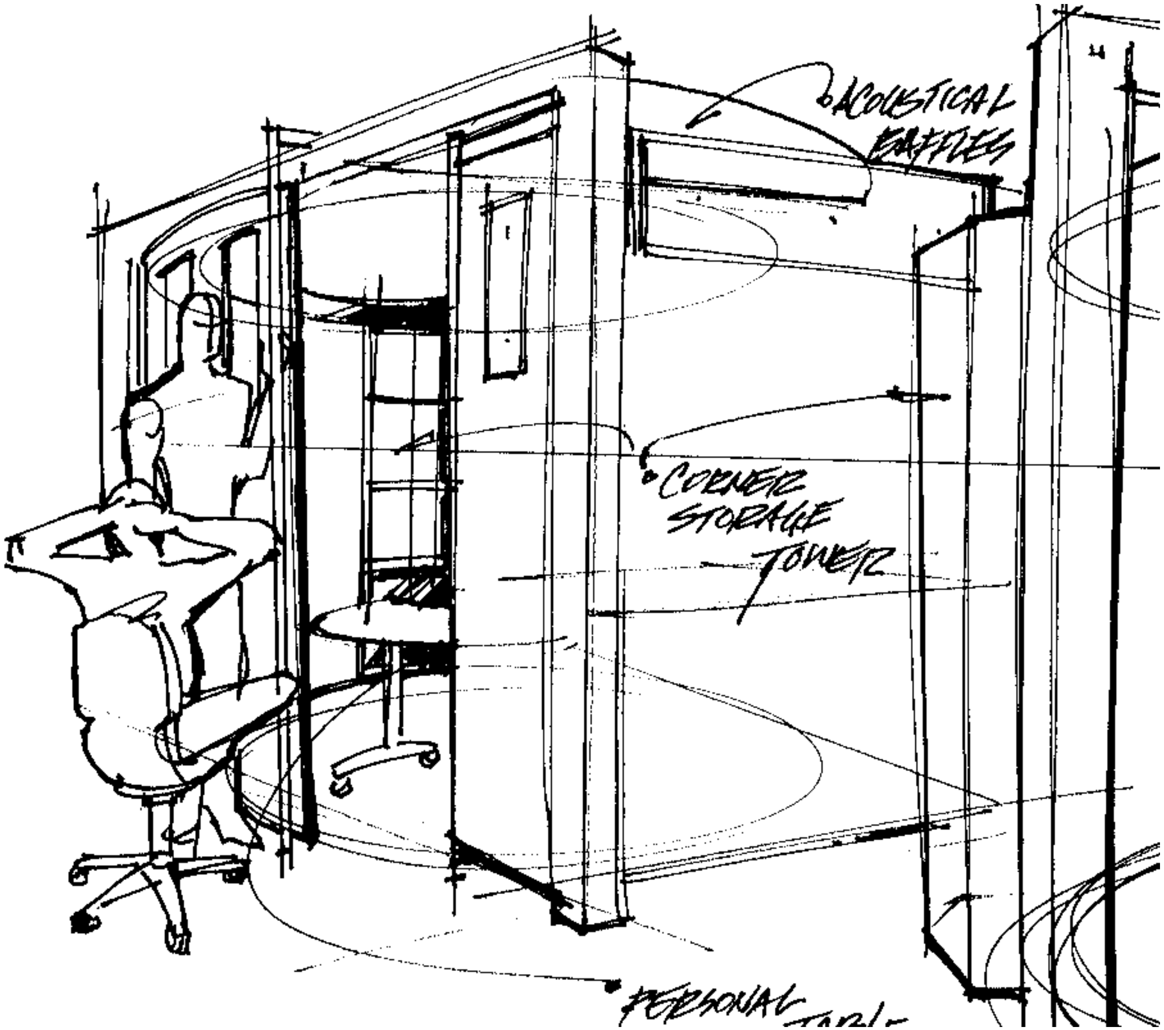
Is this a sketch? Why or why not?

Is this a sketch? Why or why not?



Is this a sketch? Why or why not?

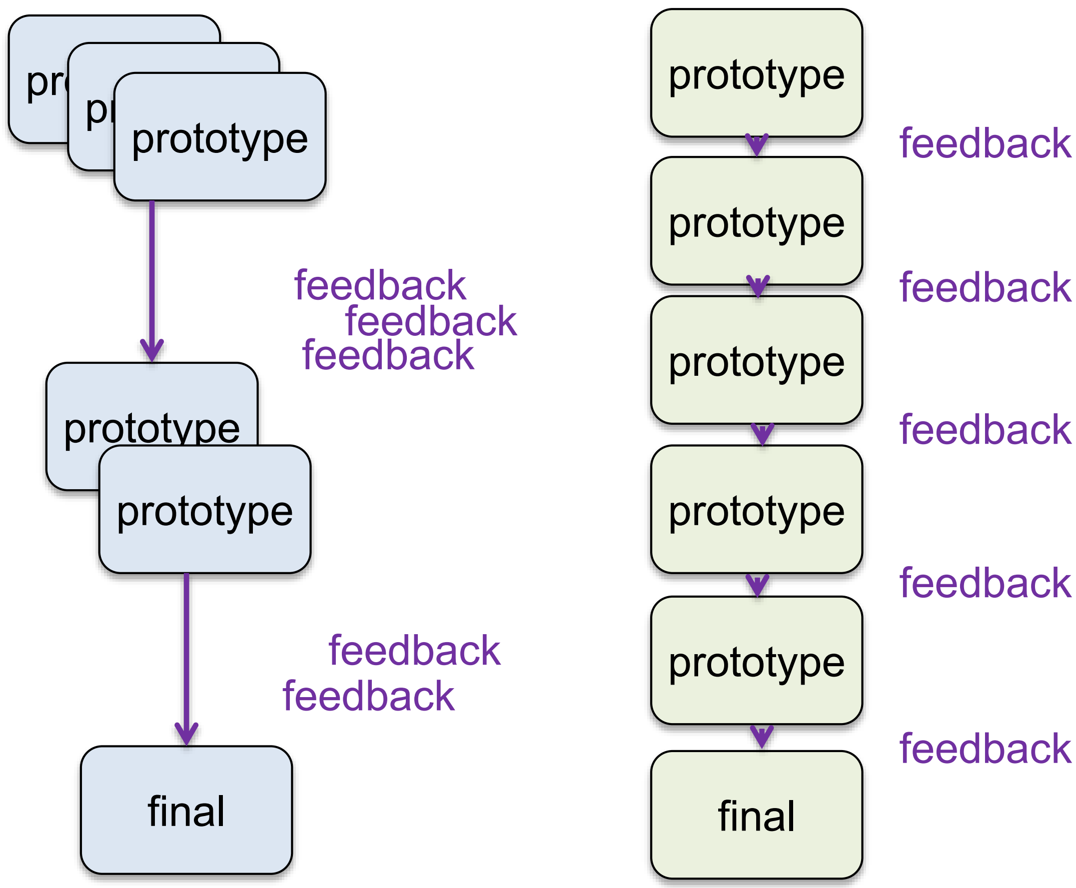
Some Evidence

Task:

Create a web banner ad for Ambidextrous magazine.

Dow et al. TOCHI 2010.

Feedback in Parallel or Serial



Parallel condition

Serial condition

Dow et al. TOCHI 2010.

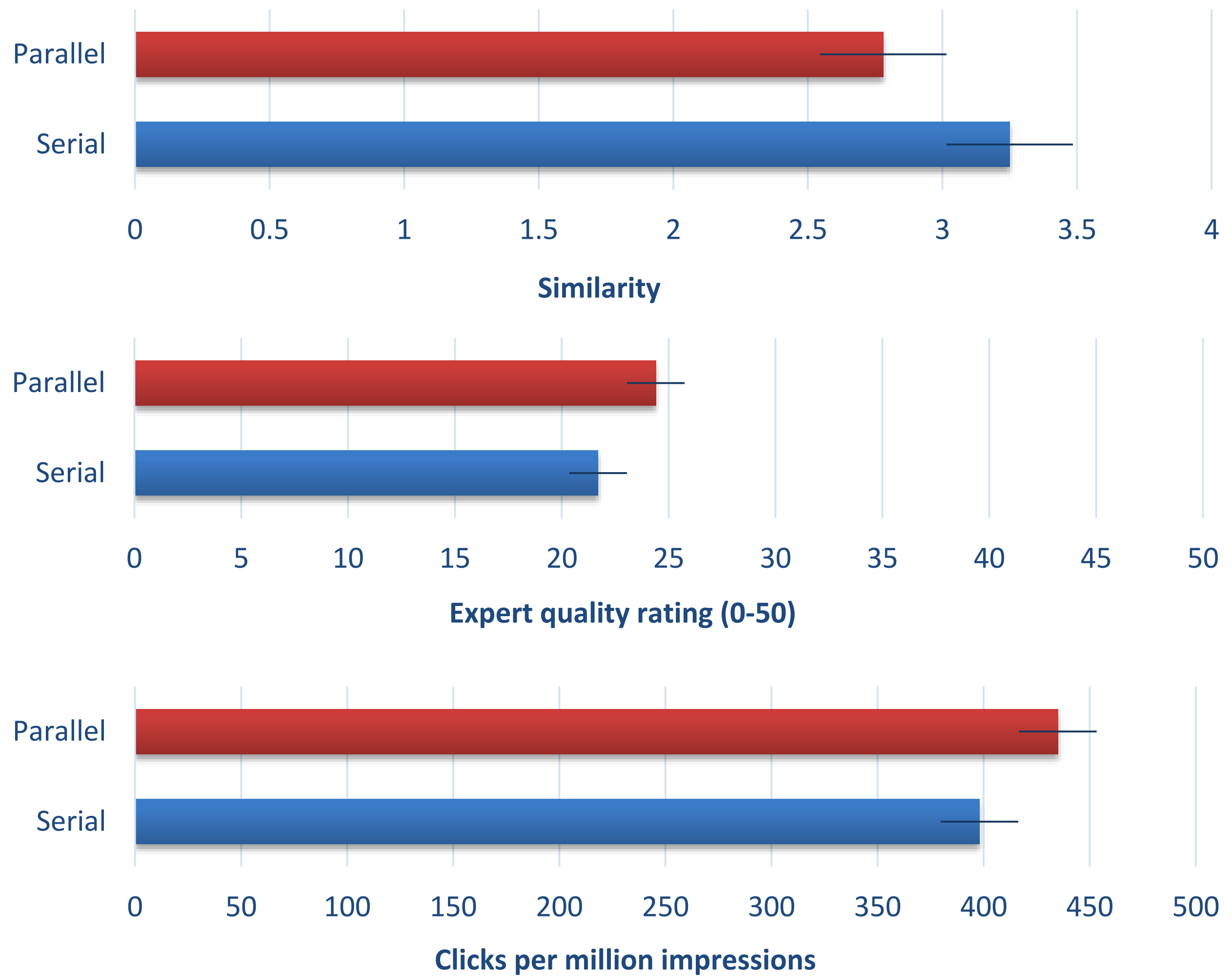
Procedure

serial
prototyping
condition

parallel
prototyping
condition

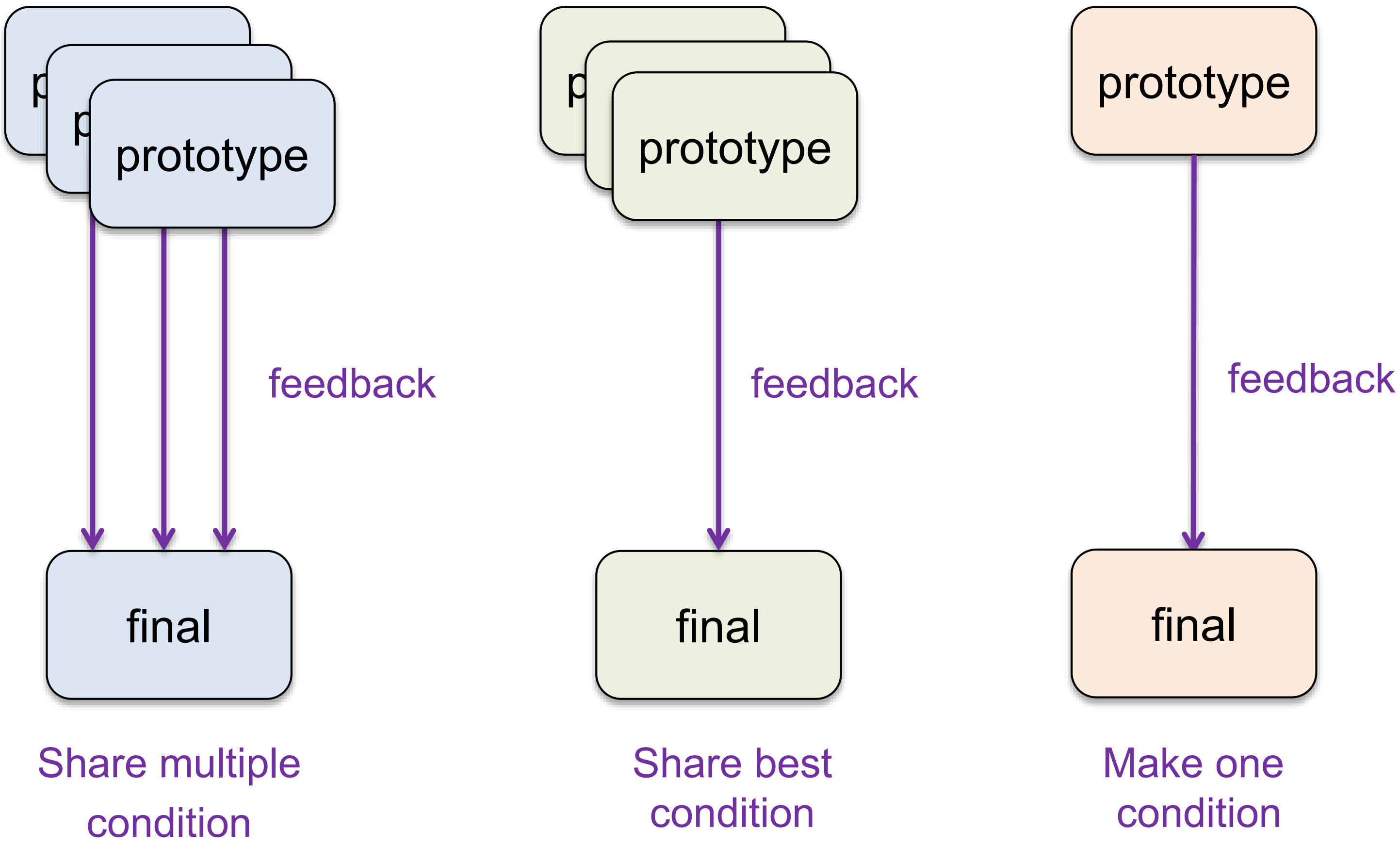
Dow et al. TOCHI 2010.

Parallel: more diverse, better, more clicks



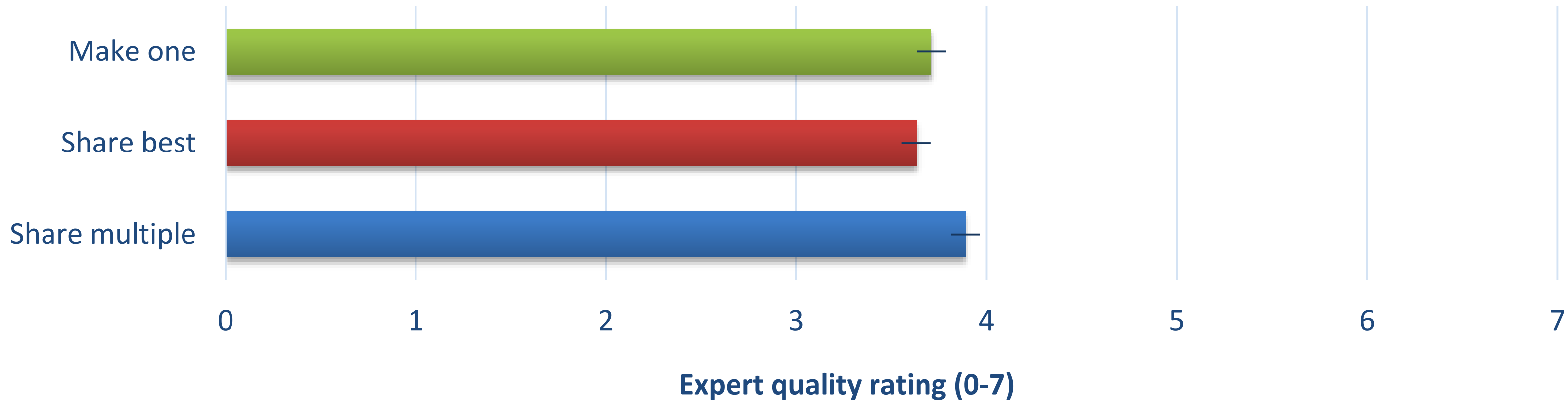
Dow et al. TOCHI 2010.

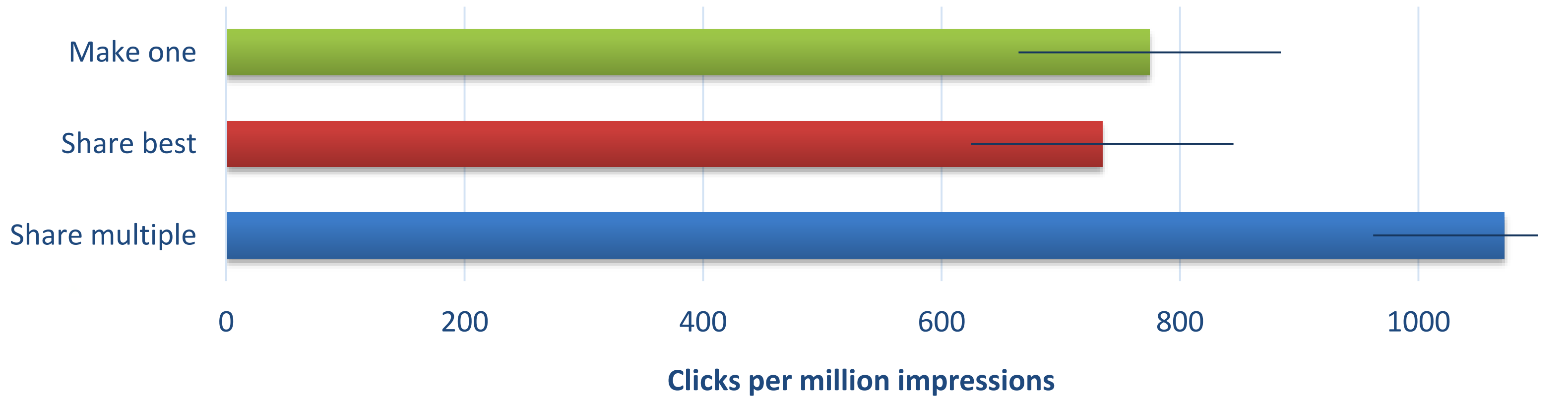
Share one or share your best?



Dow et al. TOCHI 2010.

Share Multiple: better, more clicks





Dow et al. TOCHI 2010.

Some Evidence

Greater divergence in designs

- Prevents sticking with the first idea
- Allows mashing ideas together

Alternatives facilitate feedback

- Enable comparison
- Can improve tone of critique

Sketching and the Design Diamond

- The design diamond is fundamental to understanding what you are doing here
  - Much of your education, including in CSE, has taught you to focus on having the right answer
  - Here it matters what you do long before the end
- Most ideas get thrown out, including yours
  - Better ideas are great criticism, and frequently would never have come about otherwise

CSE 440: Introduction to HCI

User Interface Design, Prototyping, and Evaluation

Lecture 05:
Design Diamond

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50

CSE 440: Introduction to HCI

User Interface Design, Prototyping, and Evaluation

Lecture 06:
Critique and
Task Analysis

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50

Learning to Give and Receive Critique

You will learn to both give and receive critique

- Each is important
- Each is a skill developed through practice

Many activities will consist of group critiques

- Each group will present an artifact
- Other class members and staff will offer critique

Starting tomorrow with critique of
Assignment 2c: Design Research Check-In

Why Critique?

Critique helps evaluate early, often, and cheaply

- Applicable to artifacts of many types
- Compare to other expert inspection methods

You are not your own worst critic

- We collectively know more than any one of us
- It is hard to see past your own decisions
- Design requires getting past our own infatuation

A design can feel like our love, our baby...

Why Critique?

Critique is not just for design

- It applies to many artifacts and domains

Examples?

Why Critique?

Critique is not just for design

- It applies to many artifacts and domains

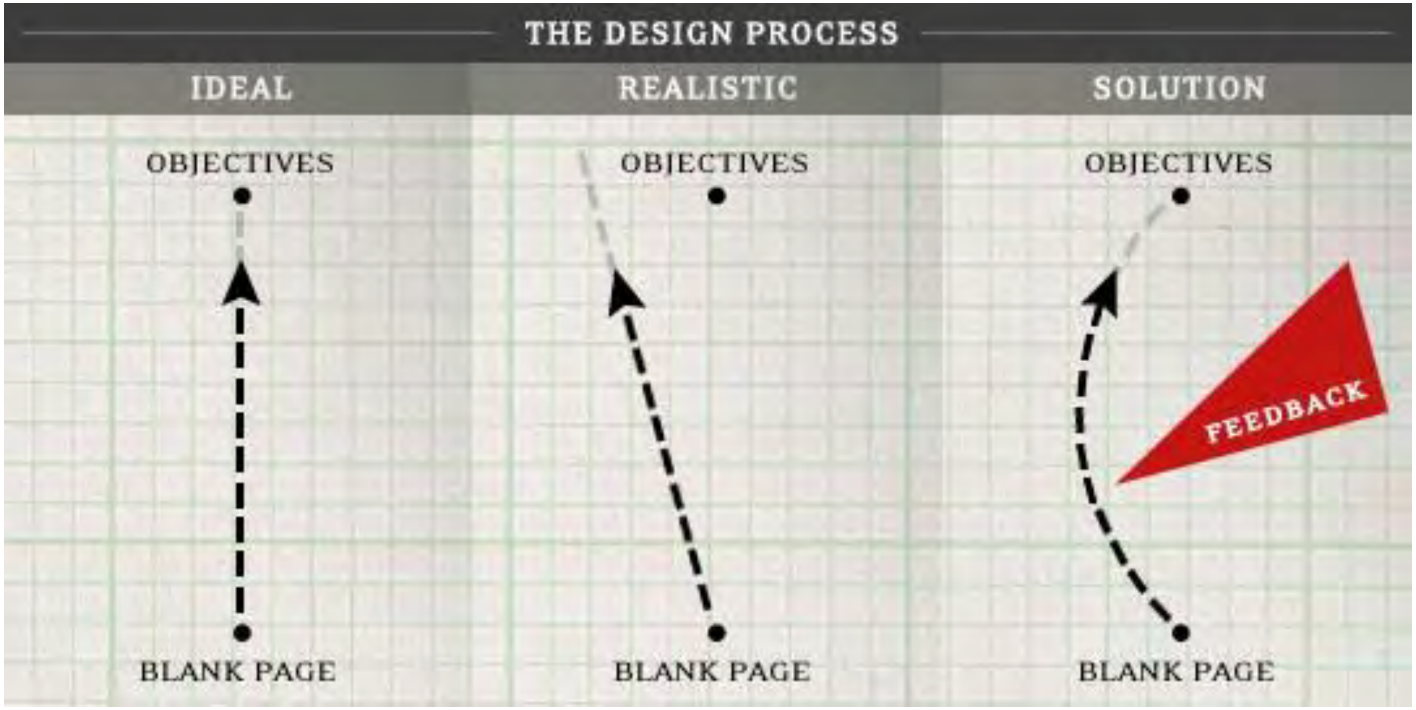
Examples?

- visual art, writing, design, code (i.e. code review)

Over time, you should gather people who can give you high-quality critique in everything you do

- You may meet some of those people in this class

Critique is About Improvement



http://alistapart.com/article/design-criticism-creative-process

What is Critique?

Critique is a method for feedback

It is not just a list of complaints

1. Presenters sit down with critics
2. Quickly explain their artifacts
   (e.g., less than 2 minutes)
3. Critics give feedback, ask questions
4. Presenters respond,
   take notes on what is discussed

Critique is Neither Criticism nor Design

Seriously, not just a list of complaints

Critics offer honest feedback

Both positive and negative

- Presenters should be able to learn *what works well* and *what is problematic* about their artifact

It is then presenter's responsibility to sort through feedback, decide what is important, how to act

- You must take notes for later review

Tips for Presenters

Critique can be hard, especially at first

Try to avoid being defensive

- You are not your work, separate yourself

Remember the expertise you bring

- Even if “the room” knows more about design, you know more about your problem / artifact and your rationale for the current design

Tips for Presenters

Taking advice is not giving up authorship

- You still make the final decisions
- A half-baked suggestion does not contain all the details of a finished solution

Design your critique

- What you show invites different forms of feedback
- Verbally indicate what kind of feedback you want, but also provide an artifact of appropriate form
- This course will guide you in a variety of forms

Tips for Presenters

- Keep an eye out for design rationale
  - You probably made some decisions without thinking through good reasons at the time
  - Critique can help give a rationalization for past decisions as you explain the artifact to others
- Exploit failure
  - A “failed” artifact should teach you about the design space, what won’t work, and why
  - The goal is to improve, this requires failure

Tips for Critics

There are many strategies for giving critique

- Hamburger method
- I like, I wish, what if
- Socratic method

These provide ways to give critique that can help the conversation go smoothly

- Can give you a question to ask when you do not have one, provide a way to ask that is productive and less likely to create defensive reaction

Tips for Critics: Hamburger Method

"Bun, meat, bun"

Bun:

Something fluffy and nice

Meat:

Criticism on how to improve

Bun:

Something fluffy and nice

Not a "shit sandwich"

Positives need to be genuine, enable learning from both positive and negative aspects of the artifact

Tips for Critics: I Like, I Wish, What If

I Like:

- Lead with something nice

I Wish:

- Some criticism, often leading from what you like

What If:

- An idea to spark further conversation, better than: "I think you should have…" or "Why didn't you …"
- Gives the presenter benefit of the doubt if they did already think of your idea, can present rationale

Tips for Critics: Socratic Method

Identify an aspect of the design and ask “Why?”

- Can be good if unsure what else to say
- Forces presenter to give, or develop, explanations for design decisions, which can help build up the design rationale
- Not fundamentally negative, hard to get defensive

Tips for Critics

- Limit your use of personal pronouns (e.g., “you”)
  - Critique is about the artifact, not the designer
- A designer deserves honest feedback
  - Both positive and negative
  - Including clarity and rationale
- Help with actionable suggestions
  - But it is not your design
  - Perhaps several possible ways of thinking

Summary

Fall out of love with the things you build

- Let others help you see past the infatuation

Get feedback early, often, and cheaply

Focus on improvement

- In brainstorming, we were not *criticizing*
- In critique, we are not *defending*

You will learn to both give and receive critique

- If you are having difficulty, please come talk to us

Design Research Reminders

You are not doing science

- You seek design insight, not knowledge or truth

Do the best design work you can

- May find that self-tracking is not the opportunity
- We designed the project sequence, but be flexible

Capture and keep your raw work products

- Dedicate a note keeper, record if possible
- Our collection is minimal, but you will want them

Structure of Section and Critique

Focus on peer feedback and learning

- Bring paper, keep the laptops put away
- Bring your artifacts, be ready to present them

Critique progression

- Reminder of your project
- What you have done
- What you have learned
  about your project, about your method
- Your plan going forward
- Time for critique
- Questions you have for the group

Developing Insight Is Hard

Design research yields a lot of data

- Does not reduce to a statistical test

Need to get from data to design insight

But this is fundamentally difficult

Data

????

Insight

Affinity Diagrams

Generated during group session

Each observation, idea, note to a post-it

Notes are hierarchically organized into themes, based on project focus

Developing Models

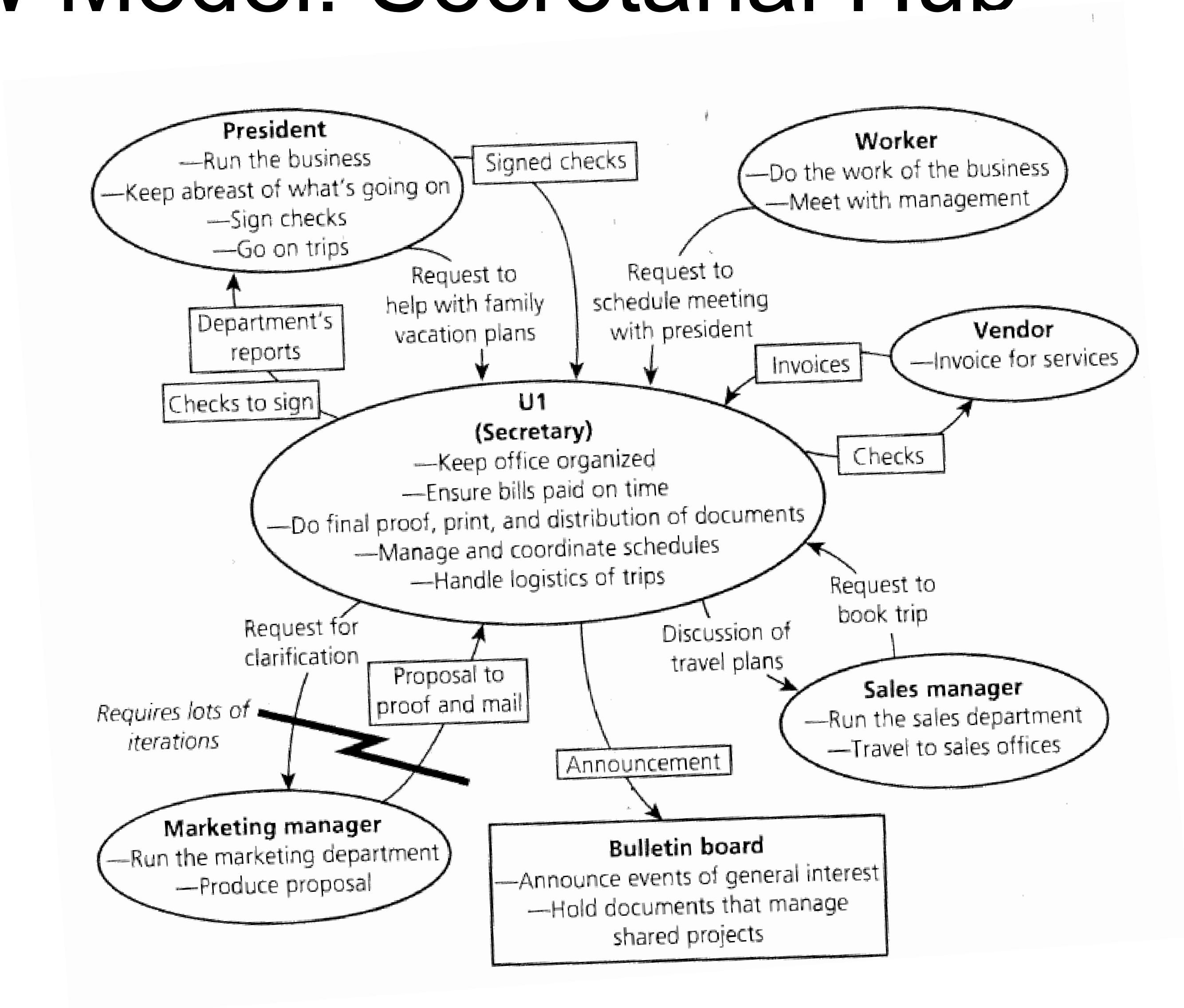
Distilling models that summarize data

- Highlights gaps in understanding
- Identify breakdowns and workarounds

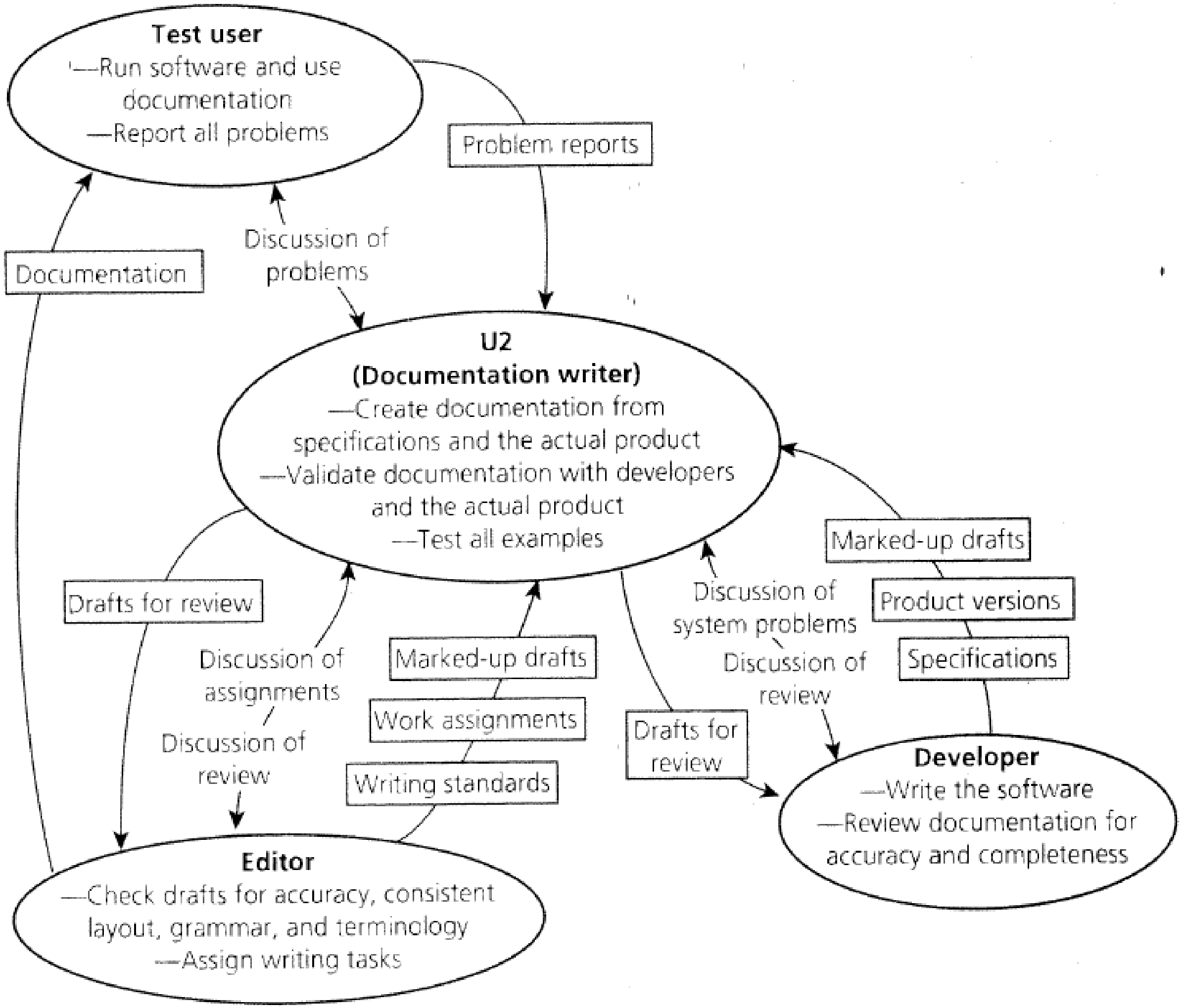
Many types of models

- e.g., Flow, Sequence, Artifact, Cultural, Physical
- None is perfect, they highlight different things

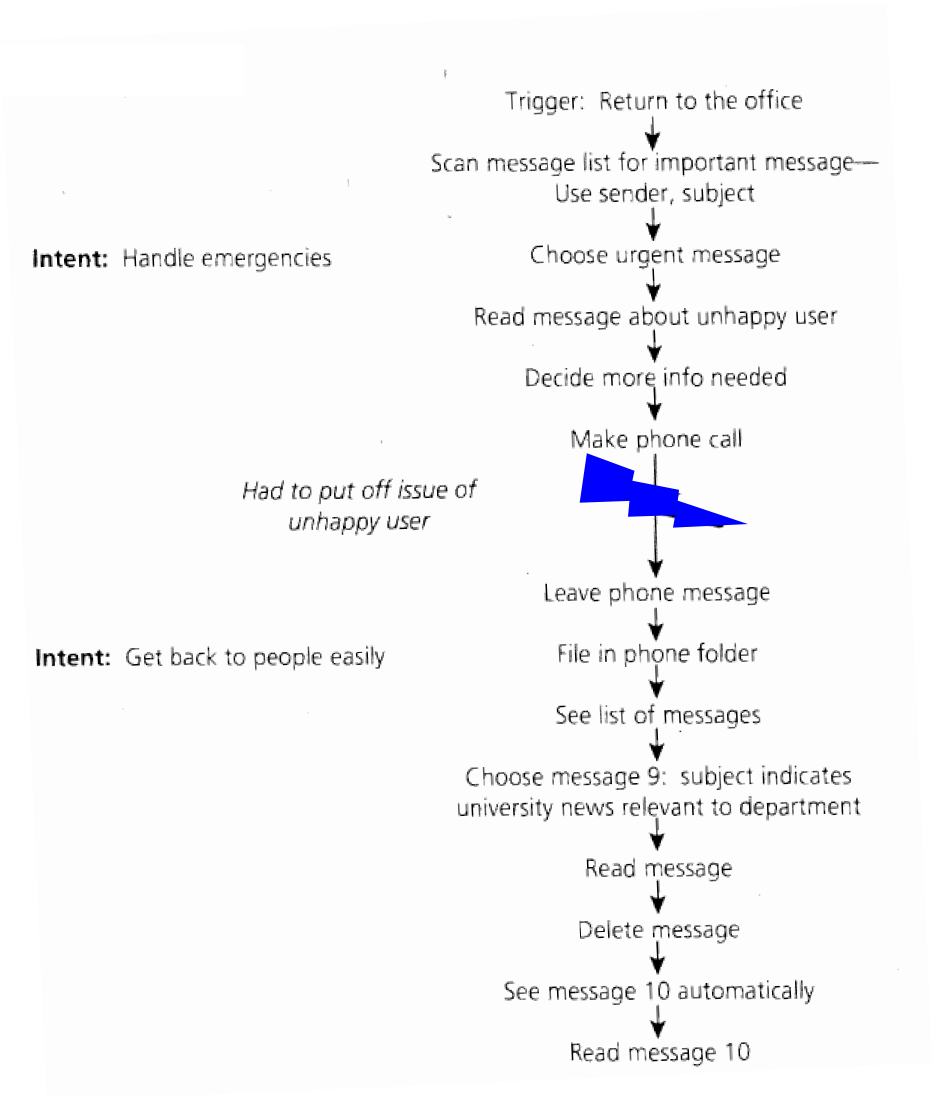
Flow Model: Secretarial Hub



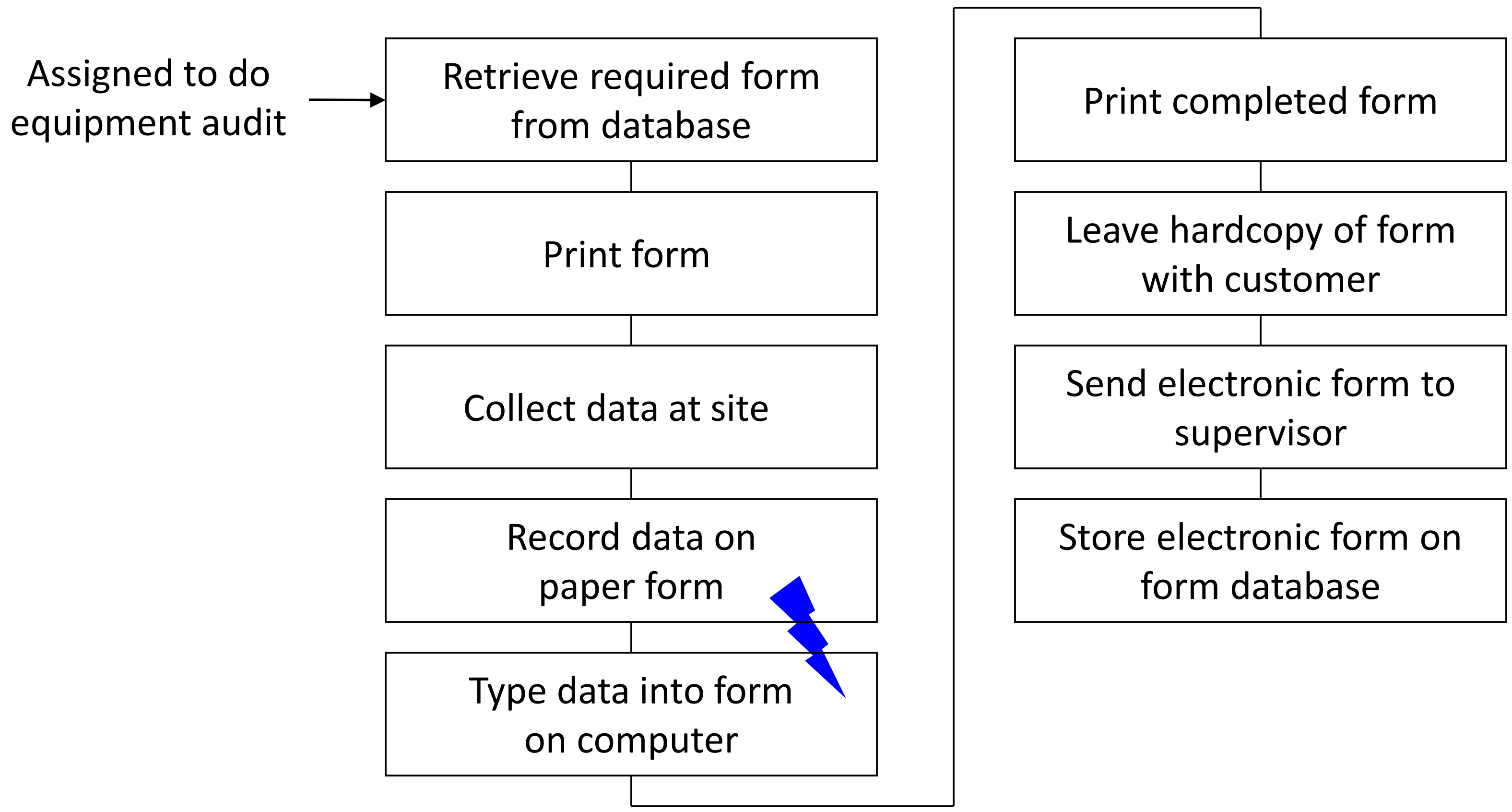
Flow Model: Creative Work



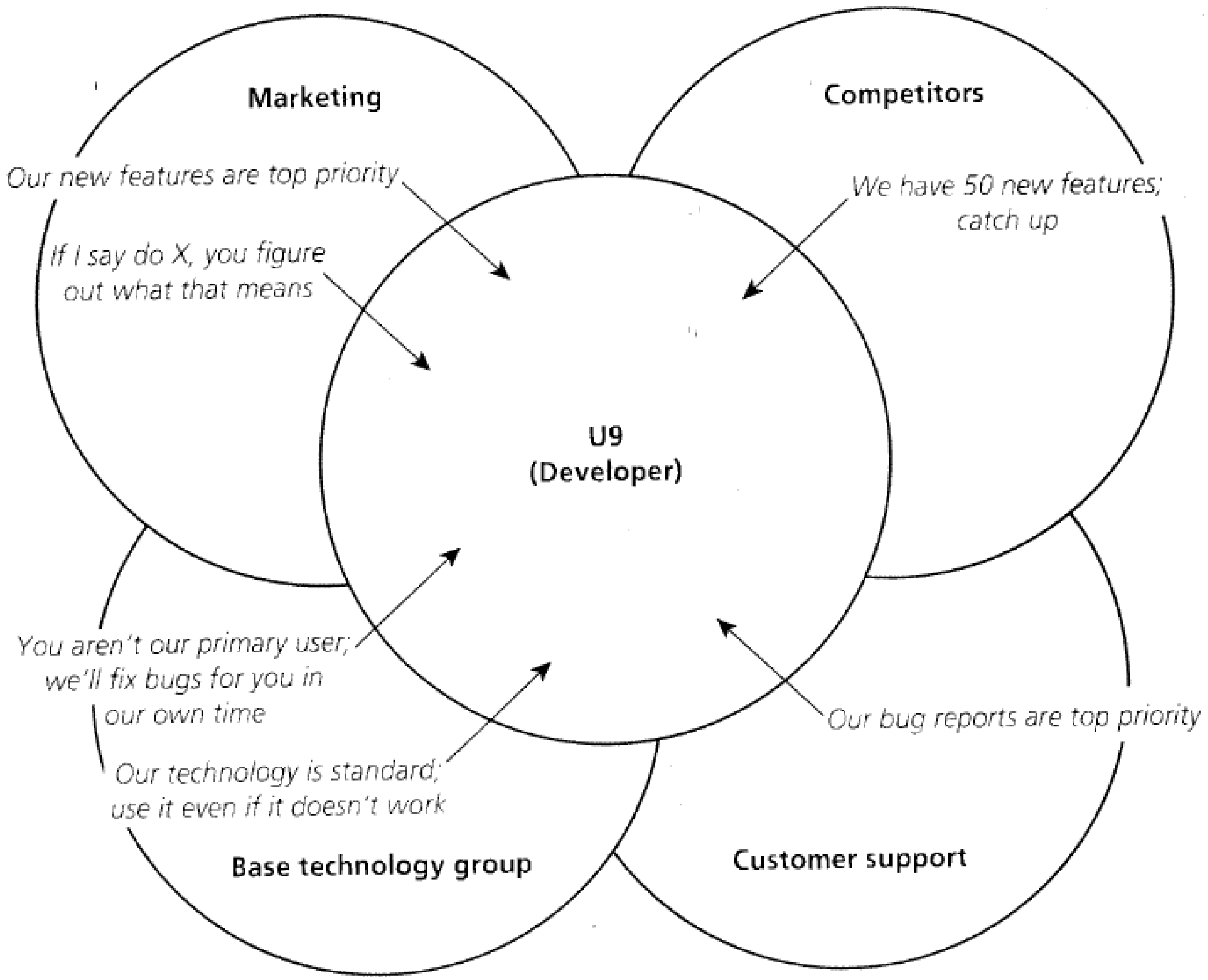
Sequence Model: Doing Email



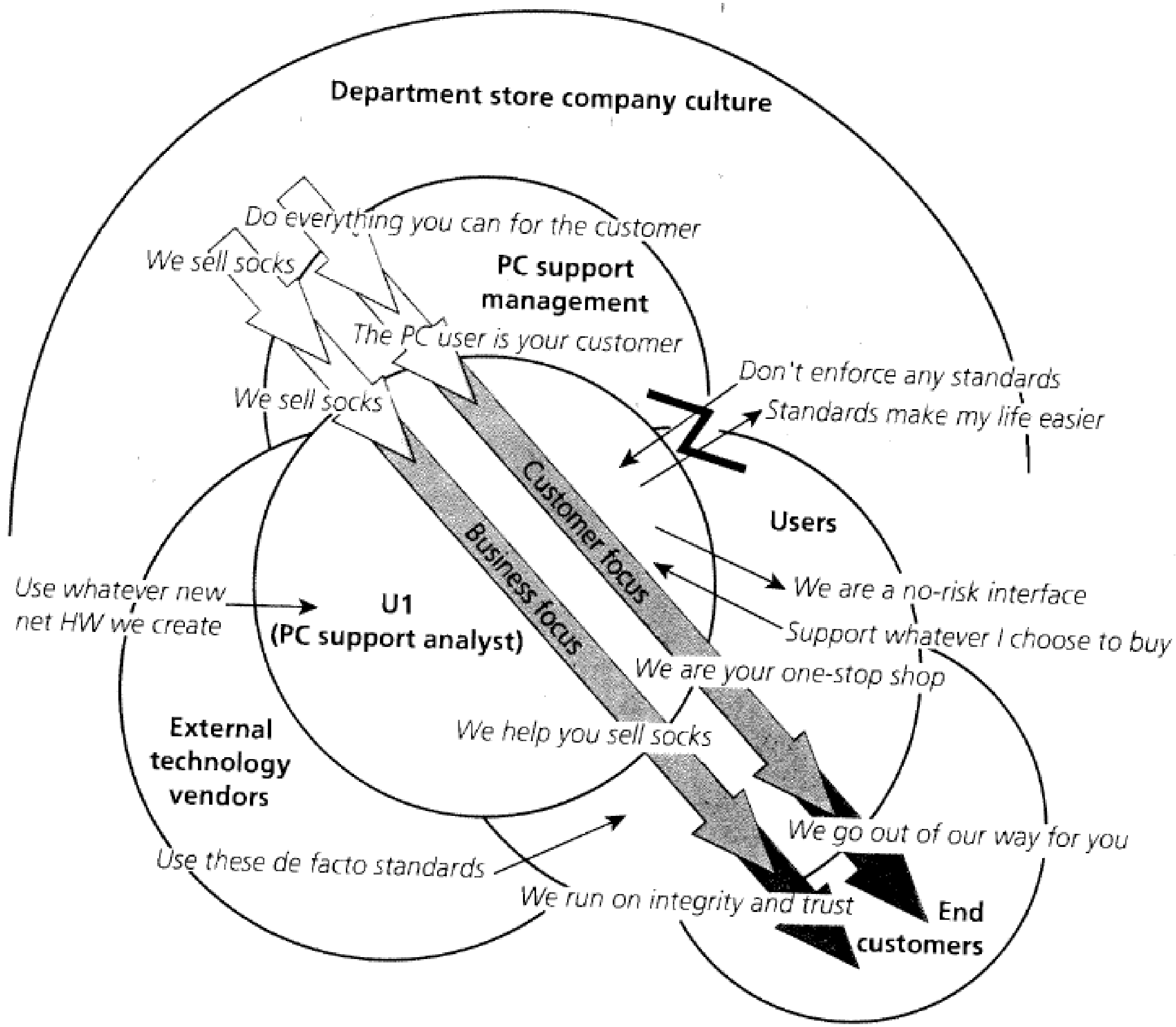
Sequence Model: Equipment Audit



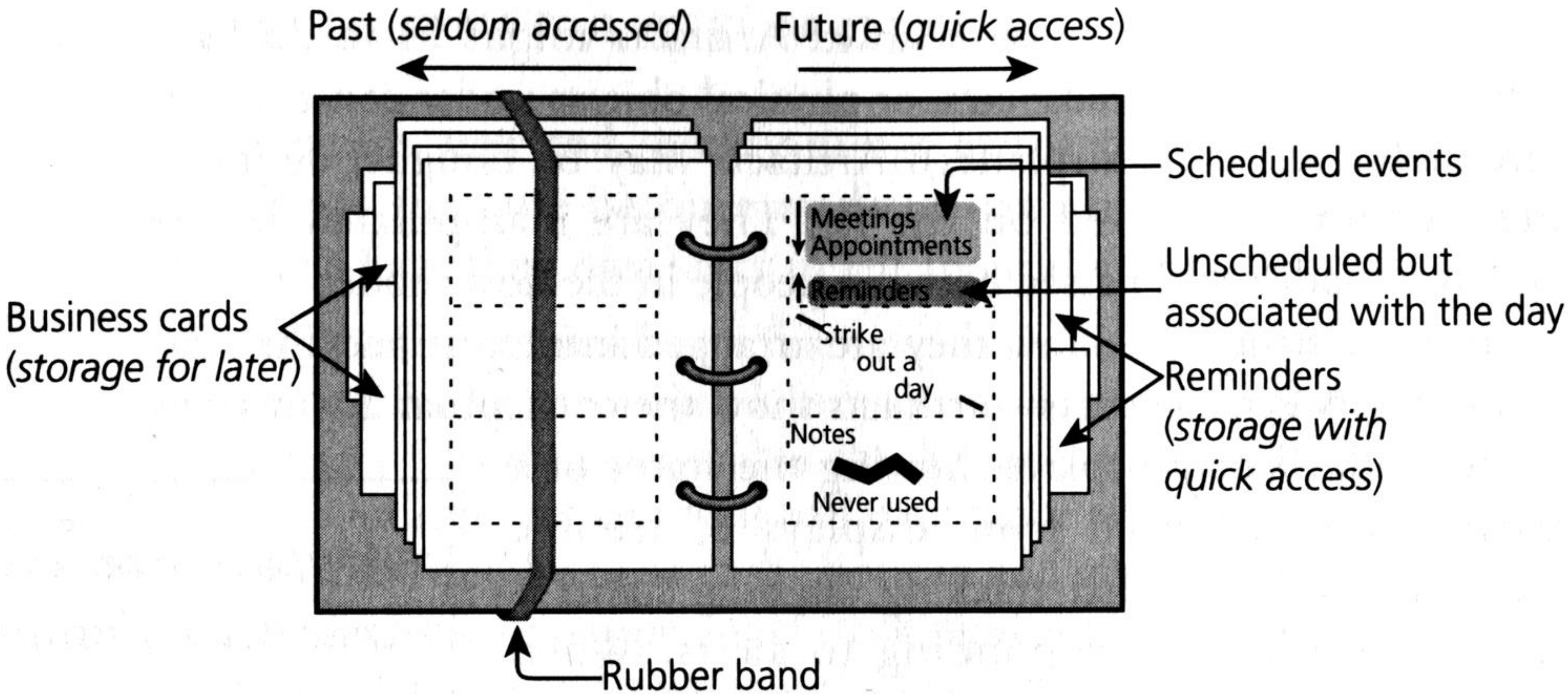
Cultural Model: Developer



Cultural Model: Department Store

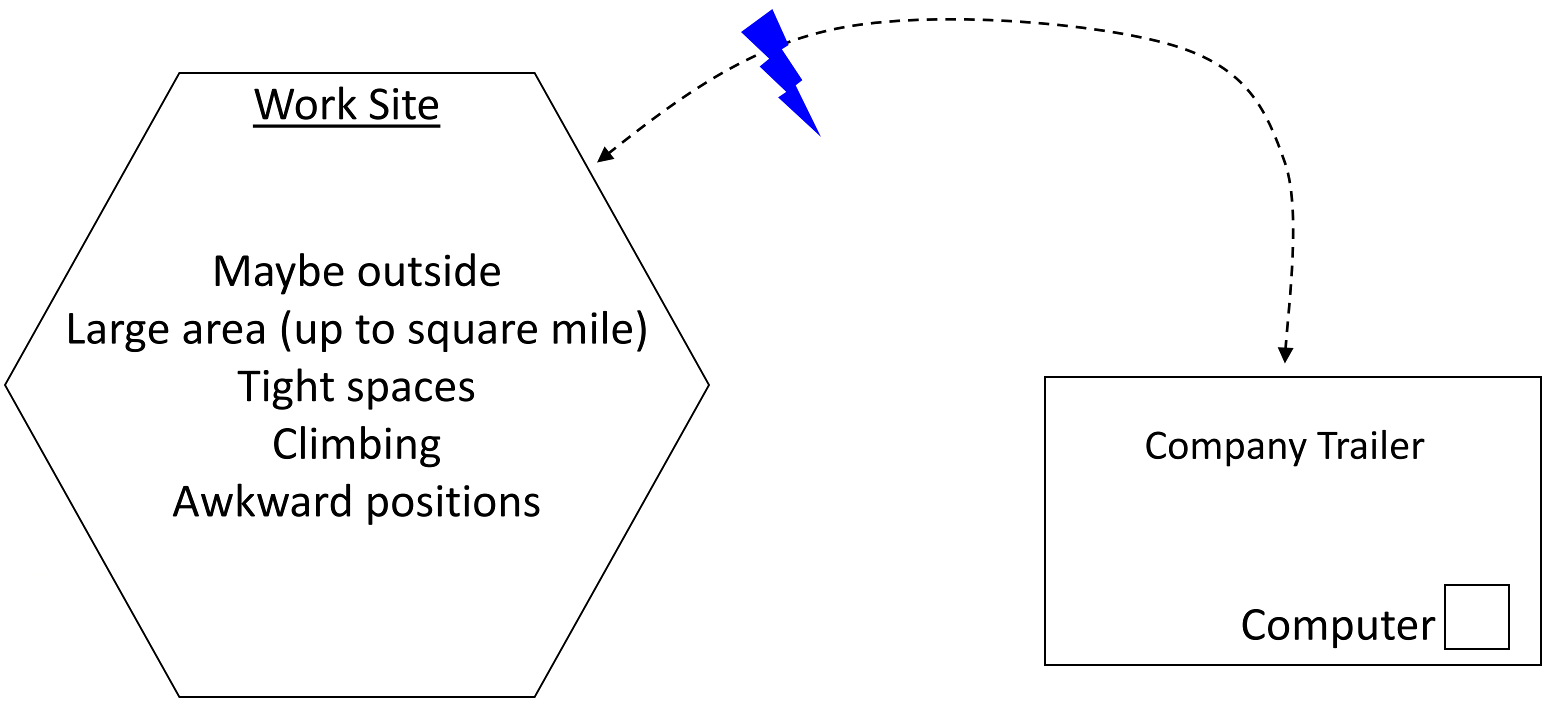


Artifact Model: Calendar



Physical Model: Work Site

Approximately a 5 minute walk. If doing an audit at a site under construction, then safe path frequently changes and may need to wait for construction equipment to pass.



Tasks Matter

System will fail if:

- It is inappropriate for the person
- It does not meet a person's needs

Your contextual inquiries will emphasize getting to know people and their needs

Can you then just make 'good' interfaces?

Why Task Analysis?

'Good' has to be interpreted in the context of use

- Might be acceptable in office, but not for play
- Infinite variety of tasks and customers

Guidelines are too vague to be generative

- e.g., "give adequate feedback"
- Can be used to critique, but not to generate

Design is often about tradeoffs

Why Task Analysis?

Task analysis is a lens on the information you obtain through design research methods

- Use what you learned in your research to answer the questions in the task analysis

Your assignments order the two, but in practice you should iteratively decide how to best draw upon all relevant methods throughout a process

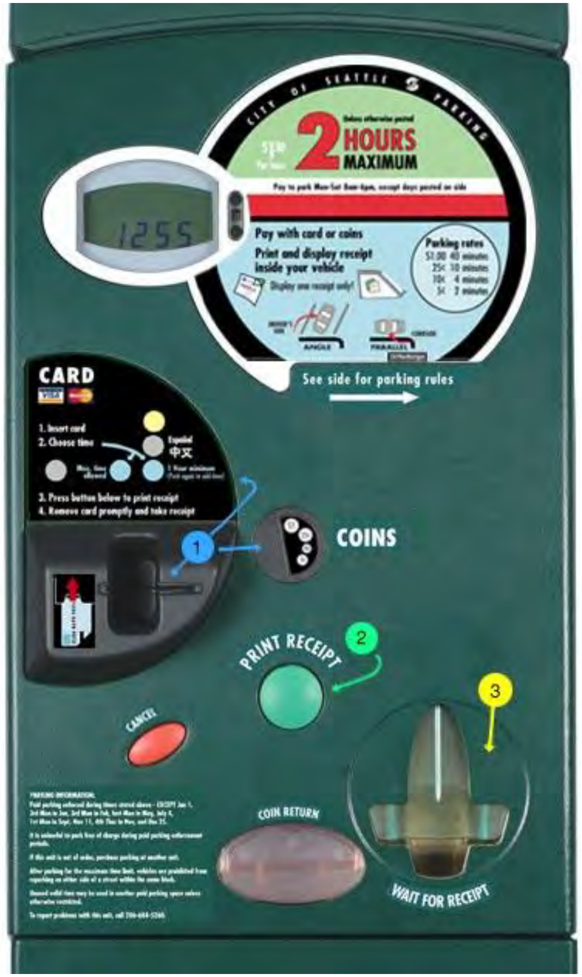
11 Task Analysis Questions

Who is going to use the system?
What tasks do they now perform?
What tasks are desired?
How are the tasks learned?
Where are the tasks performed?
What is the relationship between people & data?
What other tools do people have?
How do people communicate with each other?
How often are the tasks performed?
What are the time constraints on the tasks?
What happens when things go wrong?

Question 1

Who is going to use the system?

- Identity
  - In-house or specific customer is more defined
  - Broad products need several typical consumers
- Background
- Skills
- Work habits and preferences
- Physical characteristics and abilities


CITY OF SEATTLE PARKING
2 HOURS MAXIMUM
1255
Pay with card or coins
Print and display receipt inside your vehicle
Parking rates
See side for parking rules
CARD
1. Insert card
2. Choose time
中文
3. Press button below to print receipt
4. Remove card promptly and take receipt
1
COINS
PRINT RECEIPT
2
CANCEL
3
COIN RETURN
WAIT FOR RECEIPT

Seattle Parking Meter

Who is going to use the system?

Identity?

People who park in Seattle

Business people, students, elderly, tourists

Background?

Have used parking meters before

May have an ATM or credit card

Have used other fare machines before

Seattle Parking Meter

Who is going to use the system?

Skills?

May know how to put cards into ATM

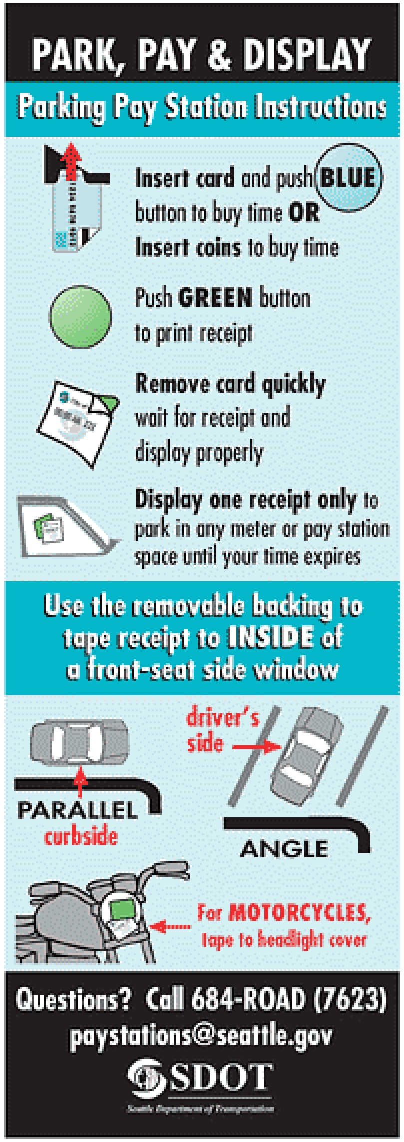
Work habits and preferences?

Park several times a week, a month, a year

Physical characteristics and abilities?

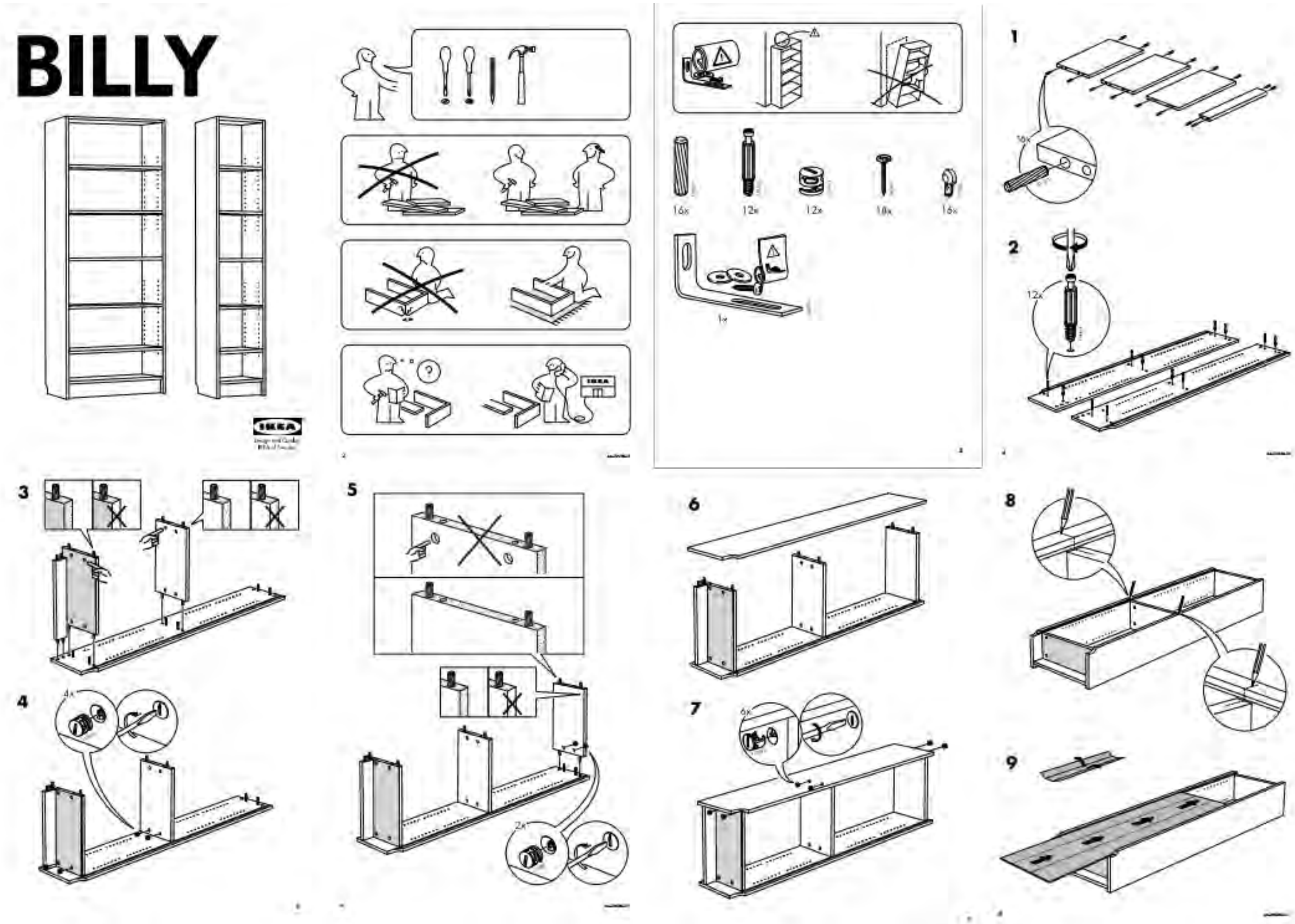
Varying heights, do not make it too high or too low

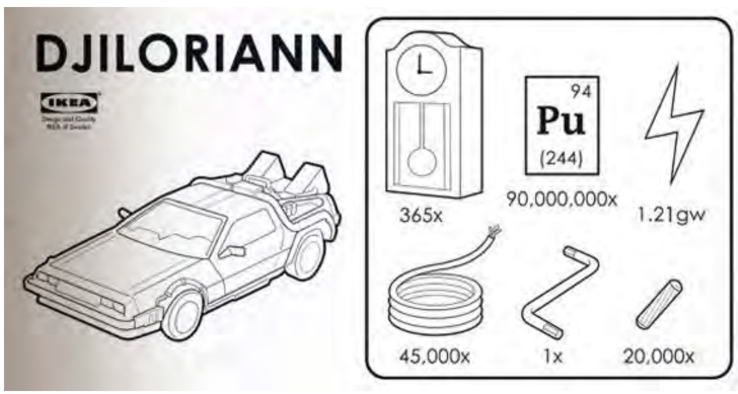
Anything else?

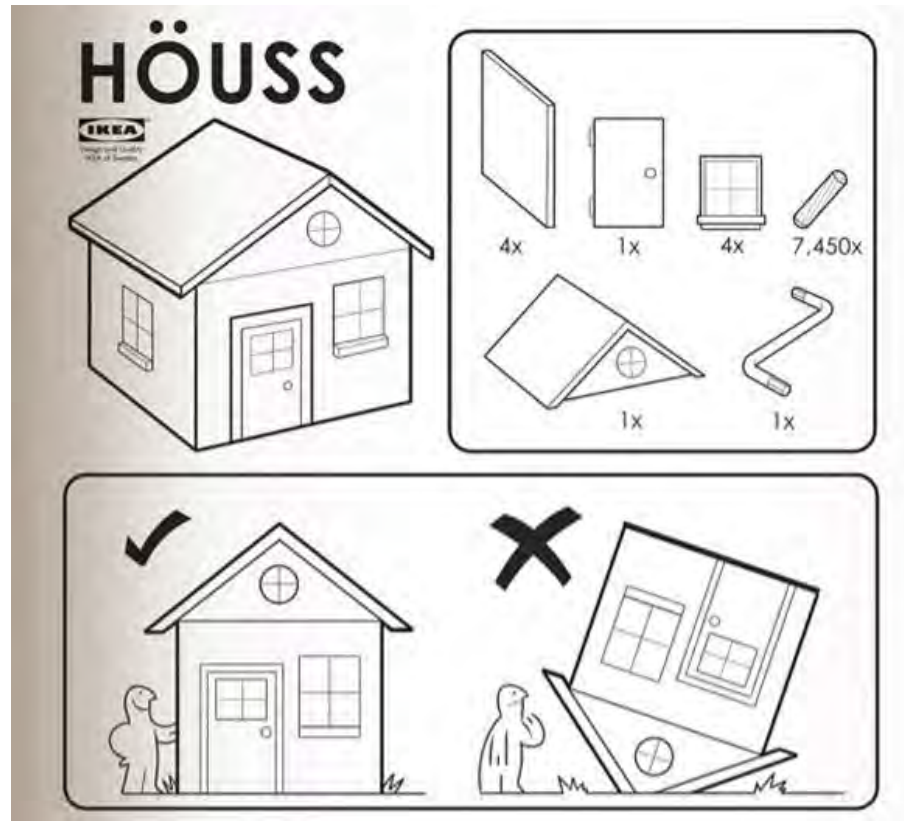

PARK, PAY & DISPLAY
Parking Pay Station Instructions
Insert card and push BLUE button to buy time OR
Insert coins to buy time
Push GREEN button to print receipt
Remove card quickly wait for receipt and display properly
Display one receipt only to park in any meter or pay station space until your time expires
Use the removable backing to tape receipt to INSIDE of a front-seat side window
driver's side
PARALLEL
curbside
ANGLE
For MOTORCYCLES, tape to headlight cover
Questions? Call 684-ROAD (7623)
paystations@seattle.gov
SDOT


泊車、付款並顯示
泊車付費站使用說明
插入卡並按 藍色 按鈕購買時間，
或投入硬幣購買時間
按綠色按鈕
打印收據
迅速將卡取出
等候收據並適當顯示
僅限顯示一張收據，以便在任何咪表或付費站的車位泊車，直到您的時間到期
請使用可剝離的背面，將收據貼在前座側車窗內側
平行路側
司機座側
斜角
如果是摩托車，請貼在車頭燈罩上
有問題嗎？請致電 684-ROAD (7623)
paystations@seattle.gov
SDOT


ĐẬU XE, TRẢ TIỀN & DÁN BIÊN NHẬN
Hướng Dẫn về Trạm Trả Tiền Đậu Xe
Đút thẻ vào và bấm nút XANH để mua giờ HOẶC
Bỏ tiền cắc để mua giờ
Bấm nút XANH để in biên nhận
Rút nhanh thẻ ra chờ biên nhận và dán đúng cách
Chỉ dán một biên nhận để đậu xe tại bất cứ chỗ nào có đồng hồ hoặc trạm trả tiền cho đến khi hết giờ đậu
Dùng miếng dán mặt sau có thể gỡ ra để dán biên nhận vào MẶT TRONG cửa kính băng trước
phía người lái
SONG SONG
bờ lề
GÓC
Đối với XE GẮN MÁY, dán vào chụp đèn trước
Thắc Mắc? Hãy gọi số 684-ROAD (7623)
paystations@seattle.gov
SDOT


BILLY
IKEA
16x
12x
12x
18x
16x
1x
1
16x
2
12x
3
4
4x
5
2x
6
7
6x
8
9


DJILORIANN
365x
Pu
94
(244)
90,000,000x
1.21gw
45,000x
1x
20,000x


HÖUSS
4x
1x
4x
7,450x
1x
1x

Question 2 and Question 3

What tasks do they now perform?
What tasks are desired?

Important for both automation and new functionality
Relative importance of tasks?
Observe people, see it from their perspective

Automated Billing Example

small dentists office had billing automated
assistants were unhappy with new system
old forms contained hand-written margin notes
e.g., patient's insurance takes longer than most

PROVED

poonful salt
beaten
l milk

beaten egg and add
melted fat. Bake in
25 min. Makes 11

cup. flour, add 4
baking powder to
g and bake same as

sp. baking powder,
same as for Plain
nd adding to other
14.

to 1 cup. chopped
fruit with 2 tbsp.
lates, figs, apples,

Yorkshire Pudding
Individual

POPOVERS

3 eggs recipe makes 12

beat well very

2 cupfuls flour	2 eggs
½ teaspoonful salt	2 cupfuls milk

2 teaspoonfuls melted fat

Beat eggs slightly. Sift flour and salt, and add alternately with milk to eggs. Add melted fat. Beat with egg beater until smooth and full of bubbles. Fill hot greased cast aluminum or iron gem-pans or glass or earthenware custard cups, ⅔ full of popover batter. Place immediately in a hot oven of 450° F. and bake for 30 min. Then lower temperature to 350° F. and bake for 15 min. longer. Makes 9 popovers.

CORNBREAD

2 cupfuls cornmeal	2 cupfuls sour milk
1 teaspoonful soda	2 eggs, beaten
1½ teaspoonfuls salt	2 tablespoonfuls melted fat

3 tablespoonfuls sugar

Sift dry ingredients together. Mix milk with beaten eggs and add to dry ingredients. Stir well together and add melted fat. Pour into a hot greased baking pan or muffin tins and bake in hot oven of 400° F. for 20-25 min. Makes 24 pieces.

GRIDDLE CAKES

Question 4

How are the tasks learned?

What does a person need to know?

Do they need training?

academic

general knowledge / skills

special instruction / training

Question 5

Where are the tasks performed?

Office, laboratory, point of sale?

Effects of environment on customers?

Are people under stress?

Confidentiality required?

Do they have wet, dirty, or slippery hands?

Soft drinks?

Lighting?

Noise?

Question 6

What is the relationship between people & data?

Personal data

Always accessed at same machine?

Do people move between machines?

Common data

Used concurrently?

Passed sequentially between customers?

Remote access required?

Access to data restricted?

Does this relationship change over time?

Question 7

What other tools does a person have?

More than just compatibility

How customer works with collection of tools

Automating lab data collection example:

how is data collected now?

by what instruments and manual procedures?

how is the information analyzed?

are the results transcribed for records or publication?

what media/forms are used and how are they handled?

Question 8

How do people communicate with each other?

Who communicates with whom?

About what?

Follow lines of the organization? Against it?

Question 9

How often are the tasks performed?

Frequent use likely remember more details

Infrequent use may need more help

Even for simple operations

Make these tasks possible to accomplish

Which function is performed

Most frequently?

By which people?

Optimizing for these will improve perception of performance

Careful about initial use scenario

Question 10

What are the time constraints on the tasks?

What functions will people be in a hurry for?

Which can wait?

Is there a timing relationship between tasks?

e.g., pregnancy in web search

Question 11

What happens when things go wrong?

How do people deal with

task-related errors?

practical difficulties?

catastrophes?

Is there a backup strategy?

What are the consequences?

Plantr Task Analysis

1. Who is going to use the system?

Anyone who owns indoor plants is a potential user of Plantr. All of the plant owners that we interviewed forgot to water their plants at some point regardless of age, experience, and background. Even Lucy, who spent most of her time at home because she worked from home, struggled with timely watering.

Plantr Task Analysis

2. What are the currently possible tasks?

When people purchase a plant, they often look up information about the proper lighting and temperature conditions for their plants. Additionally, people must find out how much and how frequently to water and fertilize their plants.

Plantr Task Analysis

3. What are currently unavailable, desired tasks?

People want a way to remember to water and care for their plants. Forgetting to water plants was the most cited reason for plant death, and the only task that participants in our inquiries mentioned completing on a regular basis.

Plantr Task Analysis

4. How are tasks learned?

Most people learned how to take care of their plants through trial and error. Some consulted the Internet, nursery staff, or friends for more information on plant care.

Plantr Task Analysis

5.Where are the tasks performed?

Tasks like watering and fertilizing are performed at the plant's location. People keep plants in their workplace, like Jack, or at home, like Lucy and Caroline. Getting information about plant care was performed in a variety of places. People who consult the Internet could be anywhere with a platform that supports web browsing. Those who go to the nursery to talk to plant experts are required to go to a specific location to talk to someone in person.

Plantr Task Analysis

6.What is the relationship between a person and data?

We identified three different types of data: a plant's current state, information about plants, and data that reflects the person's plant care history.

A plant's current state is data on the moisture level of its soil and the general appearance of the plant (e.g., color, stiffness/limpness of leaves). People use this information to determine the plant's needs. Caroline and Lucy watered their plants when the soil felt dry or the leaves began to droop.

Plantr Task Analysis

6.What is the relationship between a person and data?

People consulted various plant care information databases when they wanted to know how to care for their plants.

People used their personal history of plant care to determine how to take care of plants. Caroline said that she used to underwater plants, but she learned from her mistake and now tries to water them more often. People also base their buying decisions based upon their plant care history. Caroline noted that she tries to buy plants that require minimal water.

Plantr Task Analysis

7. What other tools do people have?

Caroline, Lucy, Jack, and Kacy all have phones and computers.
People also have a water source, pots, and soil for their plants.
Most people probably have access to a nursery or library.

Plantr Task Analysis

8.How do people communicate with each other?

Plant owners communicate on online forums and message boards. People who happen to be in the nursery at the same time might talk to each other about plant care. Likewise, people who have friends with indoor plants may share plant care tips.

Plantr Task Analysis

9.How often are the tasks performed?

Watering is performed with a frequency between twice a week (Jack) and twice a month (Caroline). Fertilizing is performed less frequently, between once every two weeks to once every three months. Plants do not become sick often enough to make a good estimate about how often people try to get help.

Plantr Task Analysis

10. What are time constraints on the tasks?

Plants must be watered with some regularity, so if people do not water their plants for long enough, the plants will start to die. Likewise, if plants are in need of attention for other reasons - pH imbalance, environment too dry - and they do not receive attention within some amount of time, they will die. Watering, caring, and learning how to care for a plant takes time. People who are very busy might not have the time or attention required for plant care.

Plantr Task Analysis

11. What happens when things go wrong?

When plants became "sick", people take action, seek help, or ignore the problem until the plant dies. When people forget to water plants, they usually notice that the plant needs water and give it water. Sometimes people may not realize that a plant needs water until it is too late.

Selecting Tasks

- Real tasks people have faced or requested
  - collect any necessary materials
- Should provide reasonable coverage
  - compare check list of functions to tasks
- Mixture of simple and complex tasks
  - easy tasks (common or introductory)
  - moderate tasks
  - difficult tasks (infrequent or for power use)

What Should Tasks Look Like?

Say what person wants to do, but not how

- allows comparing different design alternatives

Be specific, stories based in concrete facts

- say who person is (e.g., using personas or profiles)
  - design can really differ depending on who
  - give ‘names’ (allows referring back with more info later)
  - characteristics of person (e.g., job, expertise)
- story forces us to fill in description with details

Sometimes describe a complete “accomplishment”

- forces us to consider how features work together

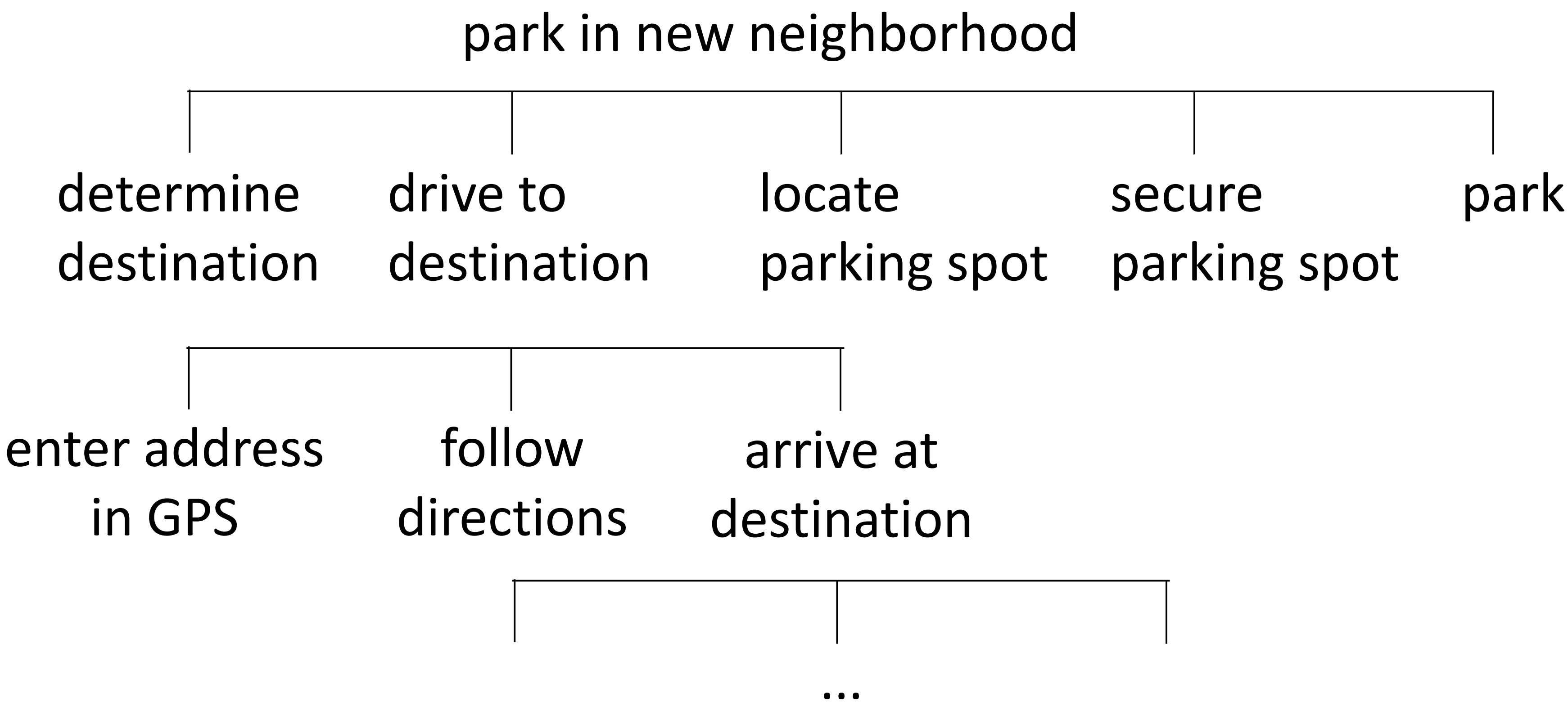
filename task example

Task: Park in a New Neighborhood

Peter is going to brunch on a Sunday with his roommates. He is trying a new place he found on Yelp. He has the address for the place and he is using his phone's GPS for directions. He leaves the apartment with his roommates at 8:30am and he wants to beat the crowd so they won't have to wait in line. He is driving a Toyota Corolla that he has owned for five years. It is a rainy day and he doesn't have an umbrella.

Hierarchical Task Analysis

Steps of the task execution (detailed in a hierarchy)



Hierarchical Task Analysis

Steps of the task execution (detailed in a hierarchy)

park in new neighborhood

determine destination

drive to destination

locate parking spot

secure parking spot

park

enter address in GPS

follow directions

arrive at destination

...

Or step back a level and motivate Uber

Using Tasks in Design

Write up a description of tasks

formally or informally

run by people and rest of the design team

get more information where needed

> Manny is in the city at a restaurant and would like to call his friend Sherry to see when she will be arriving. She called from a friend's house while he was in the bus tunnel, so he missed her call. He would like to check his missed calls and find the number to call her back.

Using Tasks in Design

Rough out an interface design

discard features that do not support your tasks

or add a real task that exercises that feature

major elements and functions, not too detailed

hand sketched

Produce scenarios for each task

what person does and what they see

step-by-step performance of task

illustrate using storyboards

Scenarios

Scenarios are design specific, tasks are not

Scenarios force us to

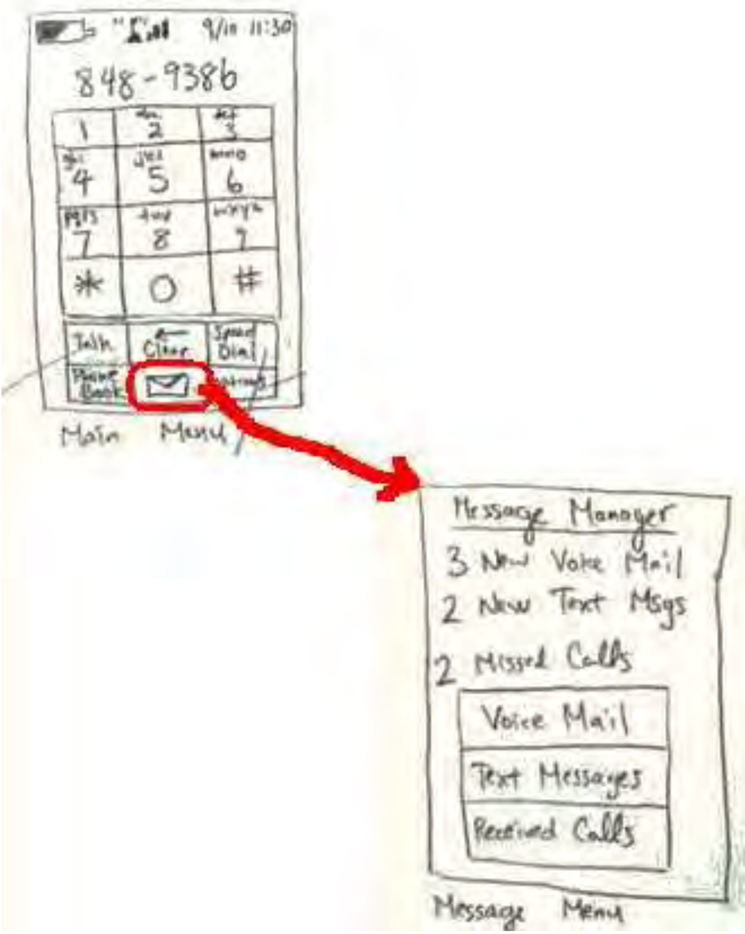
show how things work together

settle arguments with examples

but these are only examples,
and may need to look beyond flaws

Show people storyboards

topic for Tuesday



Tasks, Personas, and Scenarios

Task: a design-agnostic objective

Persona: a fictional person with a backstory

Scenario: narrative that demonstrates a persona completing a task using a particular design

Use Case: in software engineering, describes requirements using one or more scenarios

Tasks in Your Projects

Say what is accomplished, not how

Real tasks that people currently encounter, or new tasks your design will enable

Reasonable coverage of the interesting aspects of your problem and your design space

Range of difficulty and complexity

- Park at the zoo
- Park Friday night in Ballard
- Park at the airport

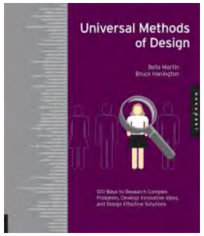
Combine with Other Methods

Personas

Concept Mapping

Competitive Analysis

Method 63



“If you want to create a product that satisfies a broad audience …, logic will tell you to make it as broad in its functionality as possible to accommodate the most people. Logic is Wrong.”

Combine with Other Methods

Personas

Concept Mapping

Competitive Analysis

Example Personae:

- Parent concerned about safety
- Carpenter transporting tools
- Executive wants a sporty car

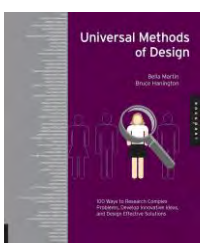
More specific is effective

- Give the person detail
- Give them a name
- Make it believable

Careful of stereotyping

Web littered with examples

Method 63



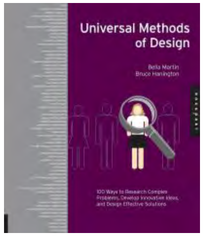
Combine with Other Methods

Personas

Concept Mapping

Competitive Analysis

Method 16

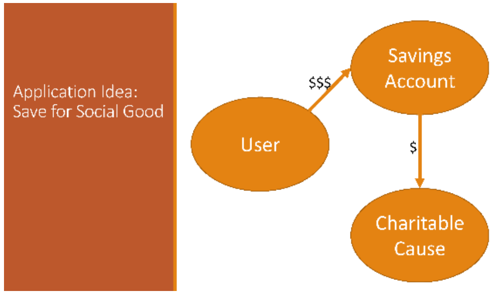


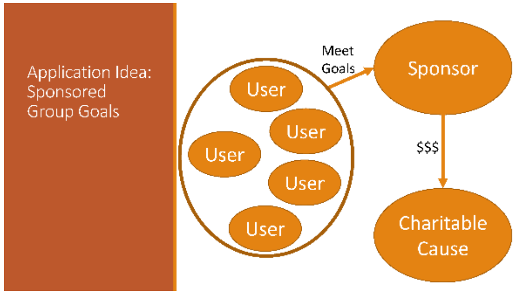
Combine with Other Methods

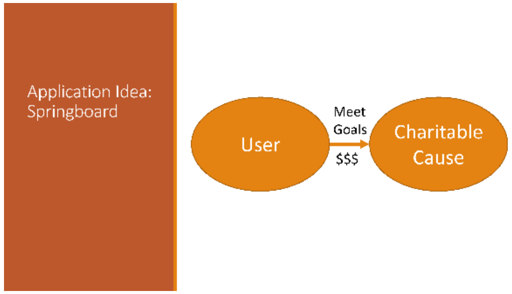
Personas

Concept Mapping

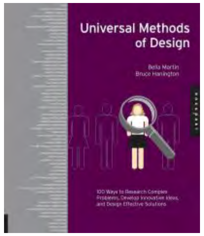
Competitive Analysis







Method 16

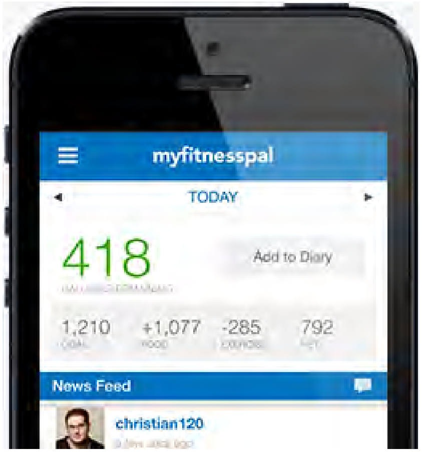


Combine with Other Methods

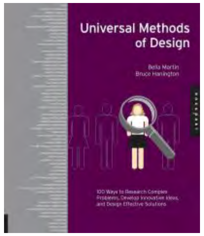
Personas

Concept Mapping

Competitive Analysis



Method 15



CSE 440: Introduction to HCI

User Interface Design, Prototyping, and Evaluation

Lecture 06:
Critique and
Task Analysis

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50

CSE 440: Introduction to HCI

User Interface Design, Prototyping, and Evaluation

Lecture 07:
Storyboarding and
Video Prototyping

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50

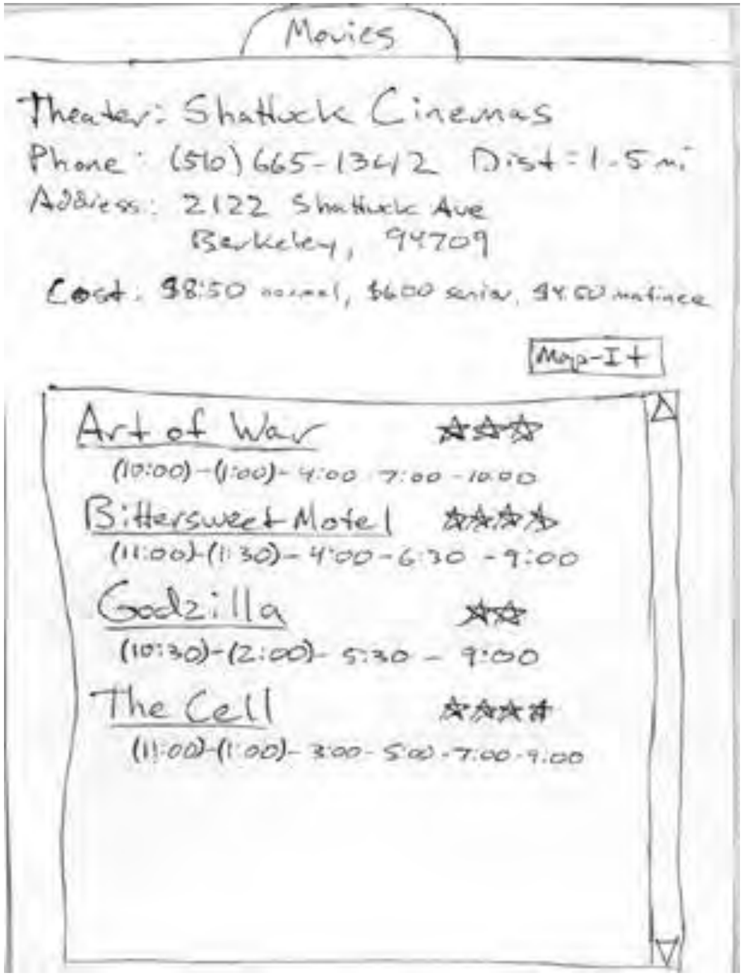
Tasks in Sketching and Design

Tasks guide your exploration of a design

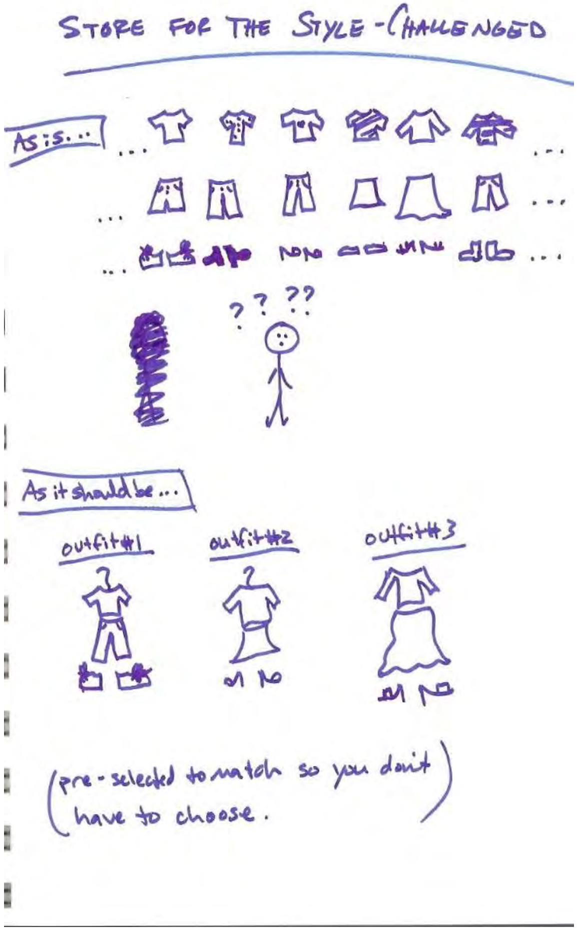
Creating scenarios for each task illustrates

- what a person does
- what they see
- step-by-step performance of task with a design

Sketching

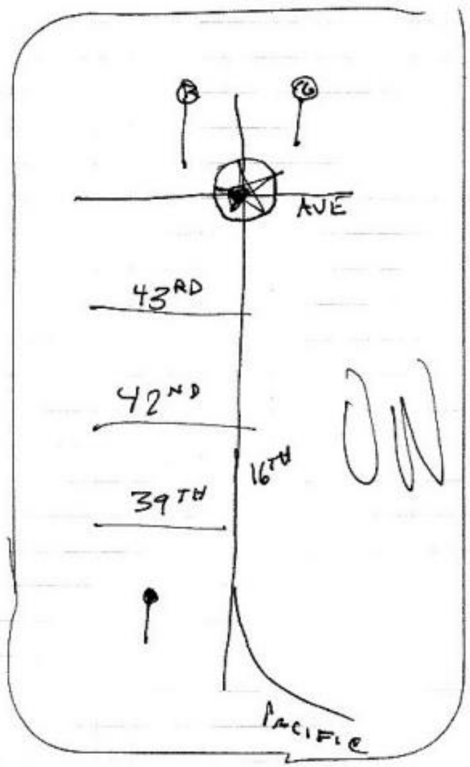


Movies
Theater: Shattuck Cinemas
Phone: (510) 665-1342 Dist: 1.5 mi
Address: 2122 Shattuck Ave
Berkeley, 94709
Map-It
Art of War
(10:00)-(1:00)-4:00-7:00-10:00
Bittersweet Motel
(11:00)-(1:30)-4:00-6:30-9:00
Godzilla
(10:30)-(2:00)-5:30-9:00
The Cell
(11:00)-(1:00)-3:00-5:00-7:00-9:00

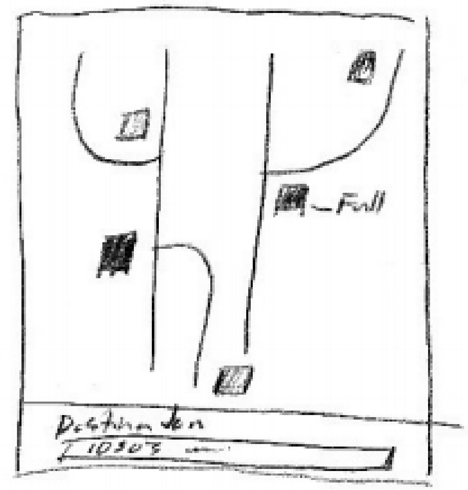


STORE FOR THE STYLE-CHALLENGED
As is...
As it should be...
outfit#1
outfit#2
outfit#3
(pre-selected to match so you don't have to choose.)

Sketching

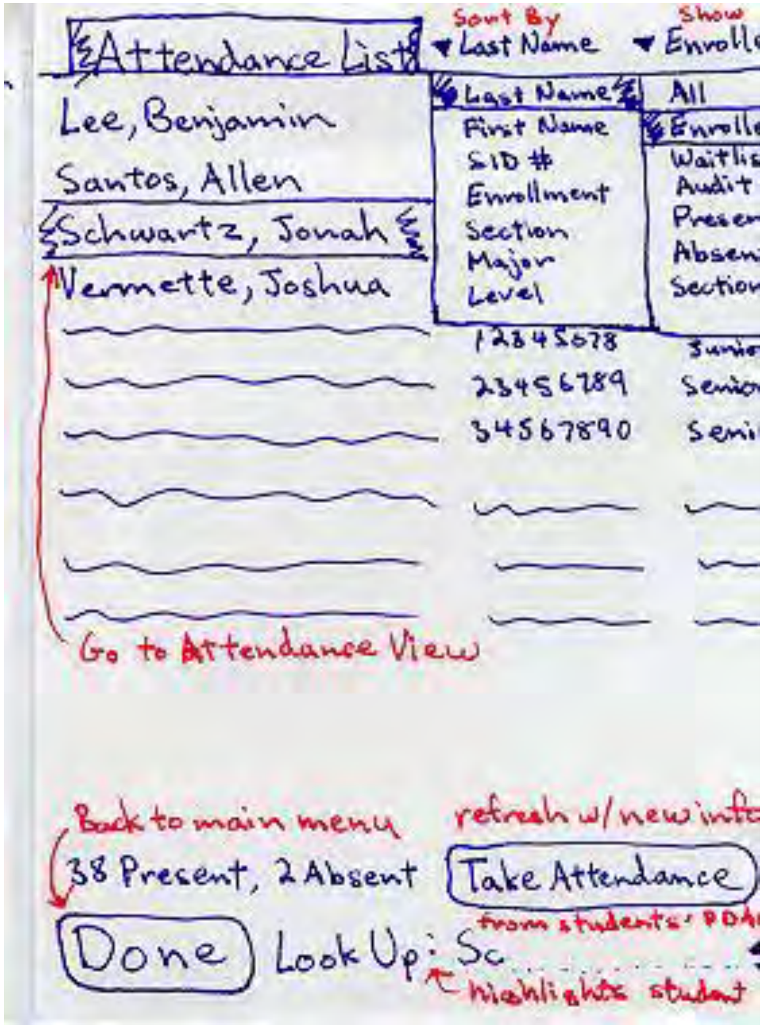


MAP SHOWING PARKING AVAILABILITY BASED ON INPUTTED DATA, INPUTTED ON MAP

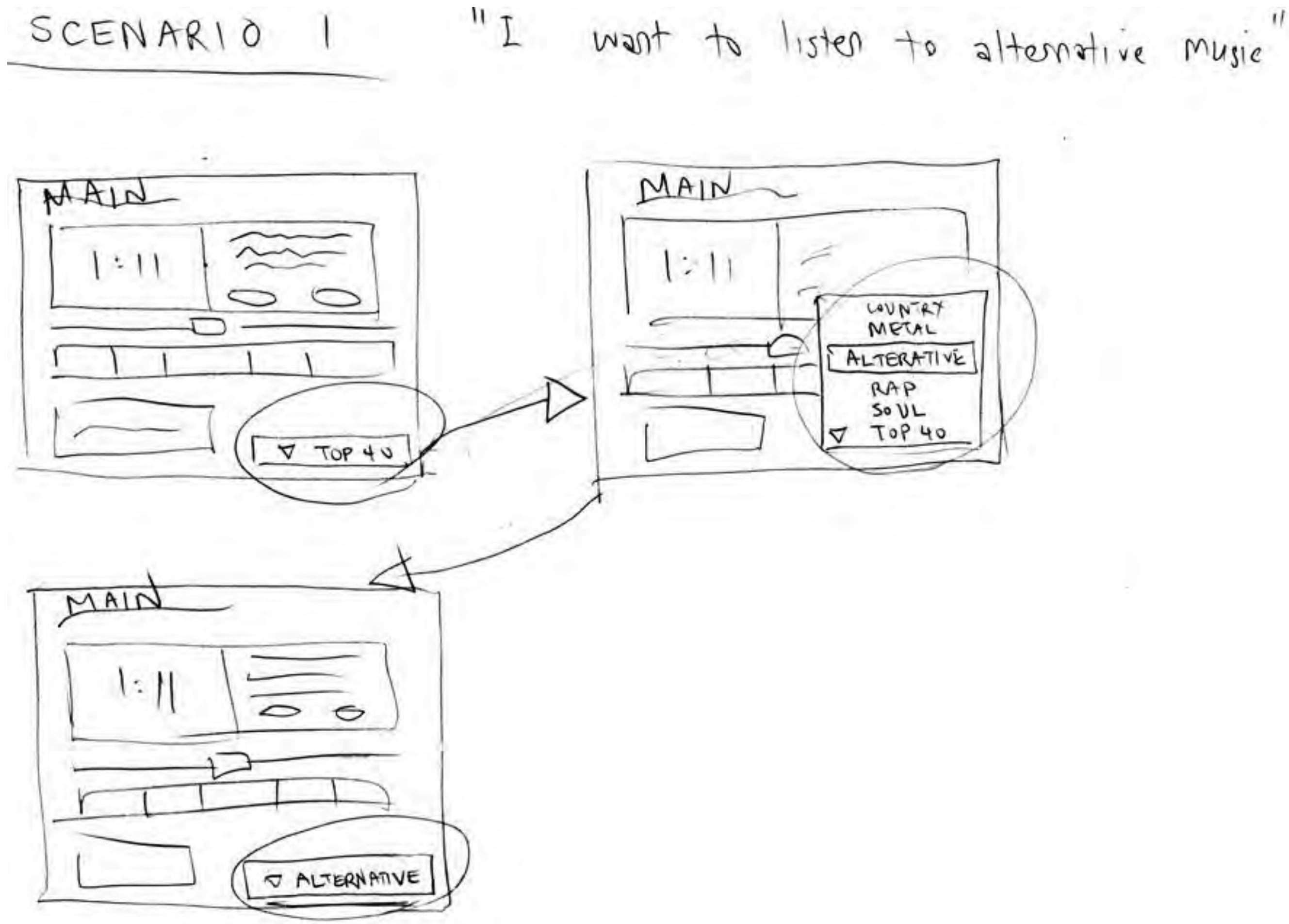


- Different colours
- highlights availability
-

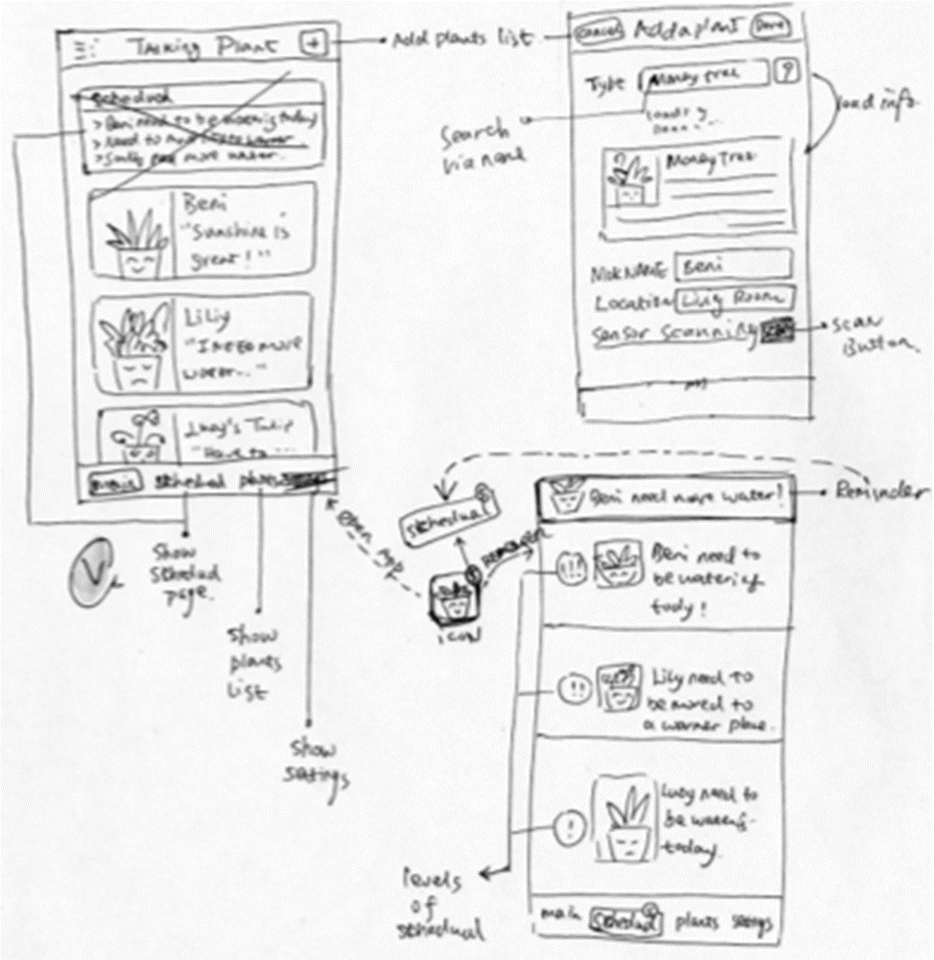
Sketching and Tasks



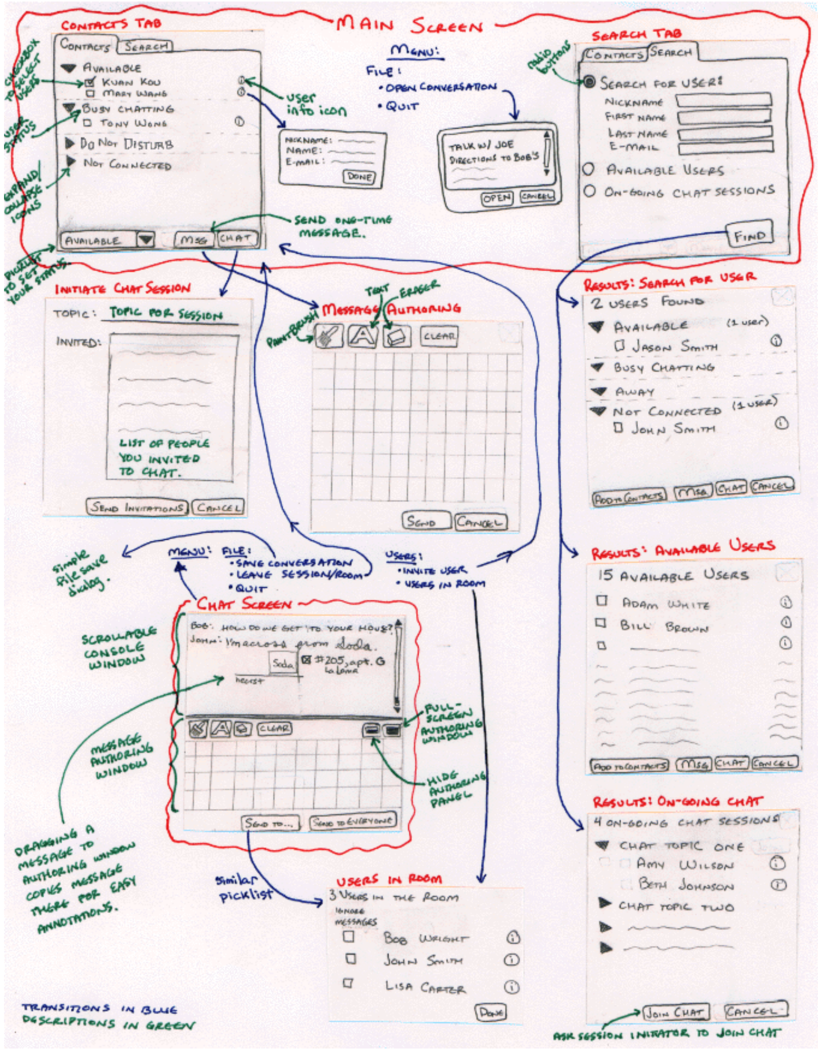
Sketching and Tasks



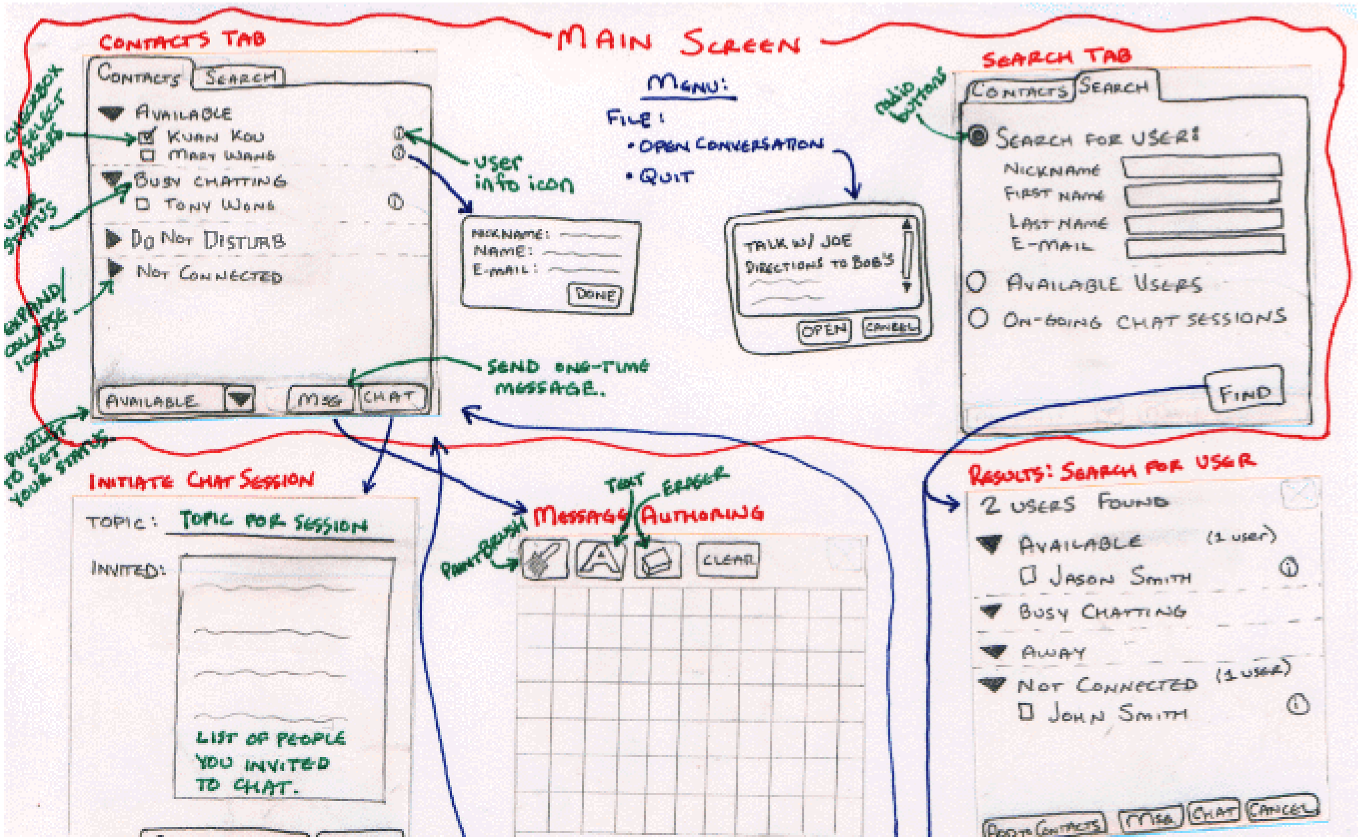
Sketching and Tasks



Sketching and Tasks



Sketching and Tasks

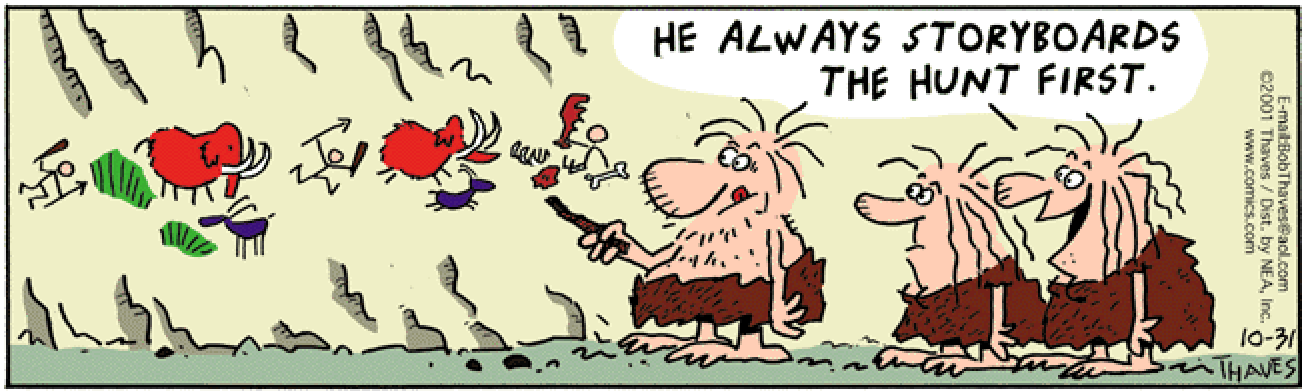


Illustrating Time

Storyboards come from film and animation

Give a “script” of important events

- leave out the details
- concentrate on the important interactions



Storyboards

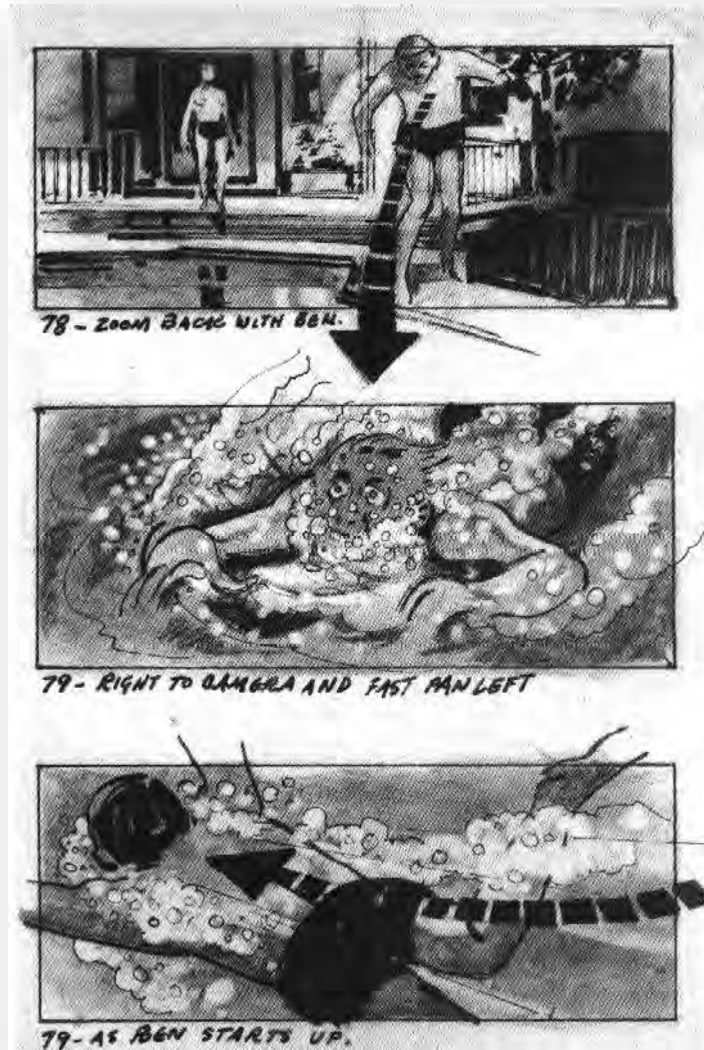
Can be used to explore

Much faster and less expensive to produce

Can therefore explore more potential approaches

Notes help fill in missing pieces of the proposal

Relative to film, these function as sketches



Storyboards

Can be used to convey

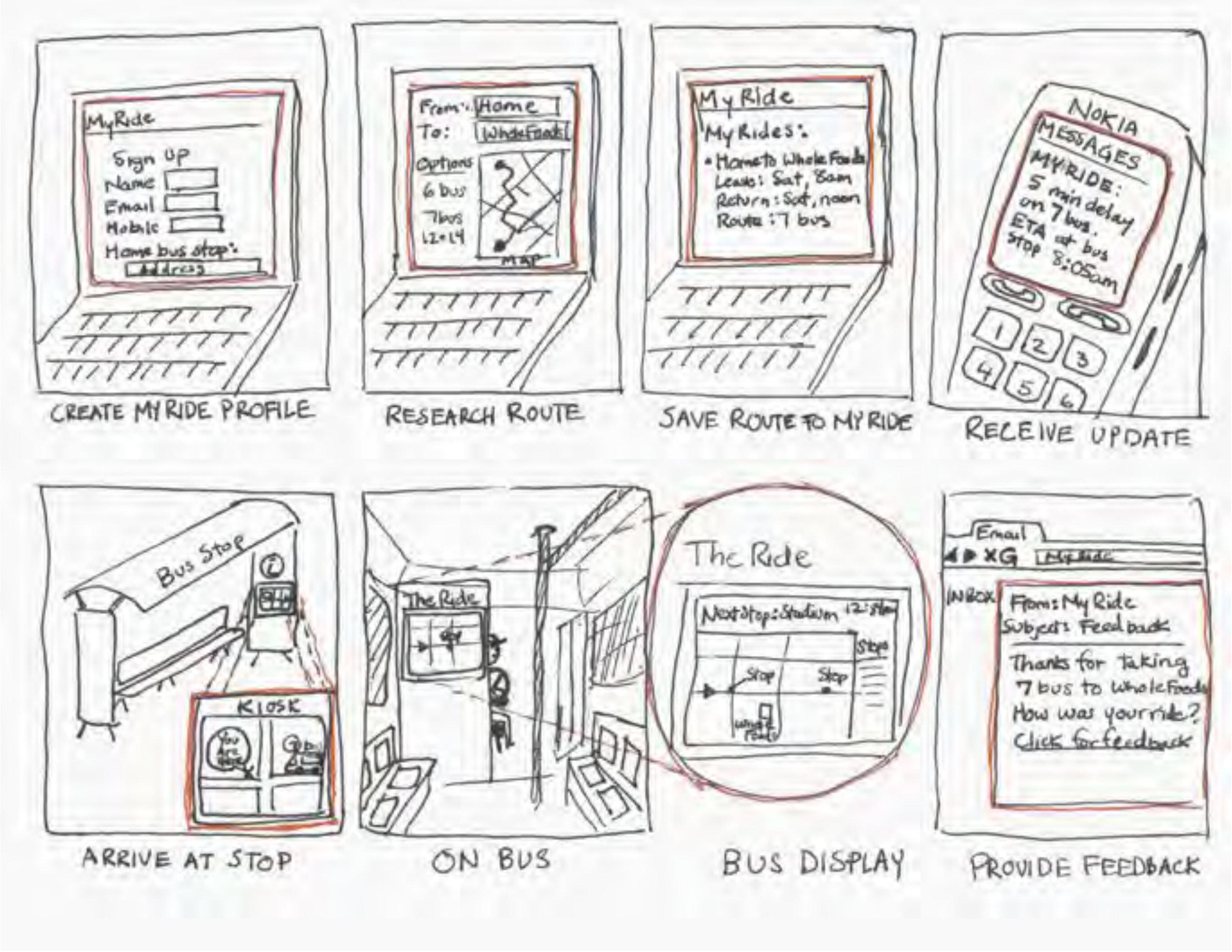
Effective storyboards can quickly convey information that would be difficult to understand in text

Imagine explaining this in text, for various audiences

Storyboards

Can illustrate key requirements and leave open less important details of design

Basic Storyboard



Storytelling

Stories have an audience

Other designers, clients, potential end-users, stakeholders, managers, funding agencies

Stories need to match audience and purpose

Quesenberg and Brooks

Potential Purpose of a Story

Purpose allows choosing effective details

Stories have a purpose

- Share information about people, tasks, goals
- Giving insight into people who are not like us, convey details that might be lost in generalities
- Put a human face on analytic data
- Spark design concepts and encourage innovation
- Share ideas and persuade on potential value

Stories Provide Context

Characters
- Who is involved

Setting
- Environment

Sequence
- What task is illustrated
- What leads a person to use a design
- What steps are involved

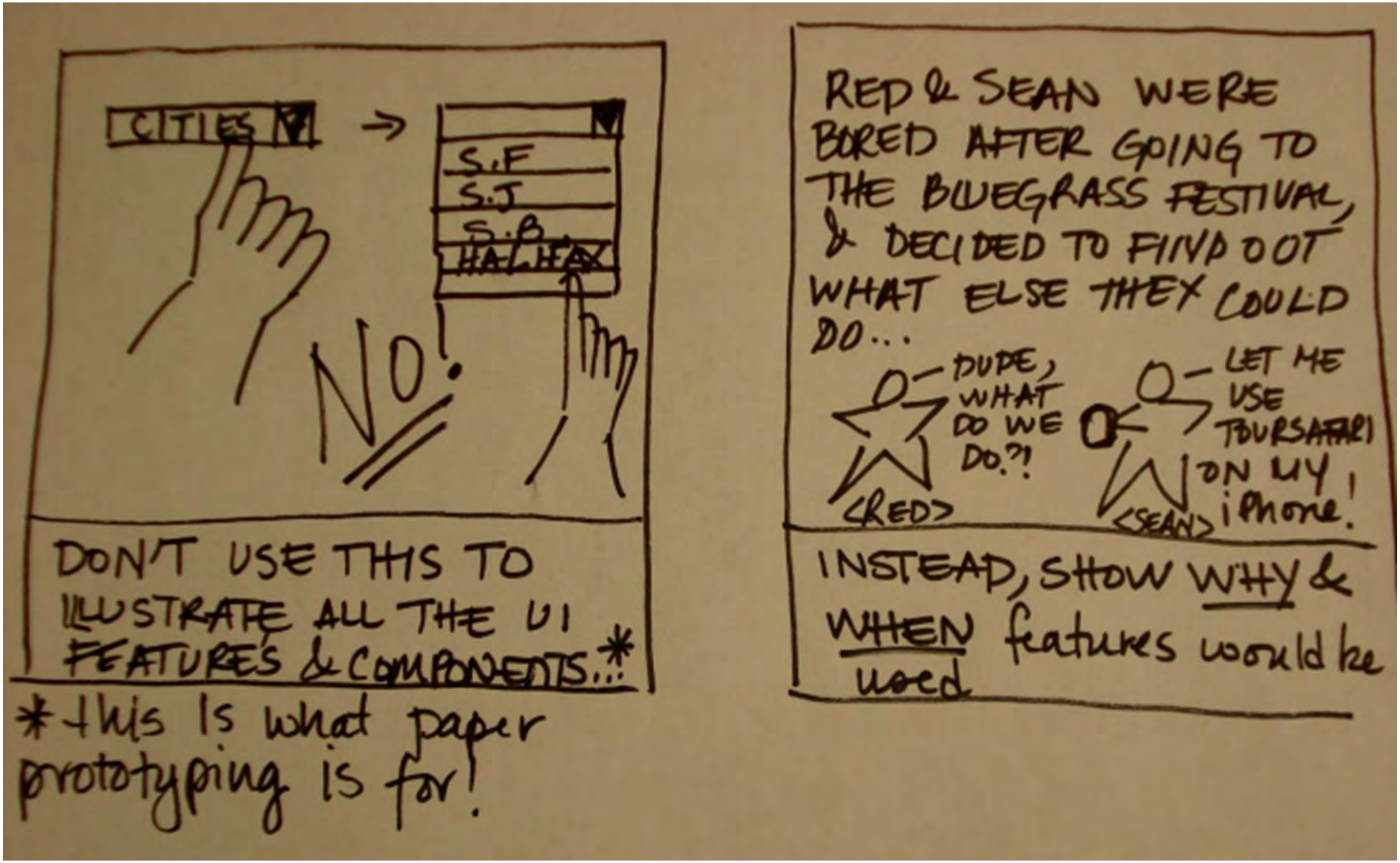
Satisfaction
- What is the motivation
- What is the end result
- What need is satisified

Details of interface features and components are not necessarily surfaced, they can often be developed and conveyed more effectively with other methods

Can help surface details that might otherwise be ignored

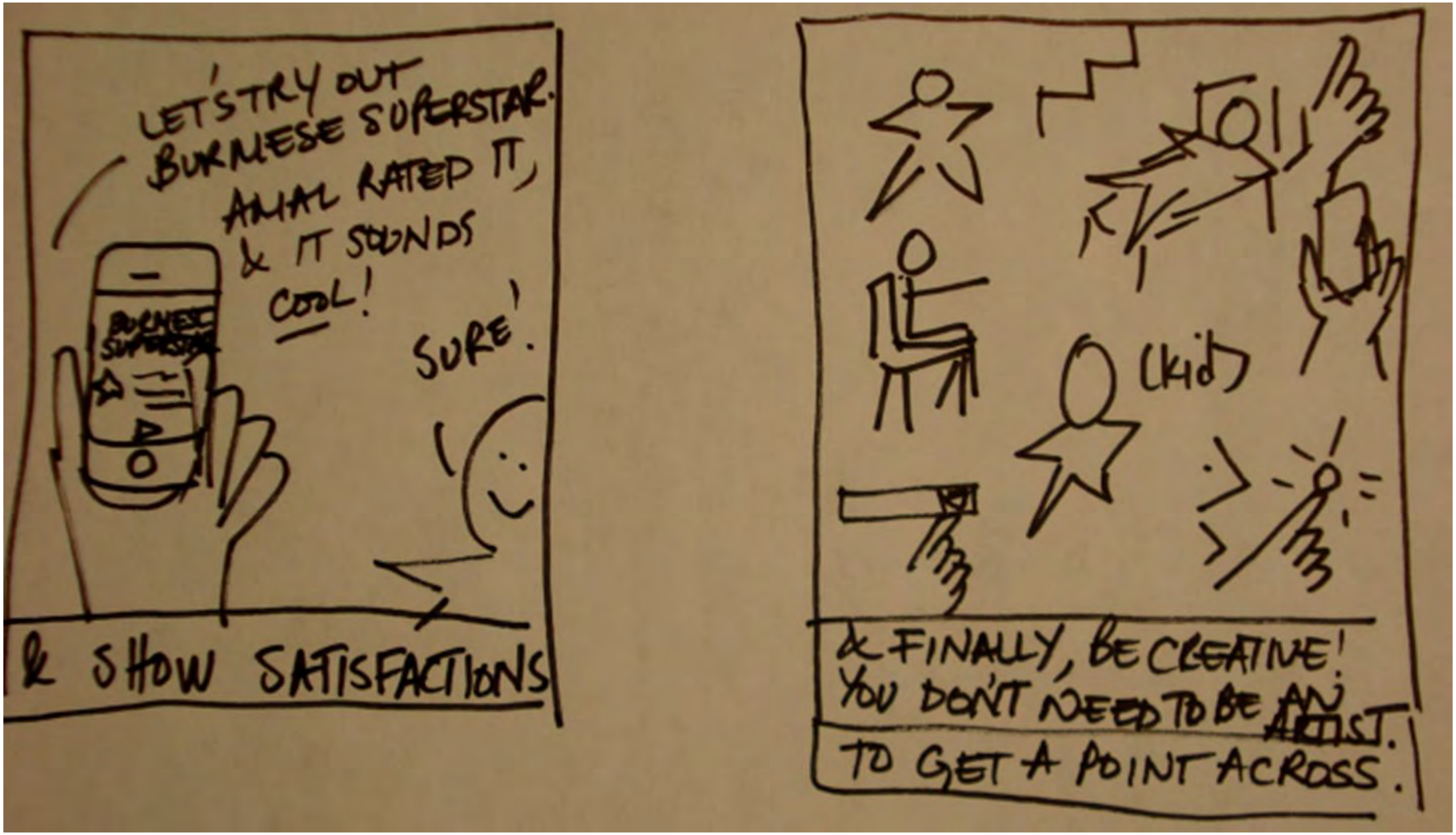
Grocery store application:
- use with one hand while pushing a shopping cart
- privacy of speech input
- split attention

Amal's Guide to Storyboarding



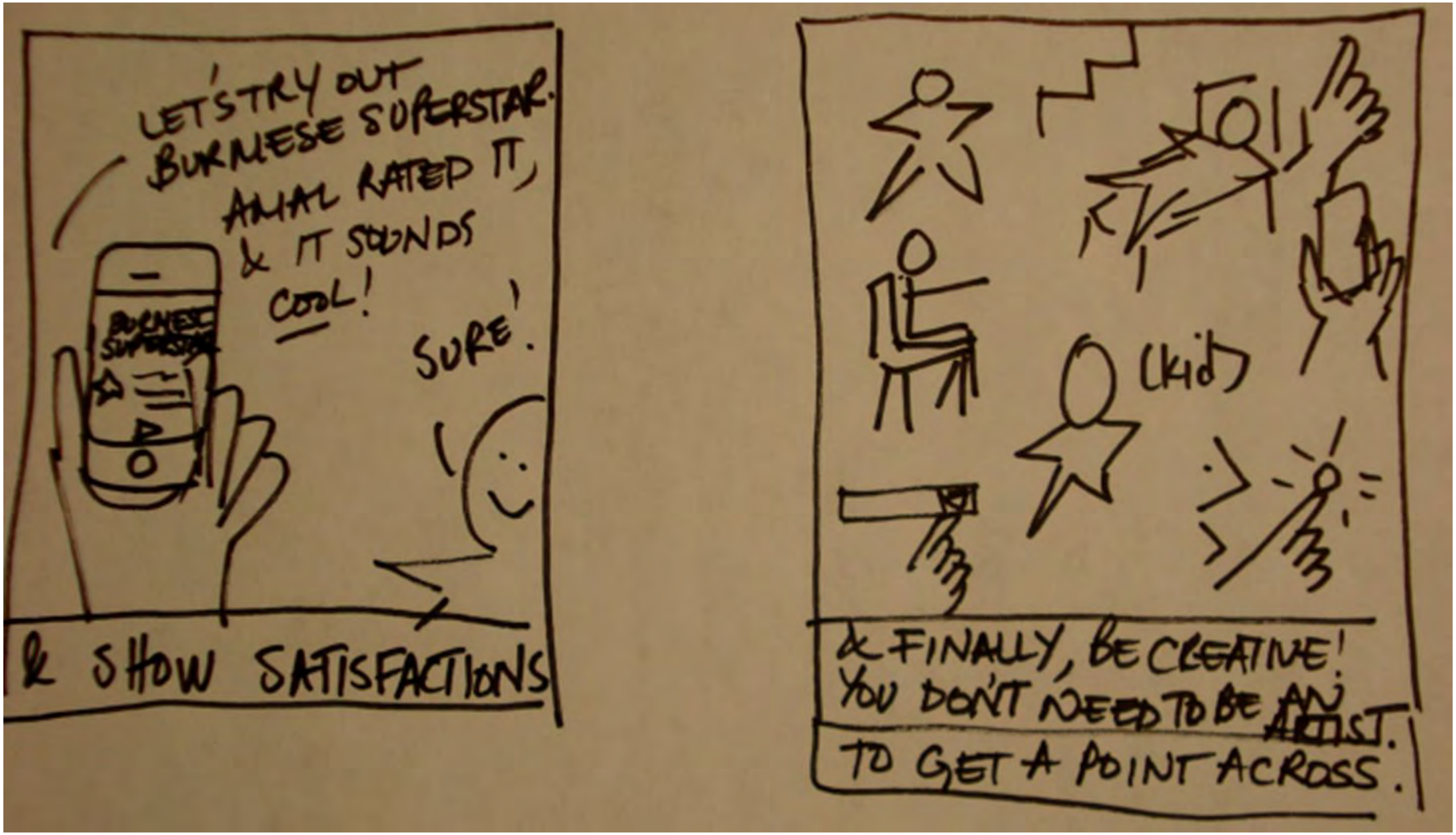
Amal Dar Aziz

Amal's Guide to Storyboarding



Amal Dar Aziz

Amal's Guide to Storyboarding



Amal Dar Aziz

Storytelling

Good stories

- Understand audience
- Provide context of use
- Are well-motivated
- Memorable
- Evokes a reaction
- Evokes empathy
- Illustrate experience
- Convey emotions
- Short and to-the-point

Bad stories

- Do not account for audience
- Boring or un-engaging
- Fantastical or unrealistic
- Wrong story for purpose
- Too long to hold attention

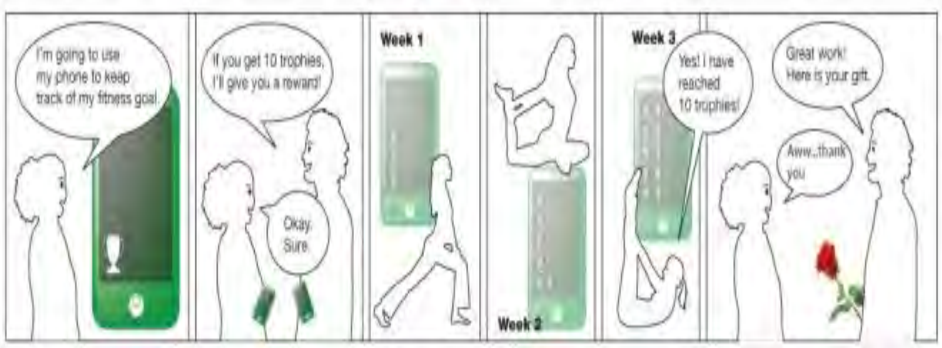
tl;dr

Elements of a Storyboard

Visual storytelling

5 visual elements

- Level of detail
- Inclusion of text
- Inclusion of people and emotions
- Number of frames
- Portrayal of time

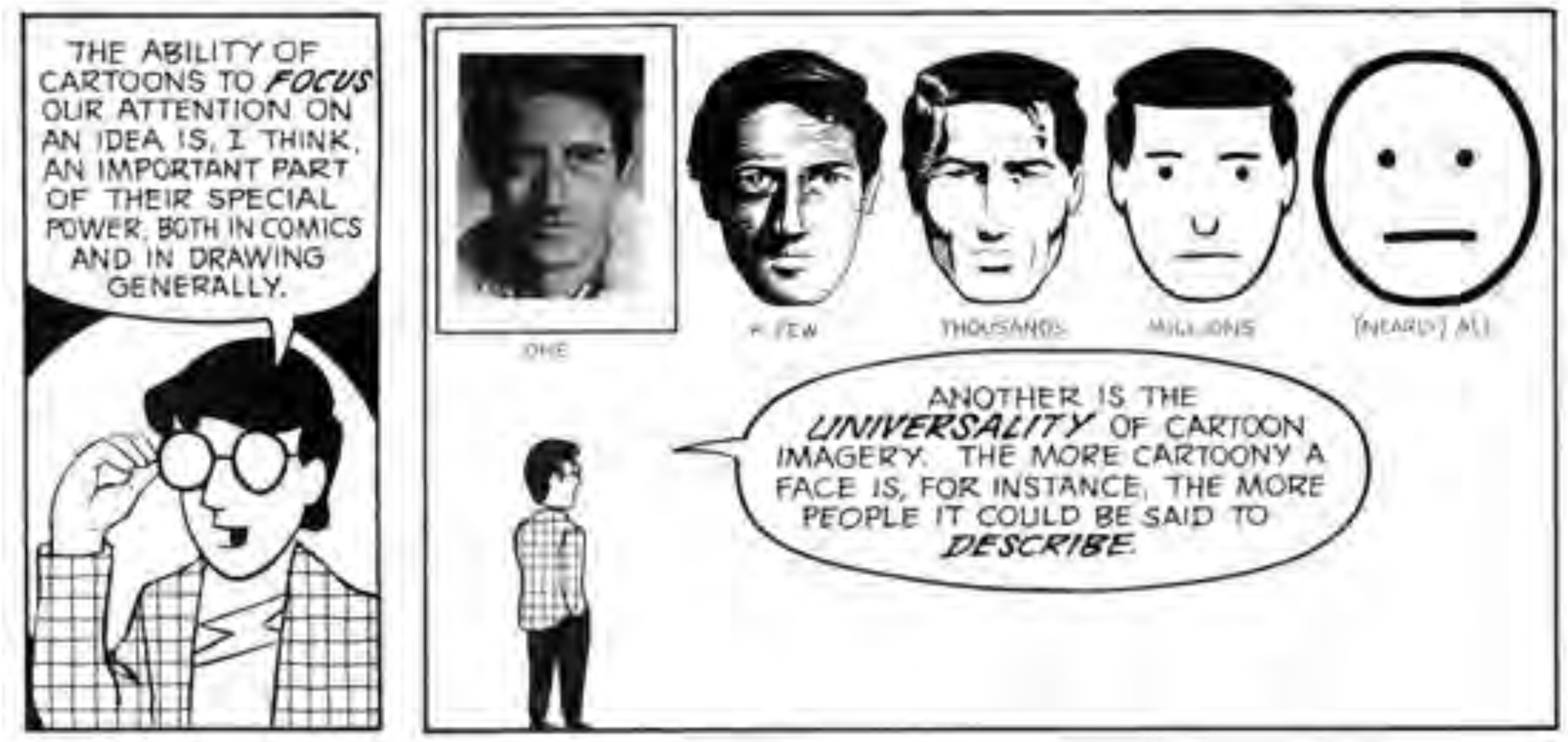


To better characterize design intuitions:
- gather and analyze artifacts
- semi-structured interviews
- survey focused on identified elements

Truong et al, 2006

1. How Much Detail?

Guideline: too much detail can lose universality

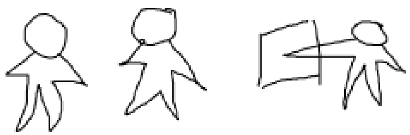


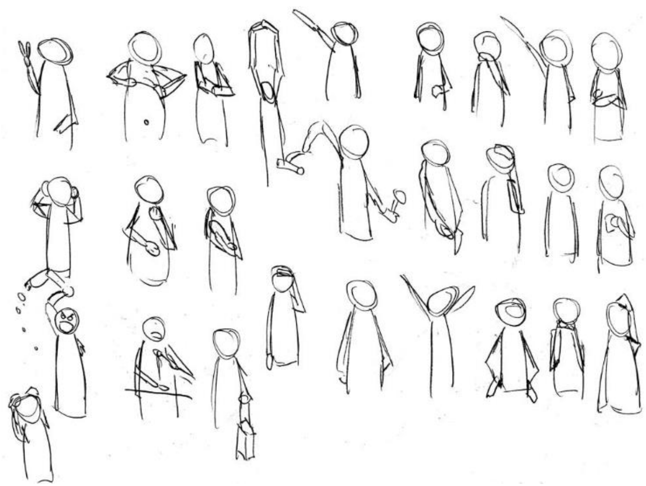
Scott McCloud

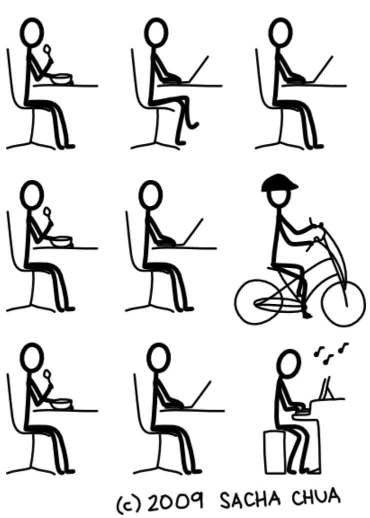
1. How Much Detail?

Sketching People

Star people
by Bill Verplank

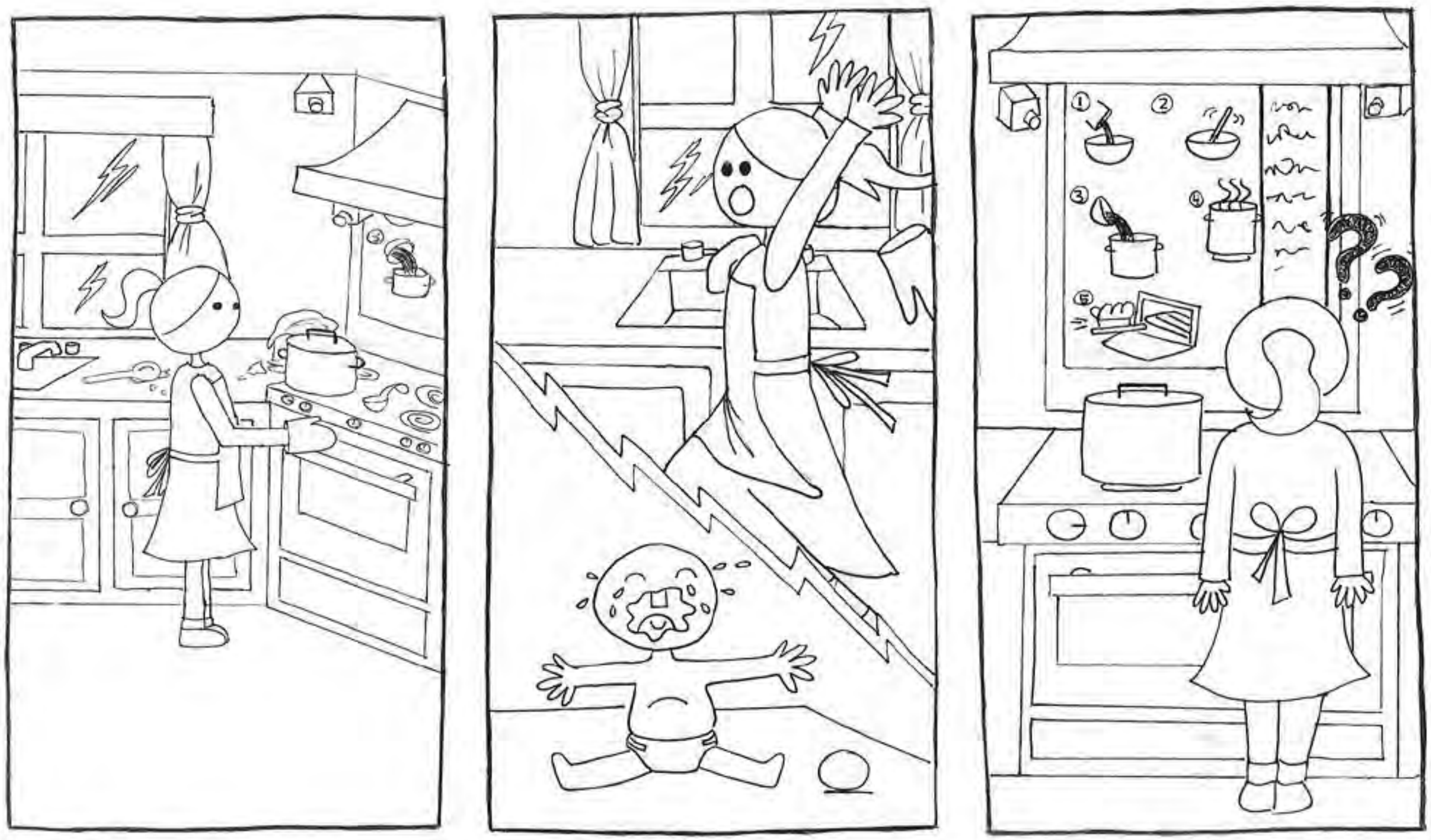






Keith Haring

1. How Much Detail?



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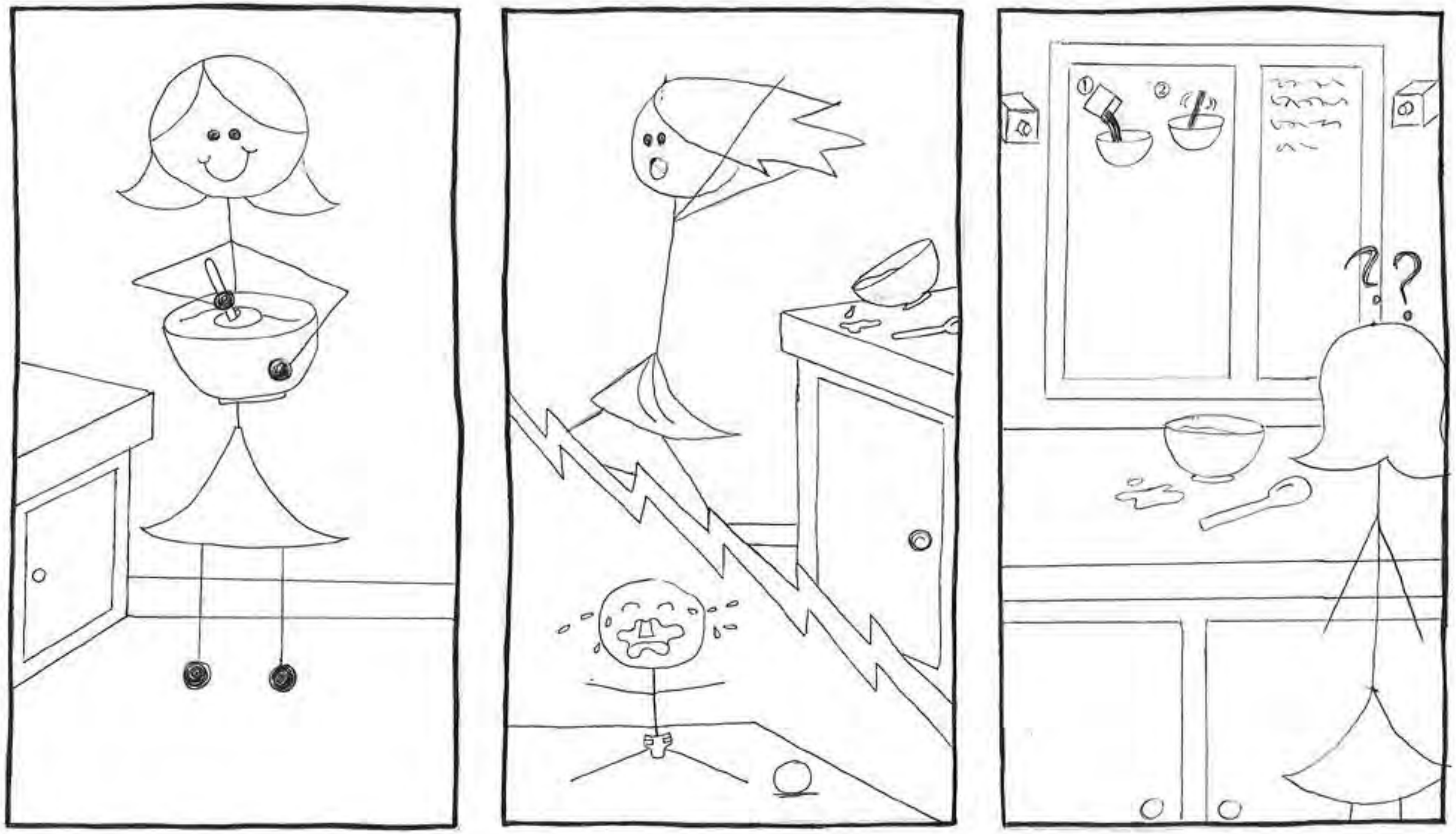
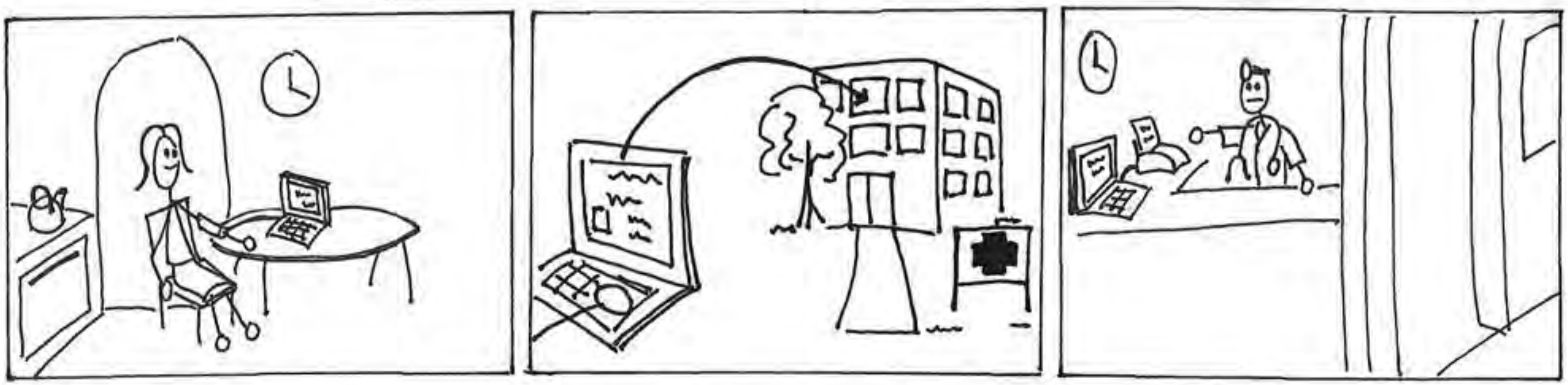


Unnecessary details distract from the story

2. Use of Text

Guideline: It is often necessary, but keep it short



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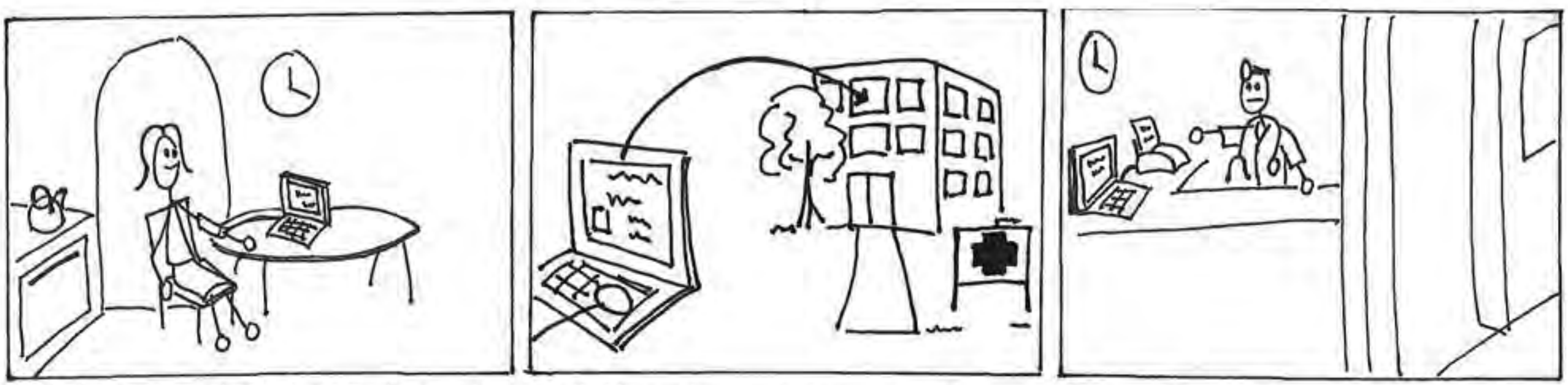
Guideline: It is often necessary, but keep it short



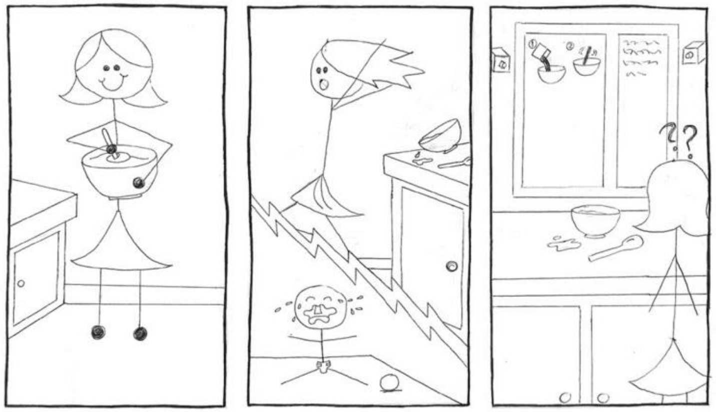
1. At home, Mary checks her blood pressure.
2. After a few simple key presses, her blood pressure readings get sent to a clinic.
3. The information is made available to her doctor.

Short text is more effective, less likely to over-explain

Watch for cases where text induces weird biases

3. Include People and Emotions

Guideline: Include people experiencing the design and their reactions to it (good or bad)



Remember, the point of storyboards is to convey the experience of using the system

4. How Many Frames?

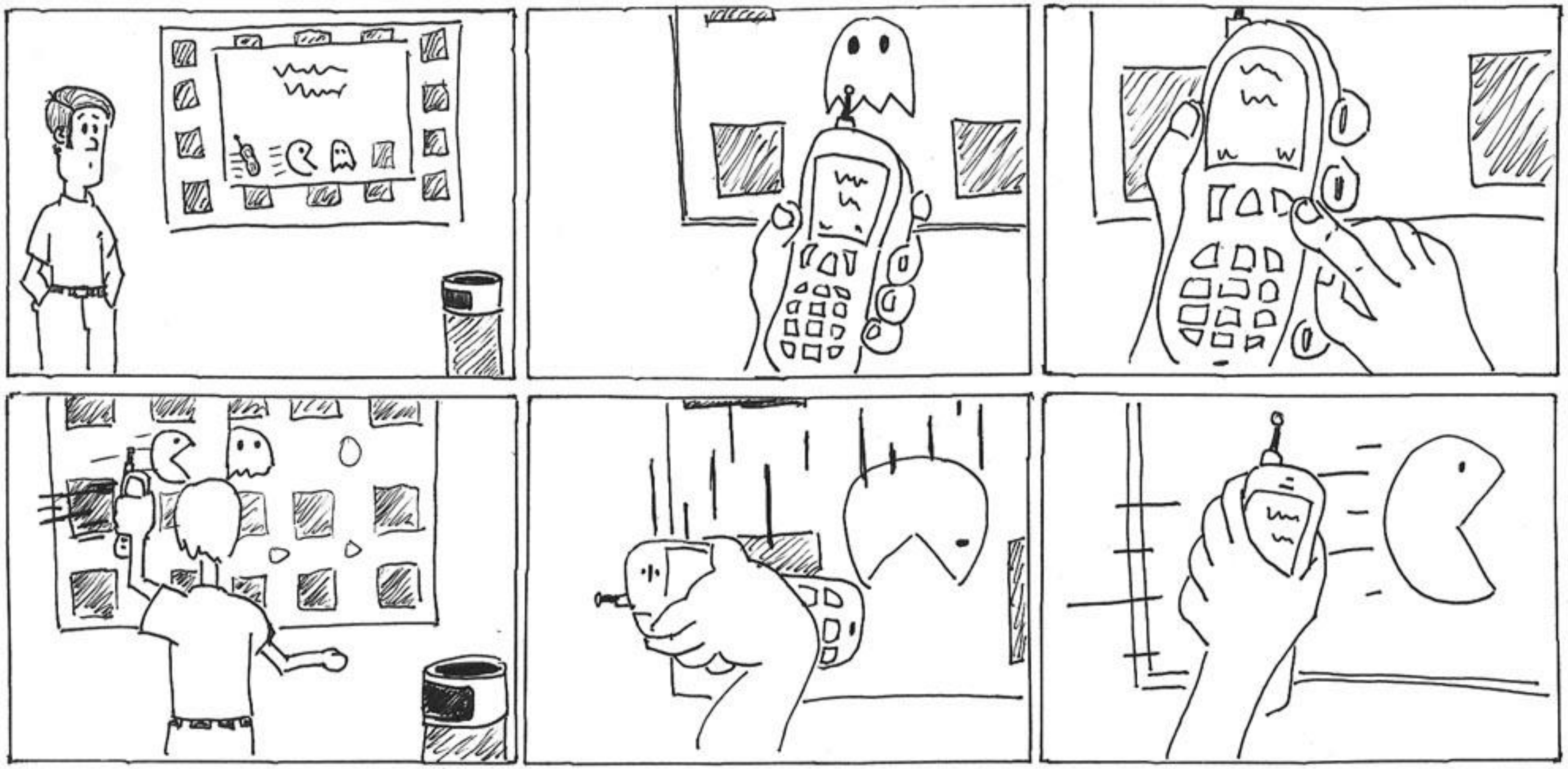
Guideline: 4-6 frames is ideal for end-users

- Less work to illustrate
- Must be able to succinctly tell story
- Potentially longer for design clients

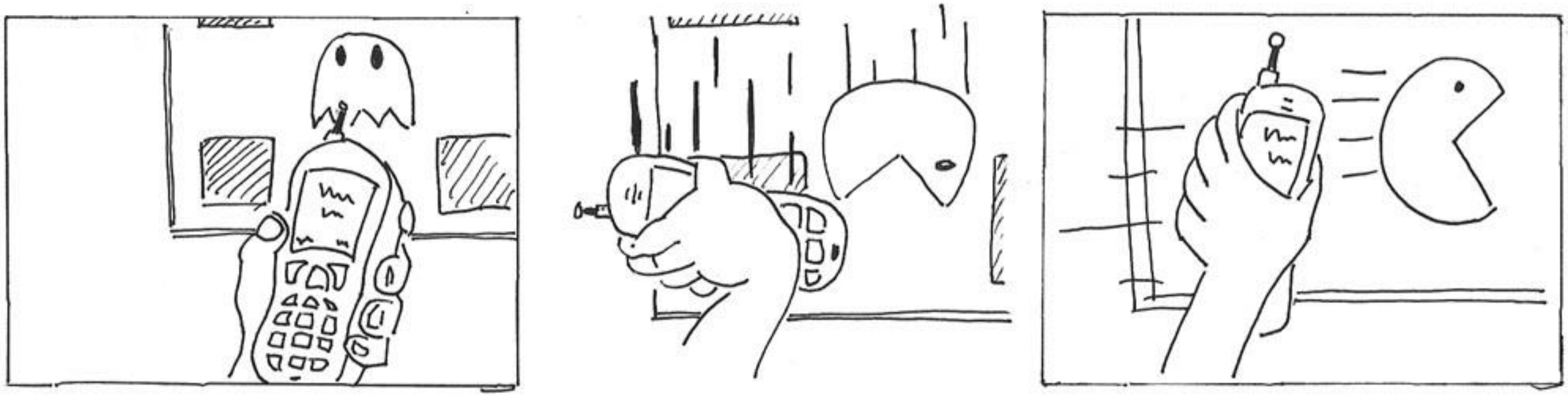
More is not always better

- May lose focus of story
- May lose attention

4. How many frames?



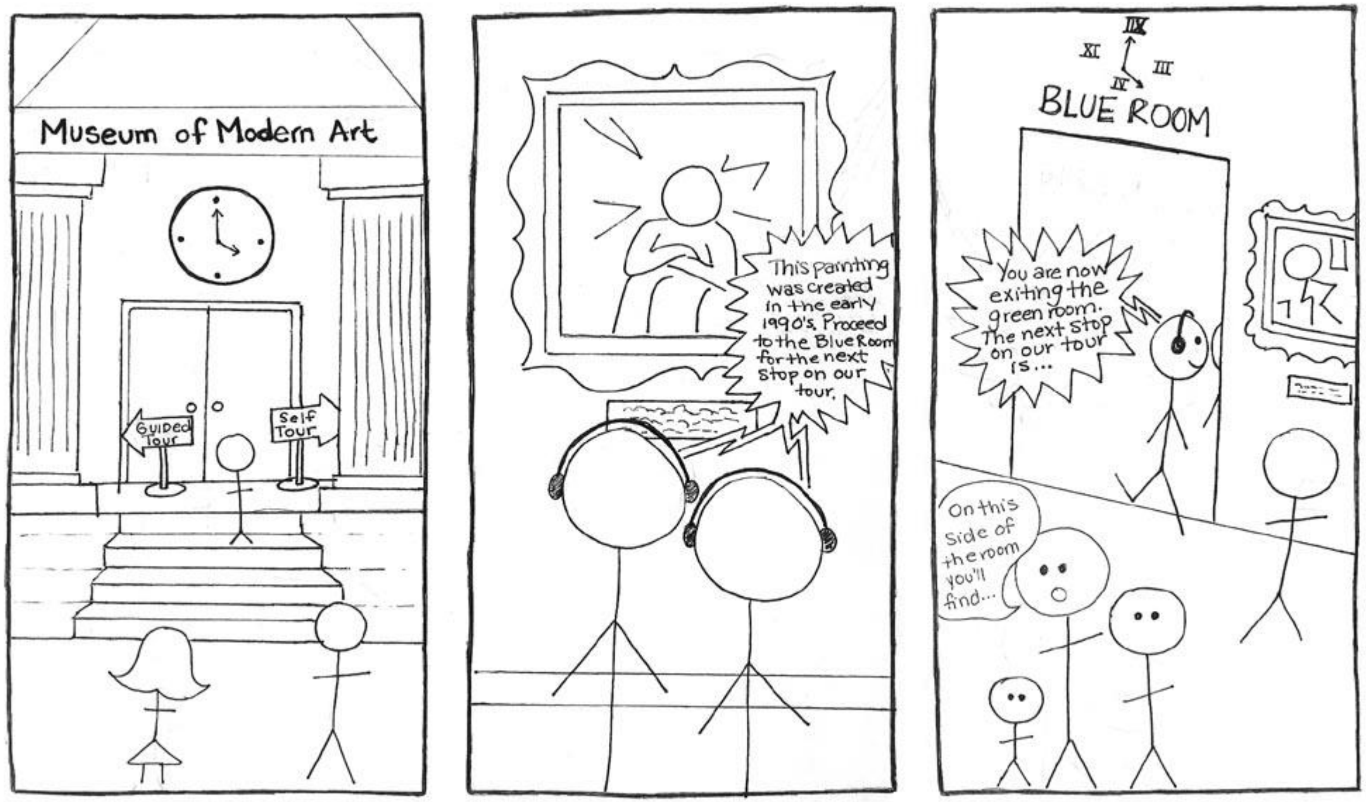
4. How many frames?



People found the extra panels were not needed

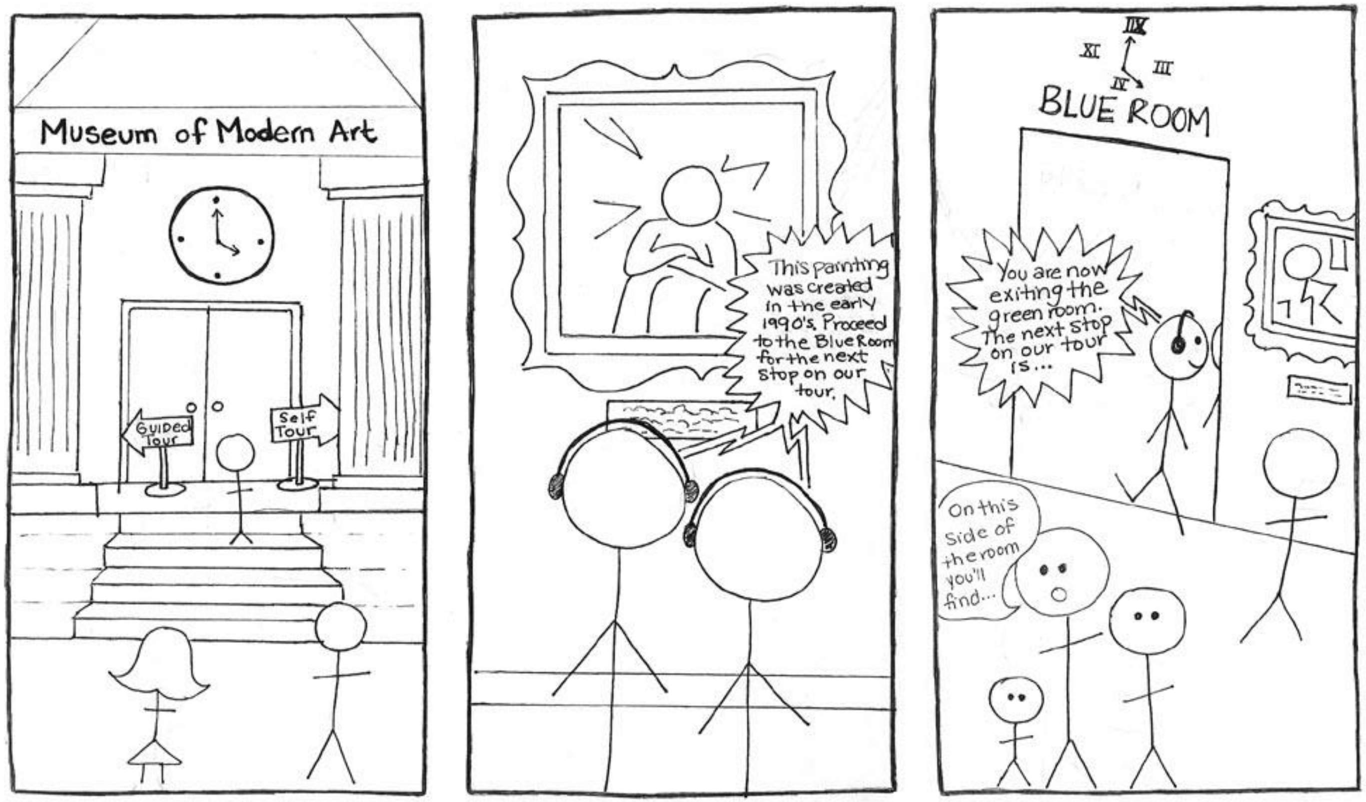
5. Passage of Time

Guideline: Only use if necessary to understand



5. Passage of Time

Guideline: Only use if necessary to understand



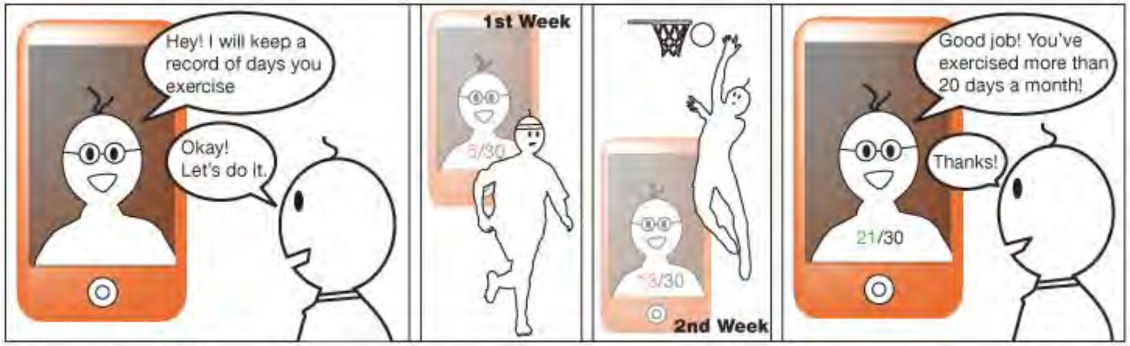
Inclusion of the clock distracts

Storyboards for Comparing Ideas

Authoritative

Cell phone is used to keep track of one's fitness goal.

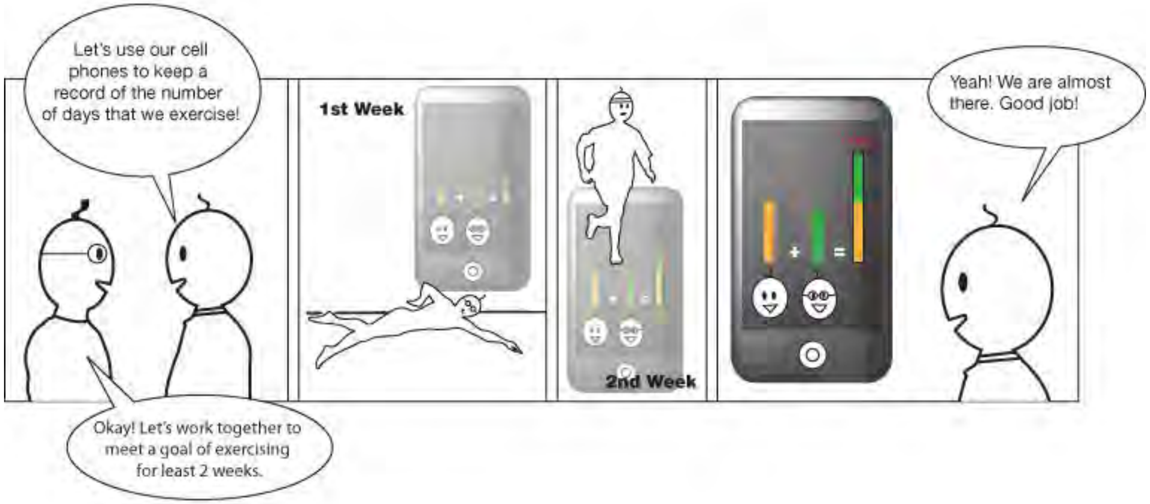
Supportive



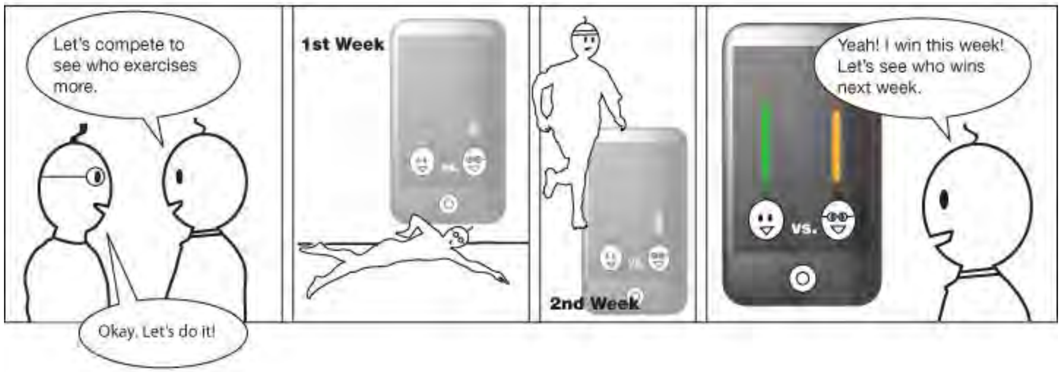
Cell phone is used to keep track of one's fitness goal.

Storyboards for Comparing Ideas

Cooperative

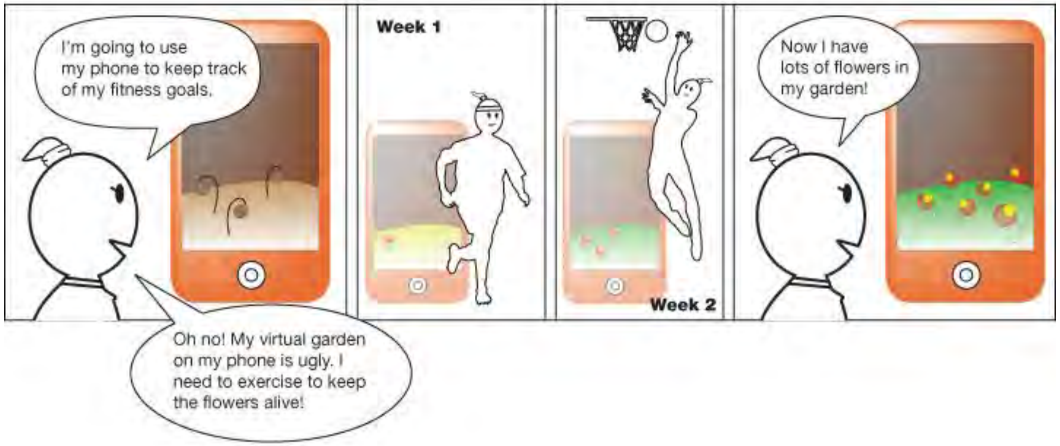


Competitive

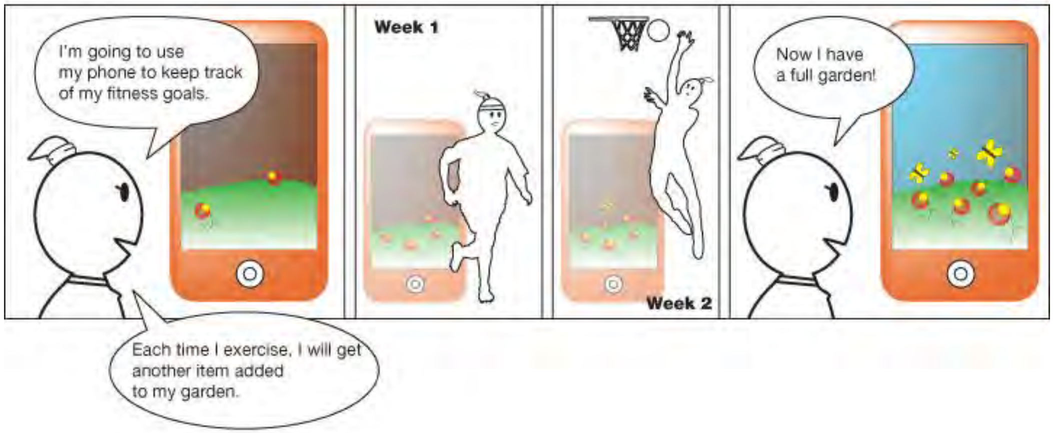


Storyboards for Comparing Ideas

Negative Reinforcement



Positive Reinforcement



Examples and Tricks in Storyboarding

This is also the focus of Reading 2

- Due Friday night
- (not needed for Friday section)

Will go over these quickly, especially the videos

- You then view them outside of class

Drawing is Hard

Will a picture work instead?

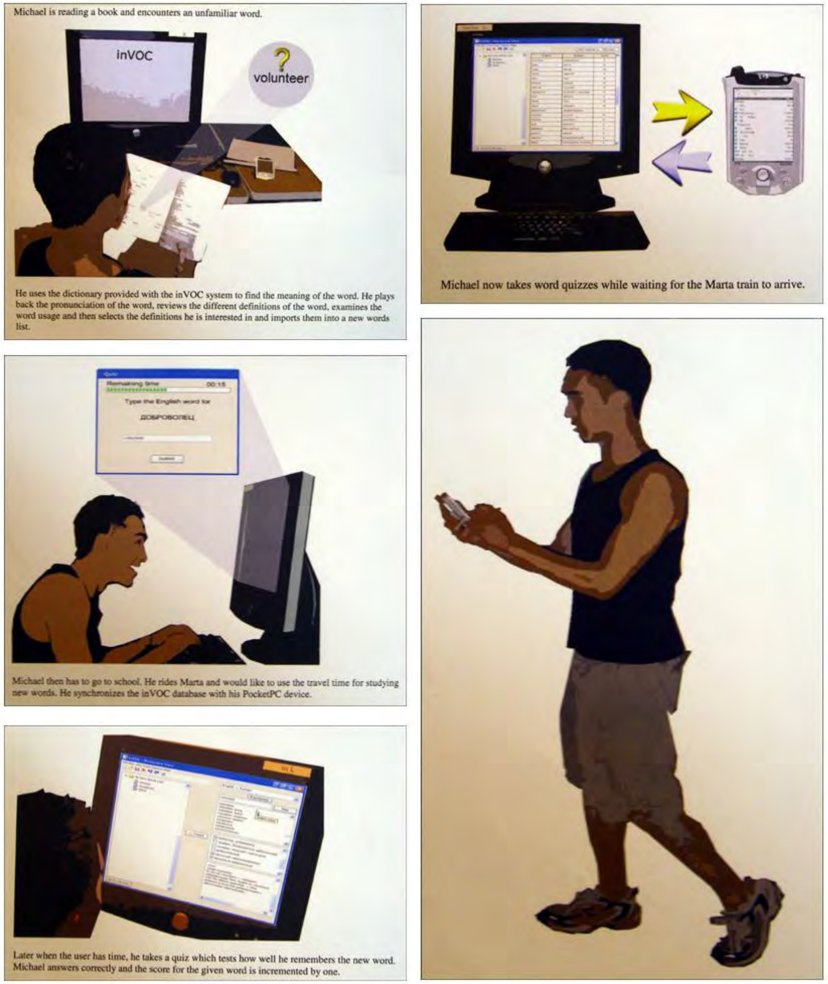
Existing Images from Other Sources

http://designcomics.org/

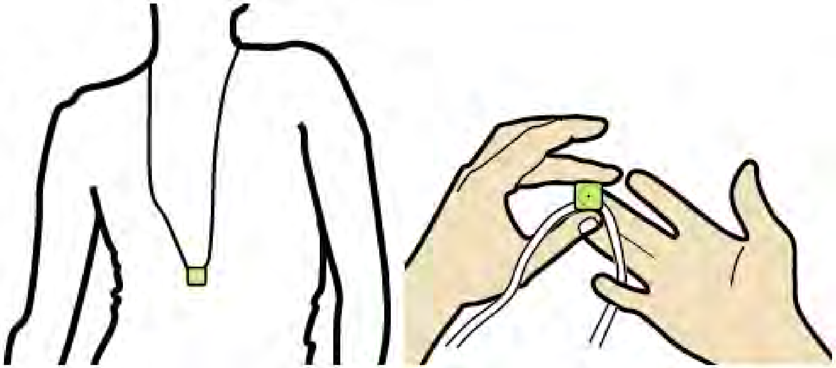
http://www.pdclipart.org/

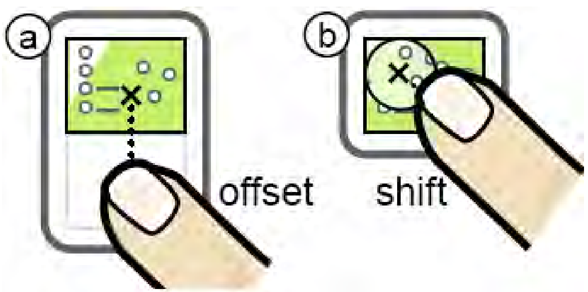
Blur Out Distracting Details

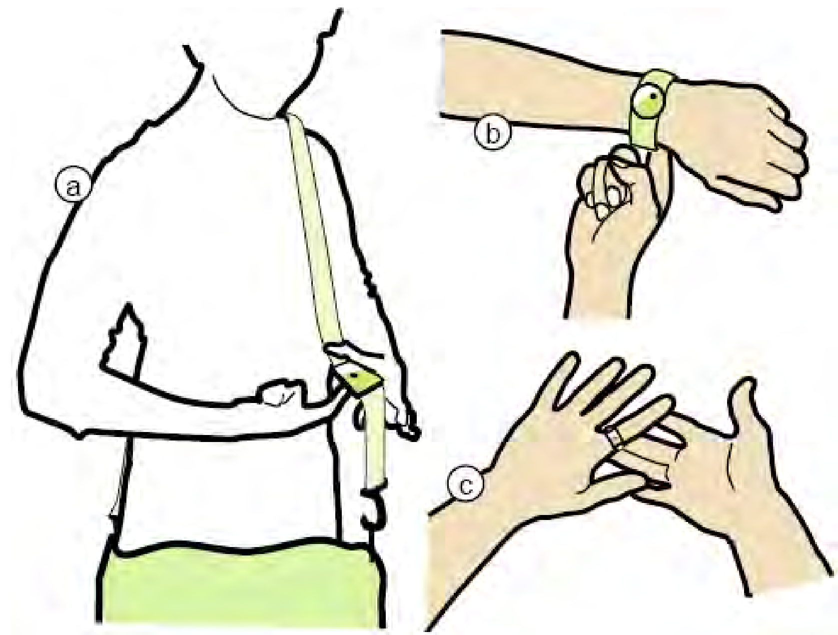
Using image editing software to simplify photos into sketches



Tracing Photos

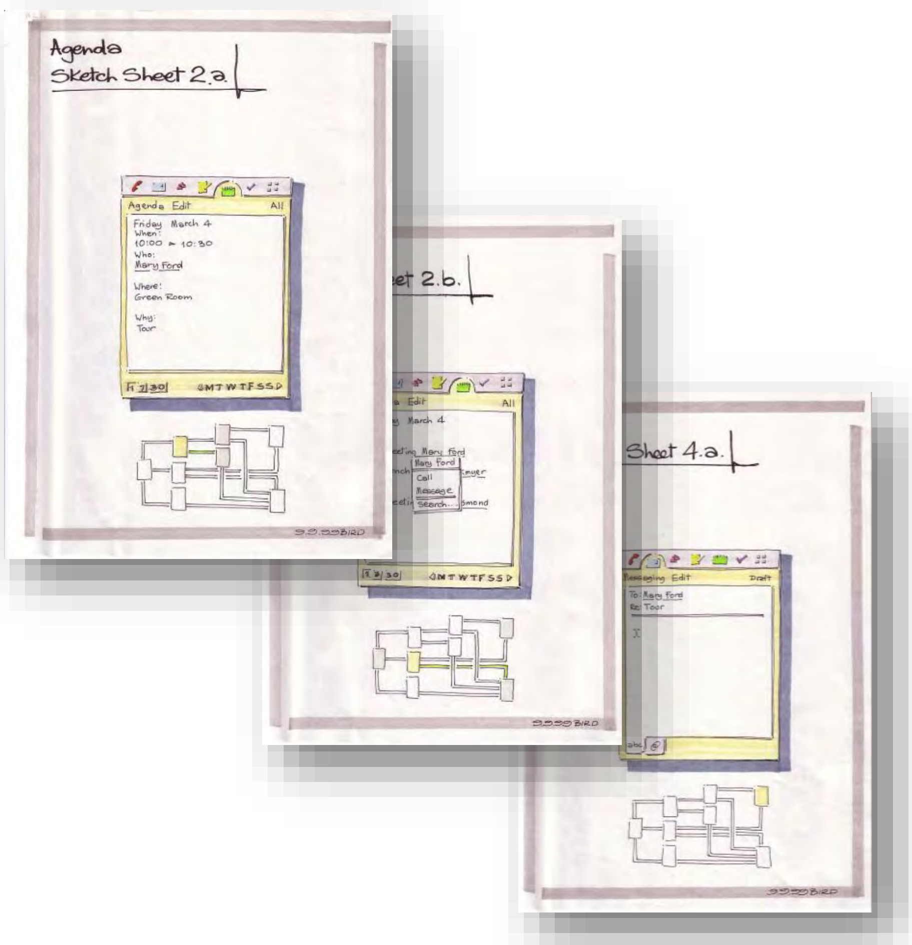


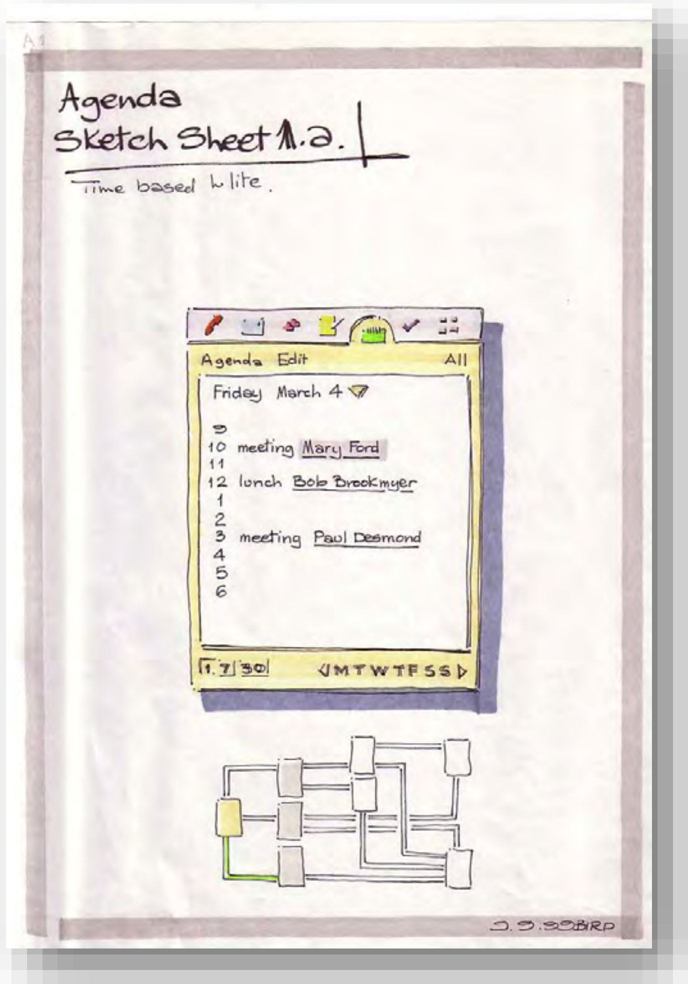




Baudisch and Chu, 2009

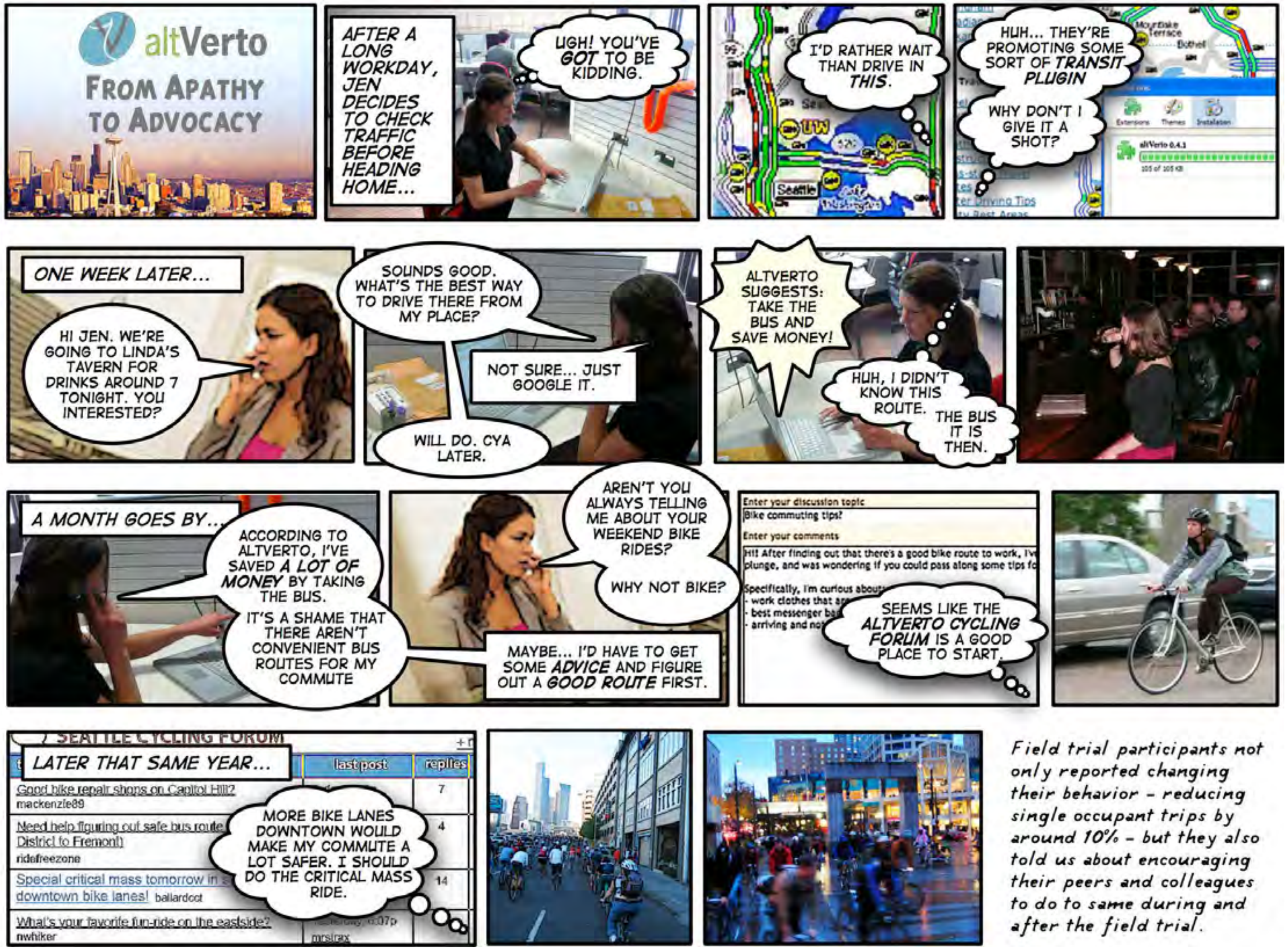
Mapping the Space of Interaction





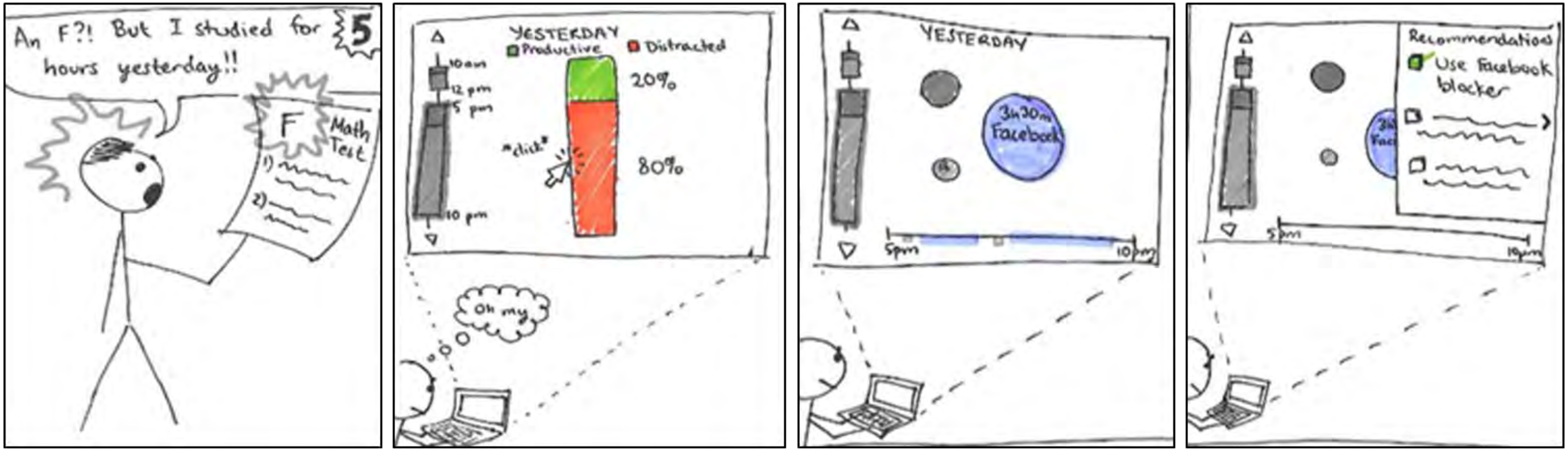
Comic Presentation

Thought bubbles argue for the design

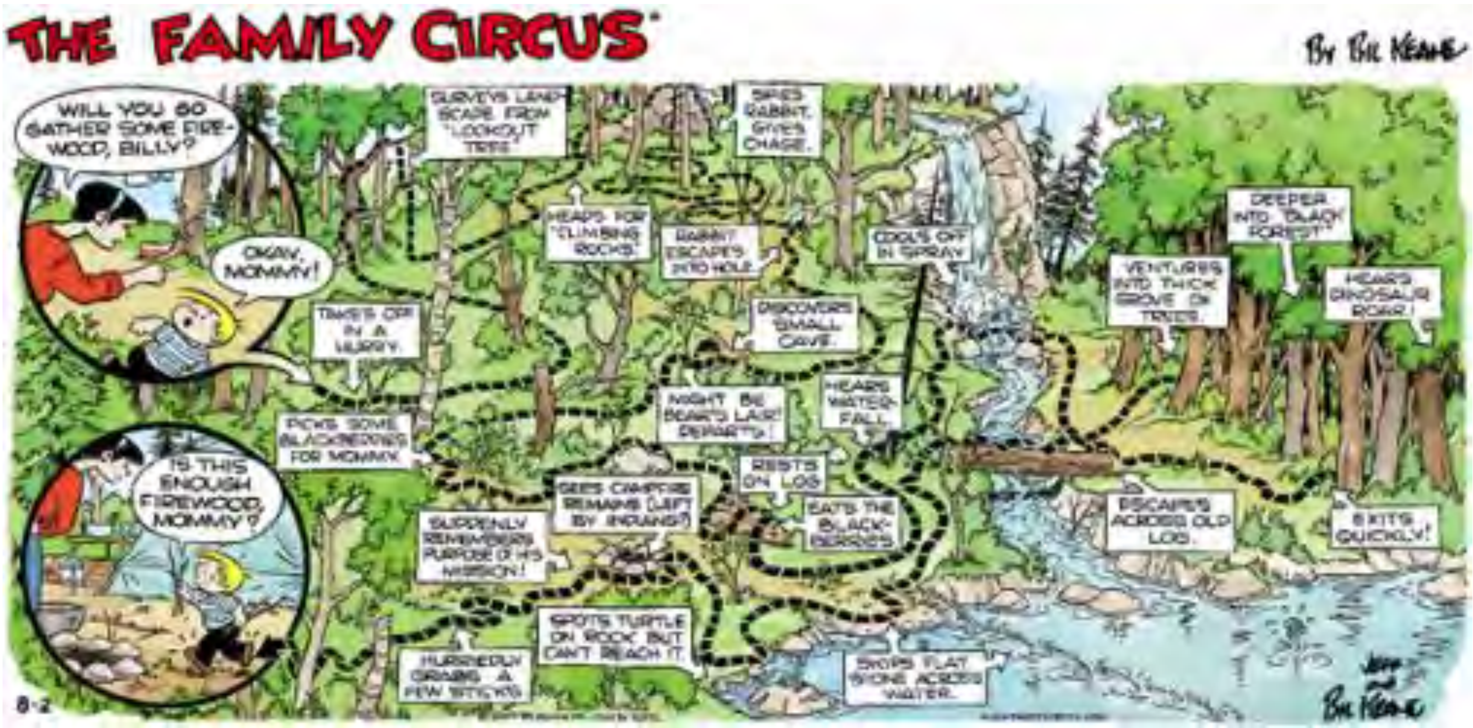


Gukeisen et al, 2007

Selective Use of Color

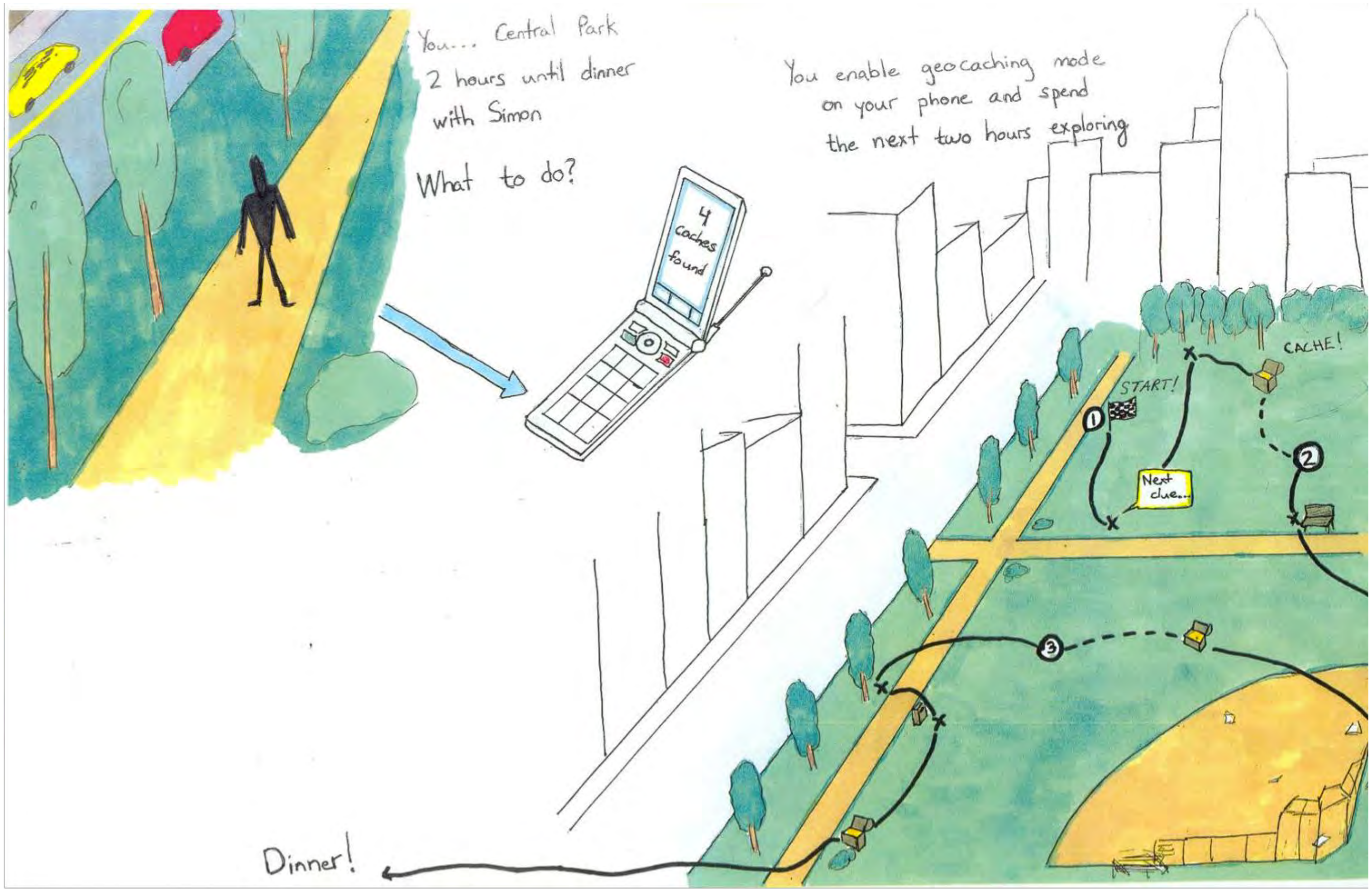


Route Maps

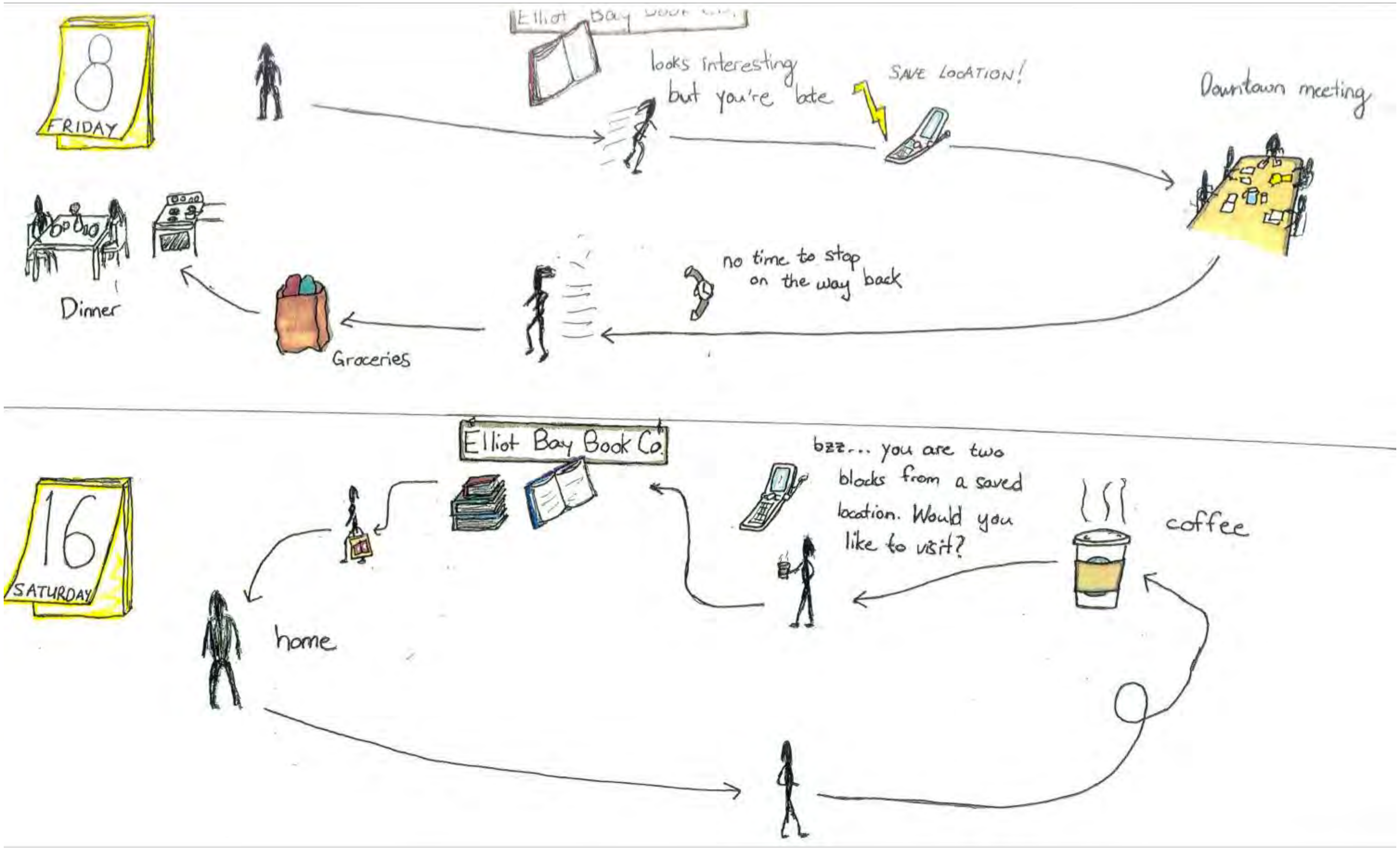


THE FAMILY CIRCUS
By Bil Keane
WILL YOU GO GATHER SOME FIRE-WOOD, BILLY?
OKAY, MOMMY!
TAKES OFF IN A HURRY.
SURVEYS LANDSCAPE FROM "LOOKOUT TREE"
HEADS FOR "CLIMBING ROCKS"
SPIES RABBIT. GIVES CHASE.
RABBIT ESCAPES INTO HOLE.
COOLS OFF IN SPRAY
DISCOVERS SMALL CAVE.
HEARS WATER-FALL.
DEEPER INTO "BLACK FOREST"
VENTURES INTO THICK GROVE OF TREES.
HEARS DINOSAUR ROAR!
EXITS QUICKLY!
ESCAPES ACROSS OLD LOG.
MIGHT BE BEAR'S LAIR! DEPARTS!
RESTS ON LOG
EATS THE BLACK-BERRIES
PICKS SOME BLACKBERRIES FOR MOMMY
SEES CAMPFIRE REMAINS (LEFT BY INDIANS?)
SUDDENLY REMEMBERS PURPOSE OF HIS MISSION!
SPOTS TURTLE ON ROCK BUT CAN'T REACH IT.
HURRIEDLY GRABS A FEW STICKS
SKIPS FLAT STONE ACROSS WATER.
IS THIS ENOUGH FIREWOOD, MOMMY?
8-2
Jeff and Bil Keane

Route Maps

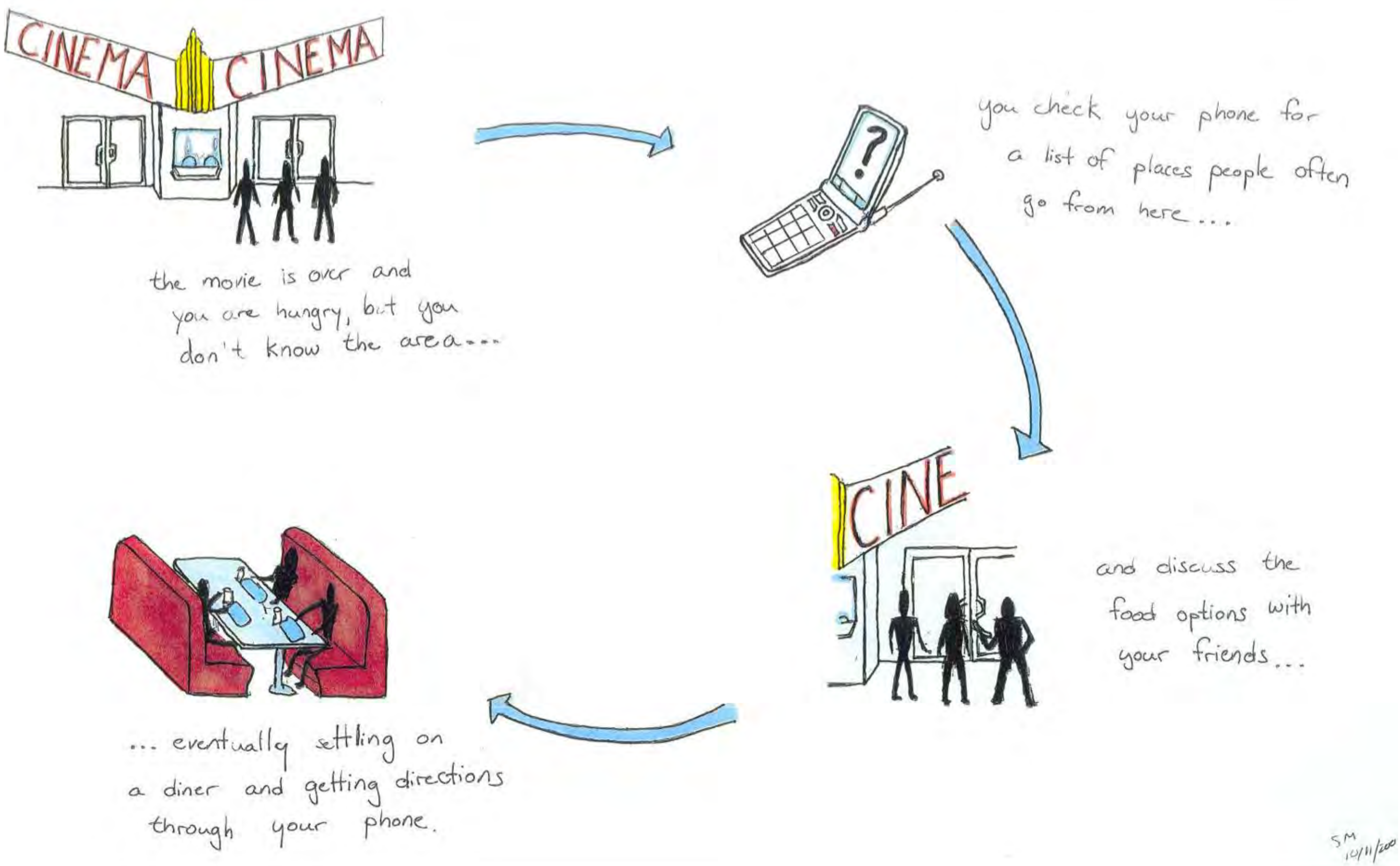

You... Central Park
2 hours until dinner
with Simon
What to do?
4
caches
found
You enable geocaching mode
on your phone and spend
the next two hours exploring
START!
CACHE!
Next
clue...
Dinner!

Route Maps



8
FRIDAY
Elliot Bay Book Co.
looks interesting but you're late
SAVE LOCATION!
Downtown meeting
no time to stop on the way back
Dinner
Groceries
Elliot Bay Book Co.
bzz... you are two blocks from a saved location. Would you like to visit?
coffee
16
SATURDAY
home

Route Maps


CINEMA CINEMA
the movie is over and you are hungry, but you don't know the area...
you check your phone for a list of places people often go from here...
CINE
and discuss the food options with your friends...
... eventually settling on a diner and getting directions through your phone.

Value of Animation or Video

Can illustrate critical timing

Can be more engaging than written or storyboard

Can help convey emotion (e.g., voice, music)

Can show interactive elements more clearly

Can be self-explanatory

If done well, can be an effective pitch

But you need to keep it quick and effective

Most Important Trick: Stop Motion

http://courses.cs.washington.edu/courses/cse440/videos/videoprototyping/Mackay-StopAction.mp4

Mackay

Most Important Trick: Stop Motion

http://courses.cs.washington.edu/courses/cse440/videos/videoprototyping/Mackay-StopActionResult.mp4

Mackay

Video Prototypes

May build upon paper prototypes, existing software, and images of real settings

Narration optional

- Narrator explains, actors move or illustrate interaction
- Actors perform movements and viewer expected to understand without voice-over

Steps to Create a Video Prototype

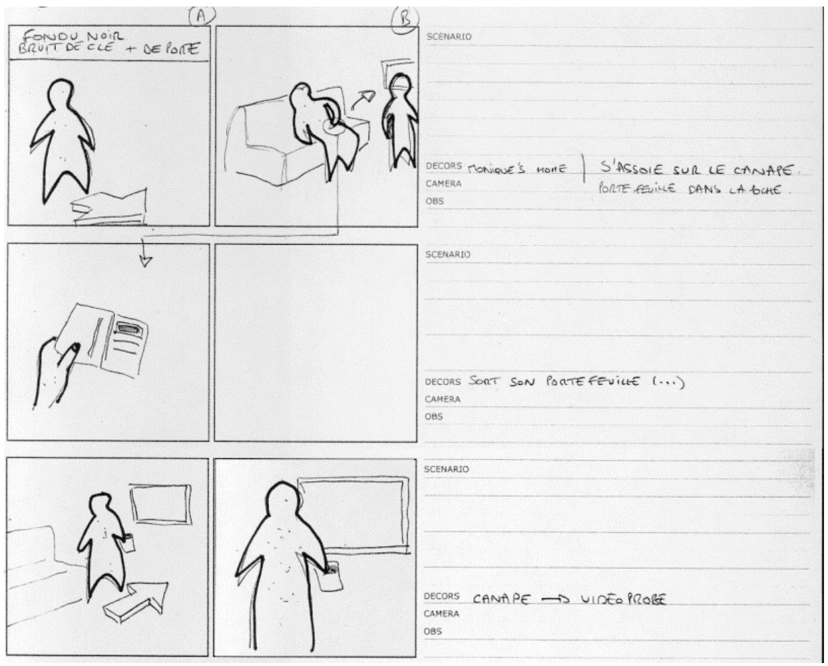
Review field data

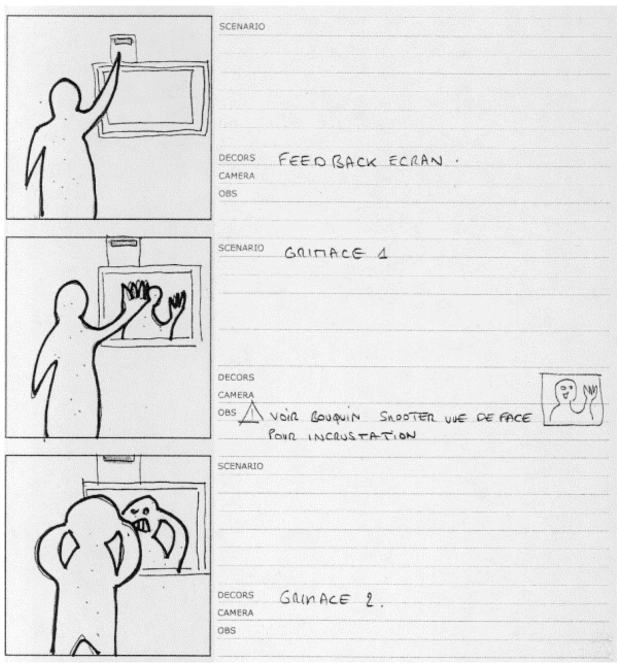
Review ideas from brainstorm

Create text for usage scenarios

Develop storyboard, with each scene on a card, illustrating each action/event with annotations explaining what is happening

Steps to Create a Video Prototype





Steps to Create a Video Prototype

Shoot a video clip for each storyboard card

- Avoid editing in the camera, just shoot scenes

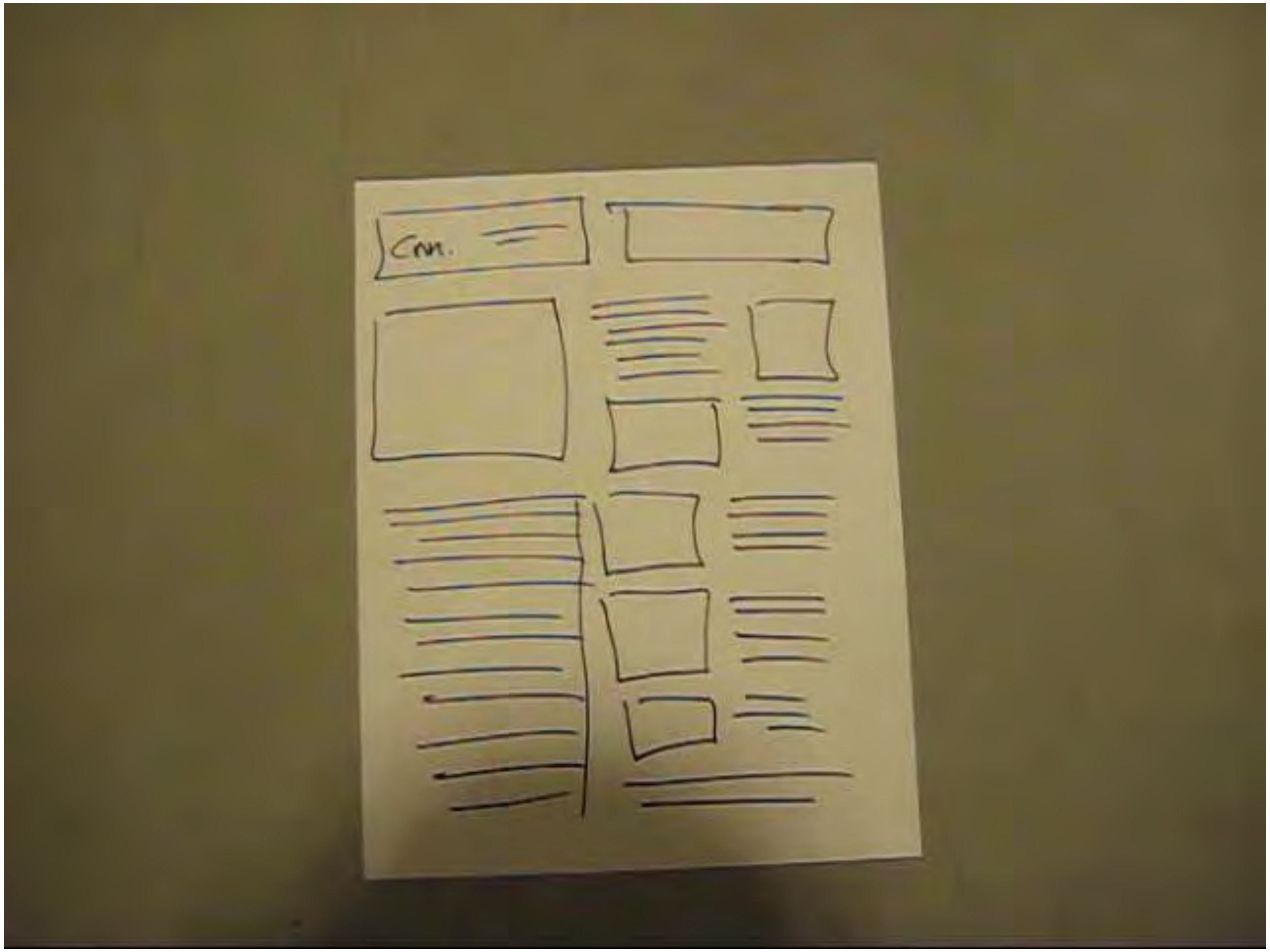
Use titles to separate clips

- Like a silent movie

Digital changes these tradeoffs, but respect the spirit of doing this quickly to get point across

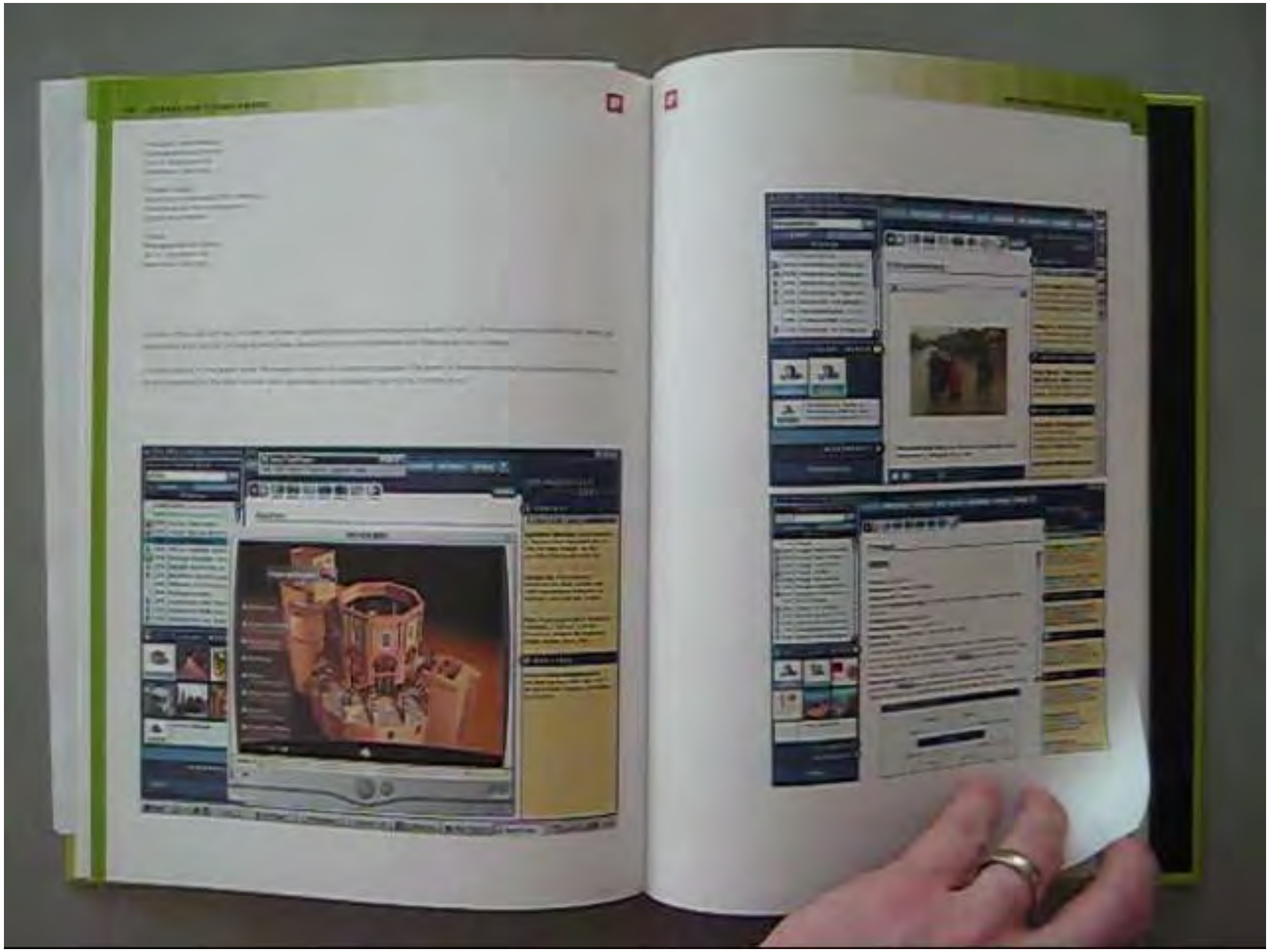
- If you make an error, just reshoot it

Prototyping Microsoft Surface



http://courses.cs.washington.edu/courses/cse440/videos/videoprototyping/Surface-Document-Interaction.mp4

Prototyping Microsoft Surface



http://courses.cs.washington.edu/courses/cse440/videos/videoprototyping/Surface-Context-Lens.mp4

Lessons from Prior Video Prototypes

Narration, Pace, and Flair

- Three versions of “Don’t Forget”

Using Projectors and Simple Props

- “Buddy Map”

Watch for Pace and Scene Relevance

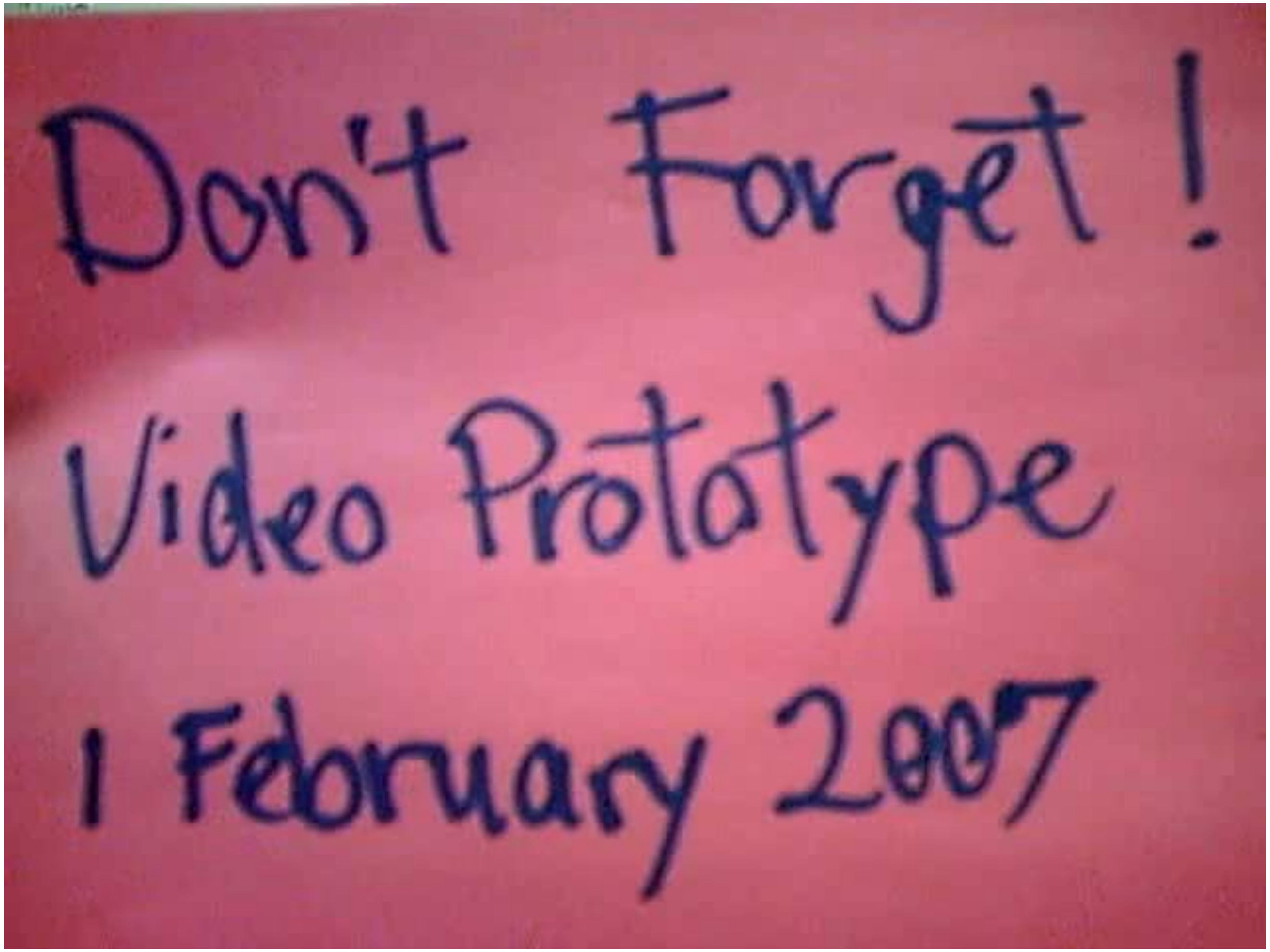
- “Consumester”

Narration, Pace, and Flair

http://courses.cs.washington.edu/courses/cse440/videos/videoprototyping/Don't-Forget-1.mp4

Don’t Forget Version 1

Narration, Pace, and Flair



http://courses.cs.washington.edu/courses/cse440/videos/videoprototyping/Don't-Forget-2.mp4

Don’t Forget Version 2

Narration, Pace, and Flair

http://courses.cs.washington.edu/courses/cse440/videos/videoprototyping/Don't-Forget-3.mp4

Don't Forget Version 3

Using Projectors and Simple Props

http://courses.cs.washington.edu/courses/cse440/videos/videoprototyping/Buddy-Map-Backcountry.mp4

Watch for Pace and Scene Relevance

http://courses.cs.washington.edu/courses/cse440/videos/videoprototyping/Consumester.mp4

Consumester

Lessons from Prior Video Prototypes

Split Presentation, Simple Effects

- “PickUp”

Still-Frame, More Effects

- “Graffiti Karma”

Split Presentation, Simple Effects

http://courses.cs.washington.edu/courses/cse440/videos/videoprototyping/Pickup.mp4

Pickup

Still-Frame, More Effects

http://courses.cs.washington.edu/courses/cse440/videos/videoprototyping/Graffiti.mp4

Lessons from Prior Video Prototypes

Scenario with a Contrast

- “ParkSmart” (note that screens are static images)

Playful while Keeping Pace

- “Plantr”

Scenario with a Contrast

http://courses.cs.washington.edu/courses/cse440/videos/videoprototyping/Parksmart.mp4

But watch for pace and scene relevance

ParkSmart

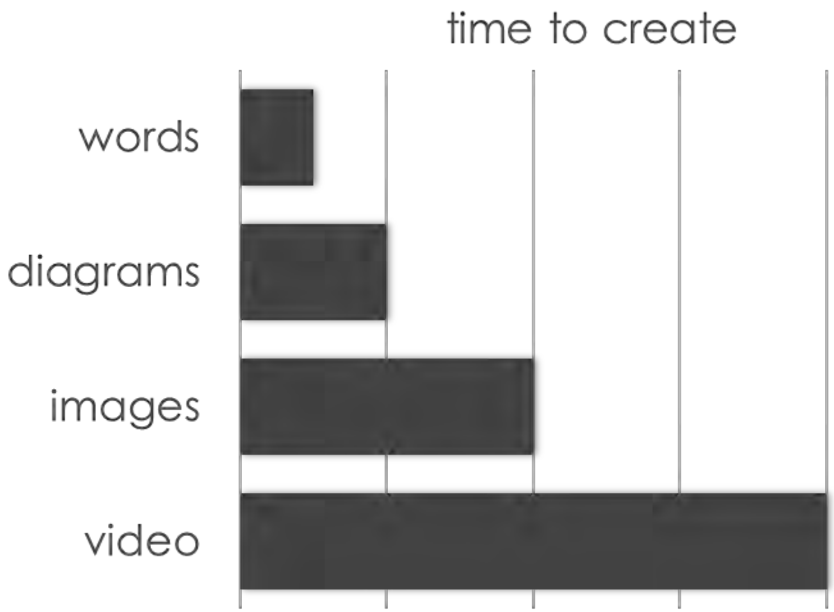
Playful while Keeping Pace

http://courses.cs.washington.edu/courses/cse440/videos/videoprototyping/Plantr.mp4

Reminder on Fidelity

http://courses.cs.washington.edu/courses/cse440/videos/videoprototyping/Mug-Sketch.mp4
http://courses.cs.washington.edu/courses/cse440/videos/videoprototyping/Mug-HiFi.mp4

Fidelity Takes Time: Stay Low Fidelity



Completely made-up bar length

But it is probably at least this bad

If you need a video,
do you really need footage?

If you need an animation,
do you really need Flash?

If you need a photo,
do you really need to shoot?

Range of Purposes

Illustrating Low-Level Techniques

- Microsoft Surface examples convey timing

Illustrate Designs

- Focus in this course

High-Level Visions

- StarFire
- Knowledge Navigator
- A Day Made of Glass

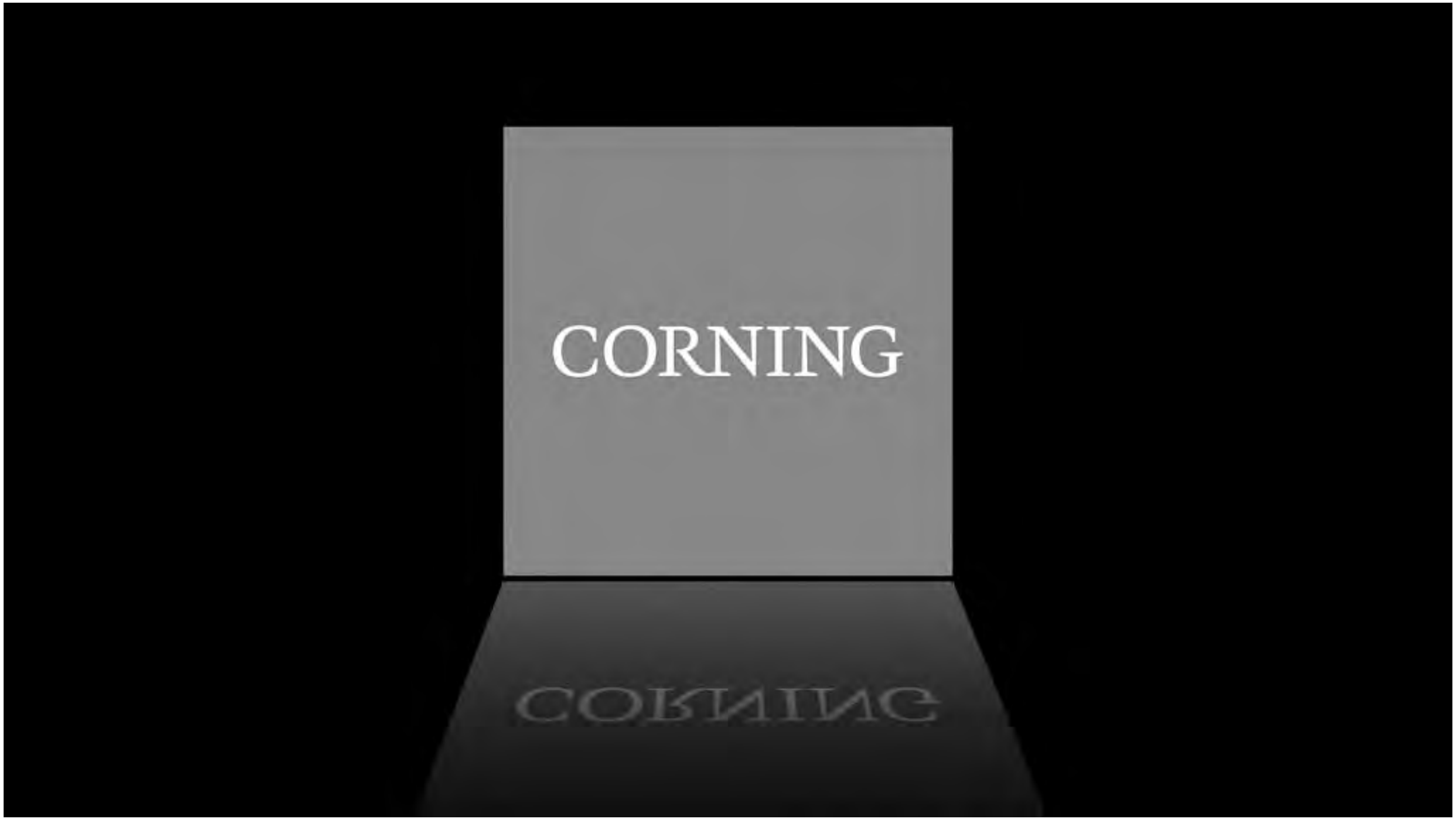
Sun's "Starfire" (1994)

http://courses.cs.washington.edu/courses/cse440/videos/videoprototyping/Vision-Sun-Starfire.mp4

Apple's "Knowledge Navigator" (1987)

http://courses.cs.washington.edu/courses/cse440/videos/videoprototyping/Vision-Apple-Knowledge-Navigator.mp4

Corning's "A Day Made of Glass" (2011)



http://courses.cs.washington.edu/courses/cse440/videos/videoprototyping/Vision-Corning-A-Day-Made-Of-Glass.mp4

Summary

Think about your audience

Think about your time constraints

Think about the purpose of your story

Think about options for effective presentation

CSE 440: Introduction to HCI

User Interface Design, Prototyping, and Evaluation

Lecture 07:
Storyboarding and
Video Prototyping

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50

CSE 440: Introduction to HCI

User Interface Design, Prototyping, and Evaluation

Lecture 08:
Human Performance

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

University of Washington Computer Science & Engineering

DUB DESIGN USE BUILD

Tuesday / Thursday
10:30 to 11:50

These are Examples of What?

Popsicle-stick bridge

$x = x_0 + v_0t + \frac{1}{2} at^2$

ACT-R

Goffman’s Negotiated Approach

Norman’s Execution-Evaluation Cycle

Models

We have said models describe phenomena, isolating components and allowing a closer look

Today is a closer look at modeling humans

- Capture essential pieces
  - Model should have what it needs but no more
  - Thus avoid underfitting or overfitting model
- Allow us to measure
  - Collect data, put in model, compare model terms
- Allow us to predict
  - The better the model, the better the predictions

Definition of Interaction?

Two-Way

- one-way is a reaction

Communicative

- information is sent

Receptive

- information is received

Effective

- the parties are changed as a result

Definition of Interaction?

Two-Way
Communicative
Receptive
Effective

Knocking over a chair

Clicking a Submit button on a web page

Two televisions, turned on, facing each other

A computer sending data to another via a network

Typing on a computer that is turned off

Picking up a telephone and putting it to your ear

Typing ESC on a screen that does not allow it

Models of Interaction

Models of interaction allow a closer look

- Define and describe an interaction
- Isolate areas where problems occur
- Design new interaction

Two examples at different scales

- Norman’s Execution-Evaluation Cycle
- Buxton’s 3-State Model

Models of Interaction

Models of interaction allow a closer look

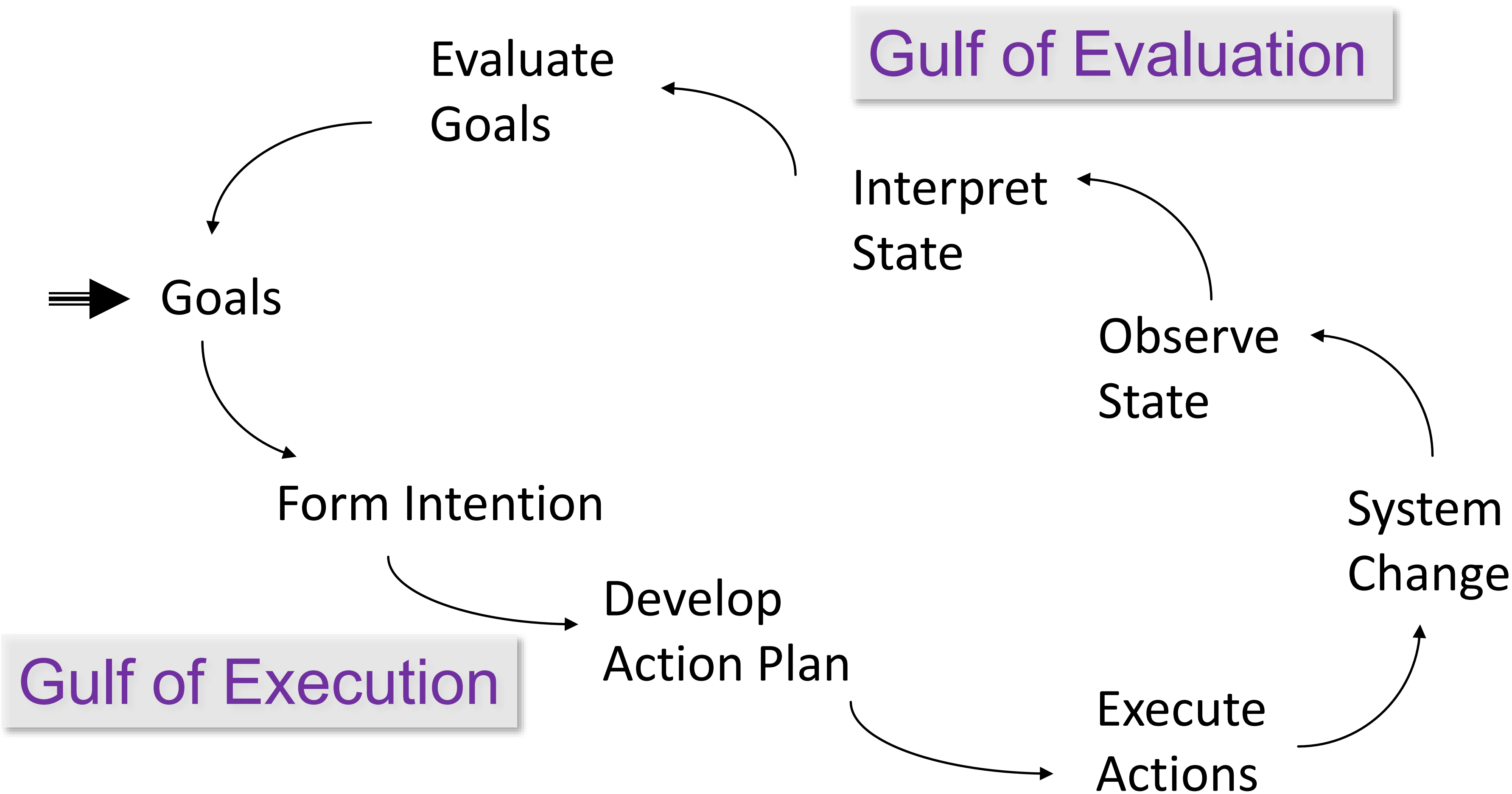
- Define and describe an interaction
- Isolate areas where problems occur
- Design new interaction

Two examples at different scales

- Norman's Execution-Evaluation Cycle
- Buxton's 3-State Model

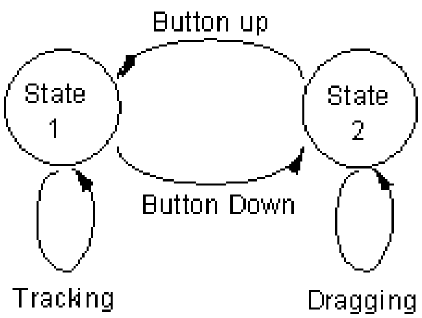
> "All models are wrong, but some are useful"
> George Box

Norman’s Execution-Evaluation Cycle

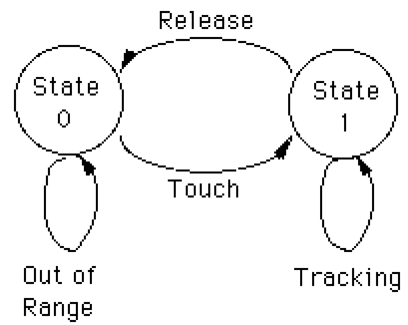


Buxton's 3-State Model

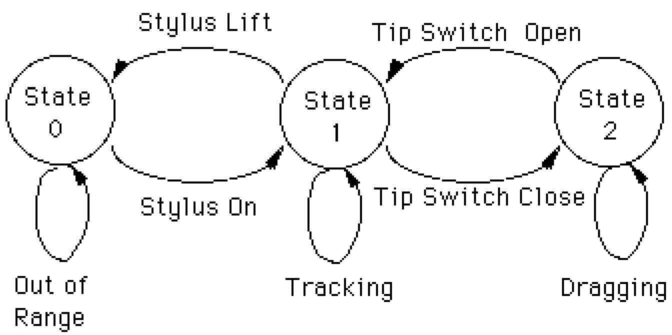
Mouse



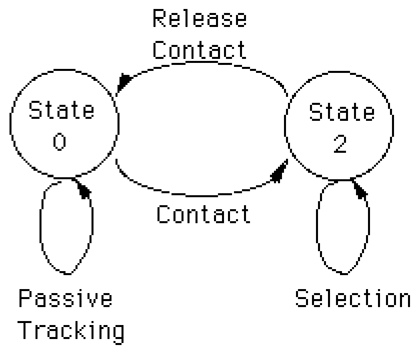
Touchpad



Stylus

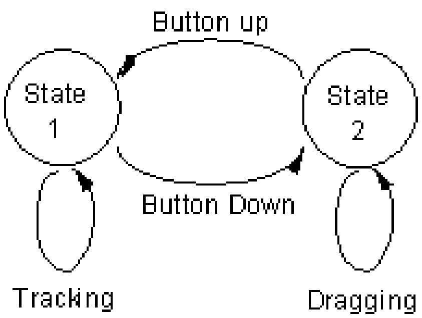


Touch Screen

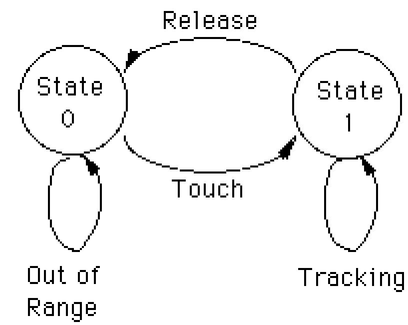


Buxton's 3-State Model

Mouse



Touchpad



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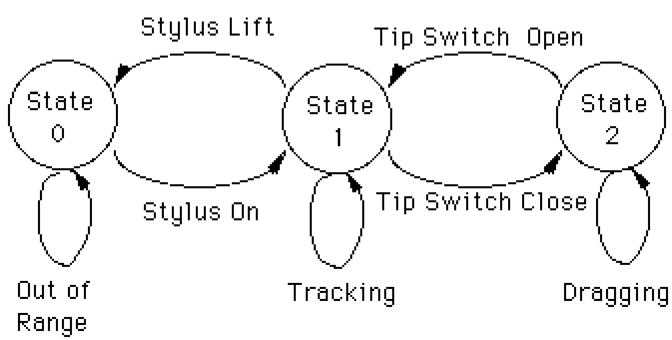
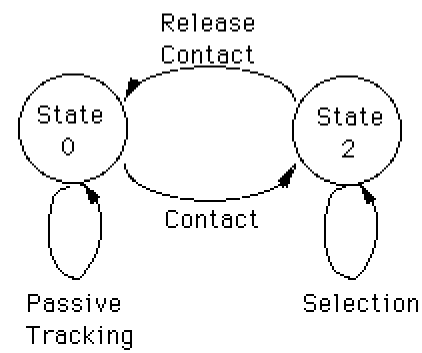


Touch Screen



Which can support tooltip previews?

Creating a Model

How would you go about creating a model?

Creating a Model

How would you go about creating a model?

One approach:

- Observe, Collect Data, Find Patterns,
- Draw Analogies, Devise Model,
- Test Fit to Data, Test Predictions, Revise

Fundamentally an inductive process

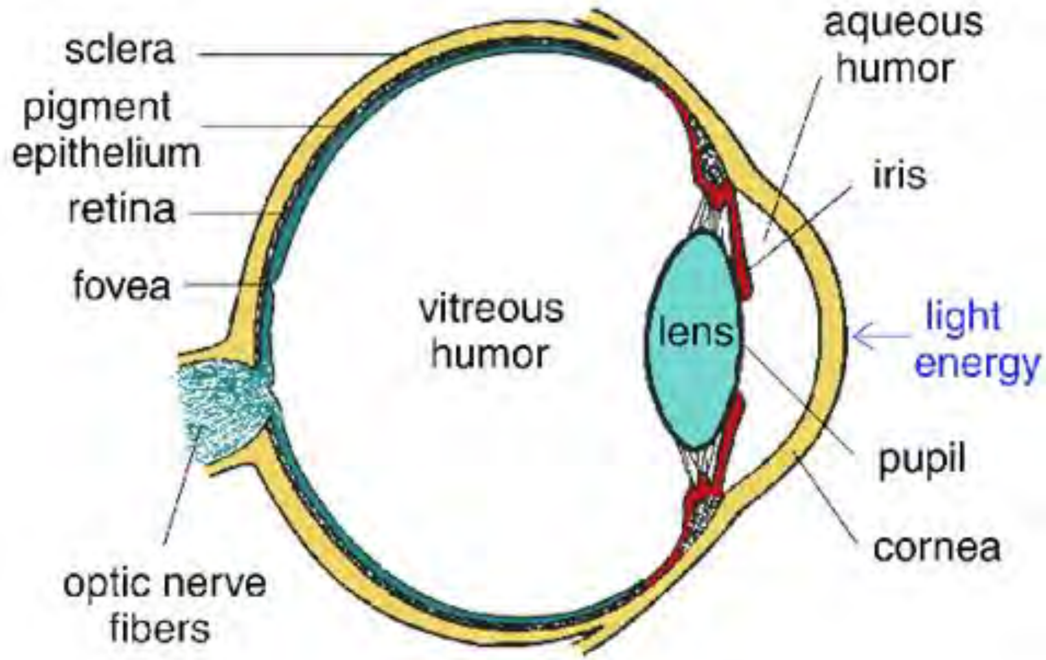
- From specific observations
  to broader generalization

Today

Some example models of human performance

Visual System	Biological Model
Model Human Processor	Higher-Level Model
Fitts's Law	Model by Analogy
Gestalt Principles	Predict Interpretation

Human Visual System



Light passes through lens, focused on retina

Blind Spot?

Blind Spot

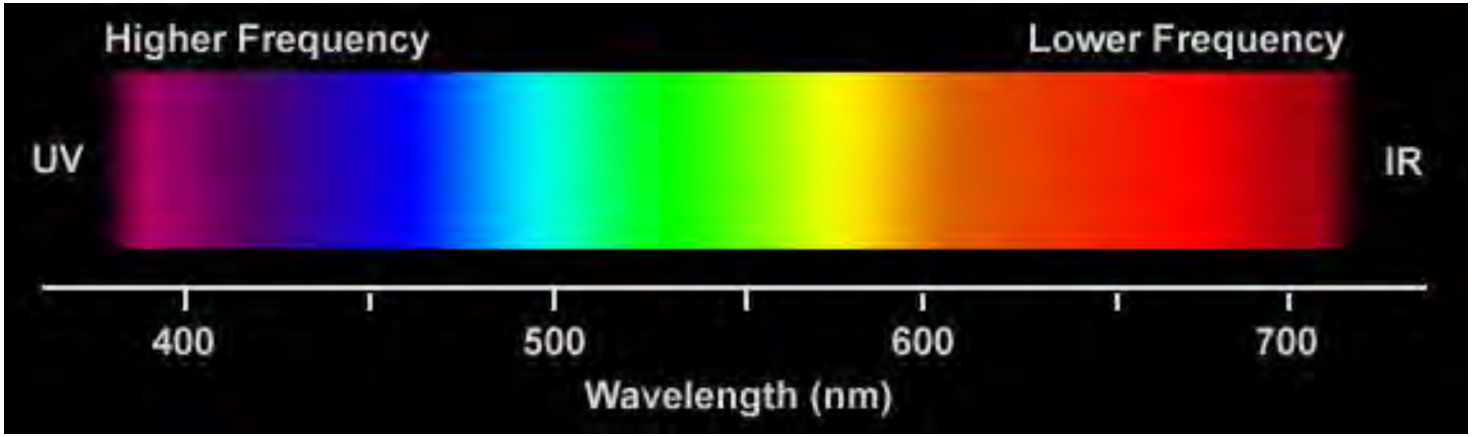
a	b	c	d	e	f	g	h
i	j	k	l	m	n	o	p
q	r	s	t	u	v	w	x

Use right eye, look at letters

Blind Spot

Use left eye, look at cross

Visible Spectrum



Retina

Covered with light-sensitive receptors

- Rods (120 million)
  - Sensitive to broad spectrum of light
  - Sensitive to small amounts of light
  - Cannot discriminate between colors
  - Sense intensity or shades of gray
  - Primarily for night vision & perceiving movement
- Cones (6 million)
  - Used to sense color

Retina

Center of retina has most of the …

Retina

- Center of retina has most of the cones
    - Allows for high acuity of objects focused at center

Retina

Center of retina has most of the cones

- Allows for high acuity of objects focused at center

Edge of retina is dominated by …

Retina

Center of retina has most of the cones

- Allows for high acuity of objects focused at center

Edge of retina is dominated by rods

- Allows detecting motion of threats in periphery

Retina

Center of retina has most of the cones

- Allows for high acuity of objects focused at center

Edge of retina is dominated by rods

- Allows detecting motion of threats in periphery

What does that mean for you?

Retina

Center of retina has most of the cones

- Allows for high acuity of objects focused at center

Edge of retina is dominated by rods

- Allows detecting motion of threats in periphery

What does that mean for you?

- Peripheral movement is easily distracting

Retina

Center of retina has most of the cones

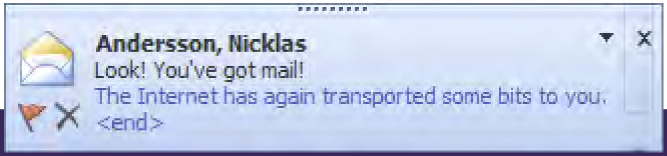
- Allows for high acuity of objects focused at center

Edge of retina is dominated by rods

- Allows detecting motion of threats in periphery

What does that mean for you?

- Peripheral movement is easily distracting



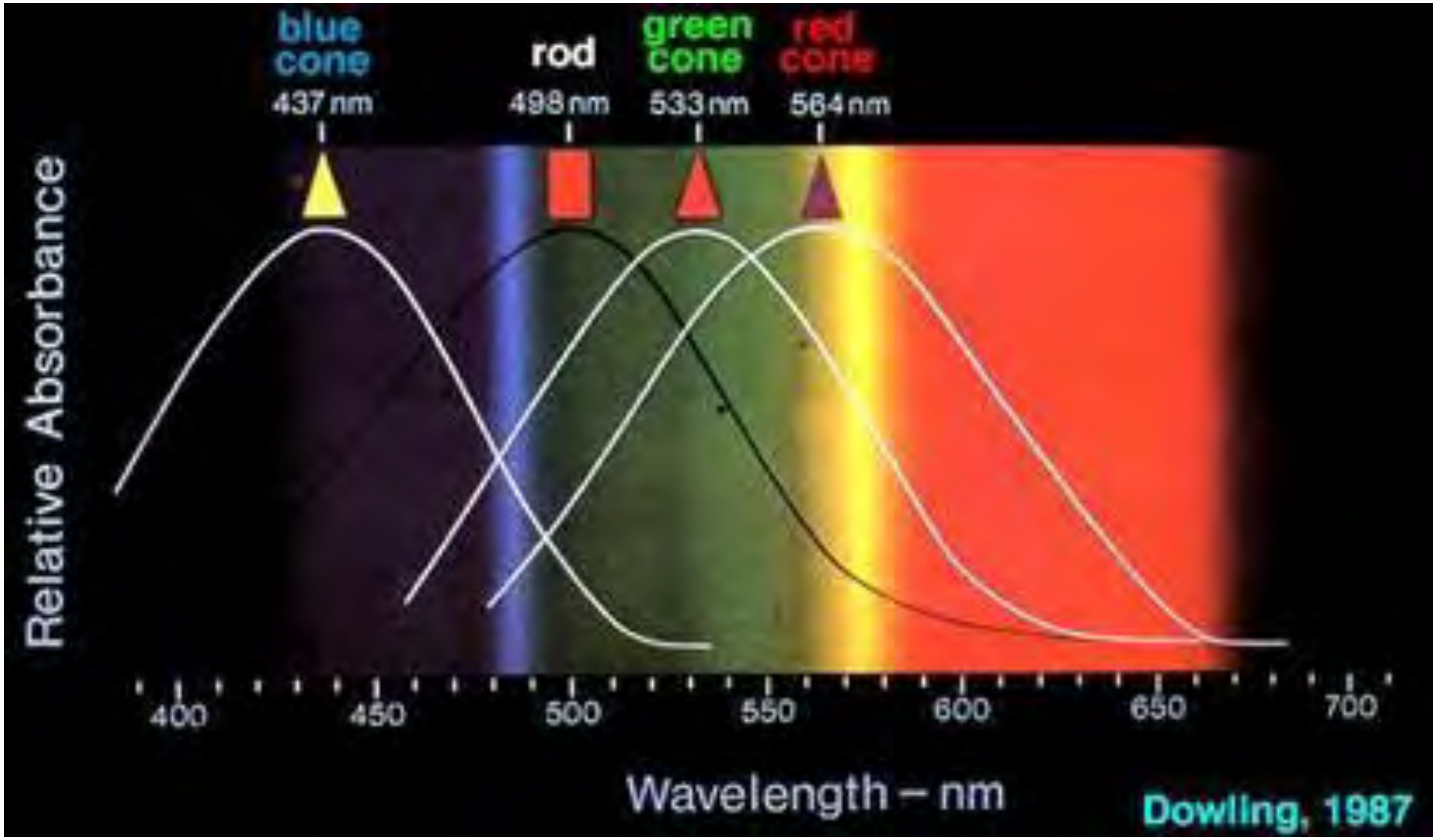
Color Perception via Cones

Photopigments used to sense color

3 types: blue, green, “red” (actually yellow)

- Each sensitive to different band of spectrum
- Ratio of neural activity stimulation for the three types of gives us a continuous perception of color

Color Sensitivity



Distribution of Photopigments

Not distributed evenly

- Mainly reds (64%), Very few blues (4%)
- Insensitivity to short wavelengths (i.e., blue)

No blue cones in retina center

- Fixation on small blue object yields "disappearance"

Lens yellows with age, absorbs short wavelengths

- Sensitivity to blue is reduced even further

Color Sensitivity & Image Detection

- Most sensitive to center of spectrum
  - To be perceived as the same, blues and reds must be brighter than greens and yellows
- Brightness determined mainly by red and green
  - $Y = 0.3\ Red + 0.59\ Green + 0.11\ Blue$
- Shapes detected by finding edges
  - We use brightness and color difference
- Implication
  - Blue edges and shapes are hard

Color Sensitivity & Image Detection

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Implication

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Focus

Different wavelengths of light focused at different distances behind eye's lens

- Constant refocusing causes fatigue

Saturated colors (i.e., pure colors) require more focusing than desaturated (i.e., pastels)

Focus

Different wavelengths of light focused at different distances behind eye’s lens

- Constant refocusing causes fatigue

Saturated colors (i.e., pure colors) require more focusing than desaturated (i.e., pastels)

The Falklands Society

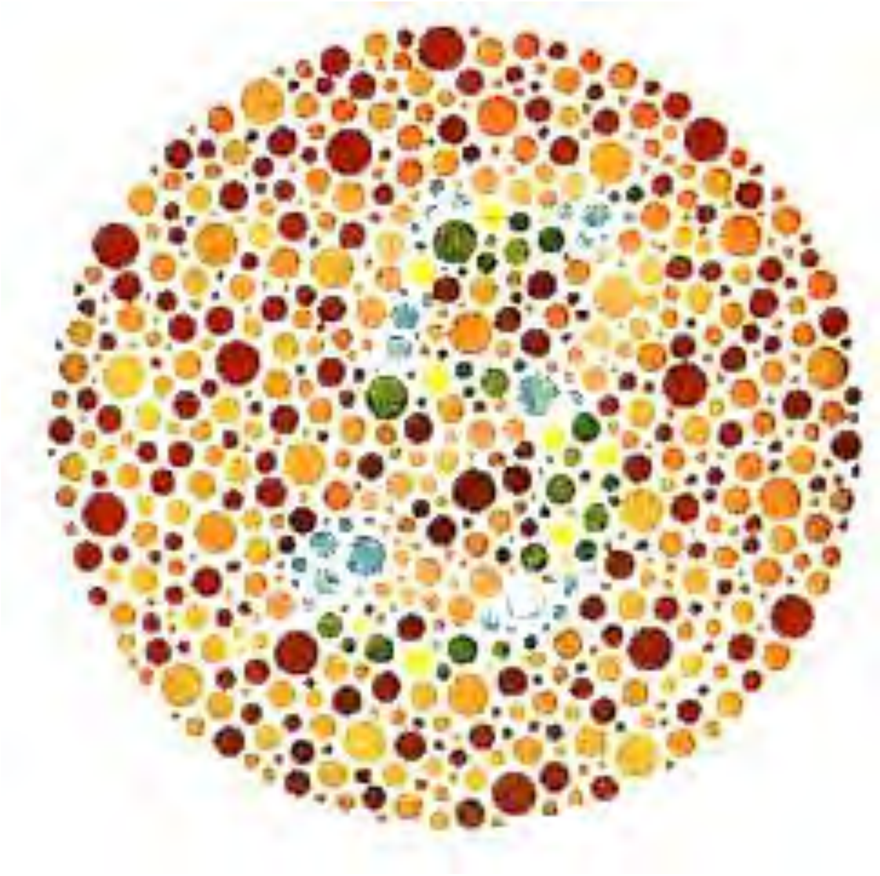
This hurts, why?

Color Deficiency

- Trouble discriminating colors
  - Affects about 9% of population
- Two main types
  - Different photopigment response most common
    - Reduces capability to discern small color differences
  - Red-Green deficiency is best known
    - Lack of either green or red photopigment, cannot discriminate colors dependent on red and green

- Also known as color blindness

Red-Green Deficiency Test



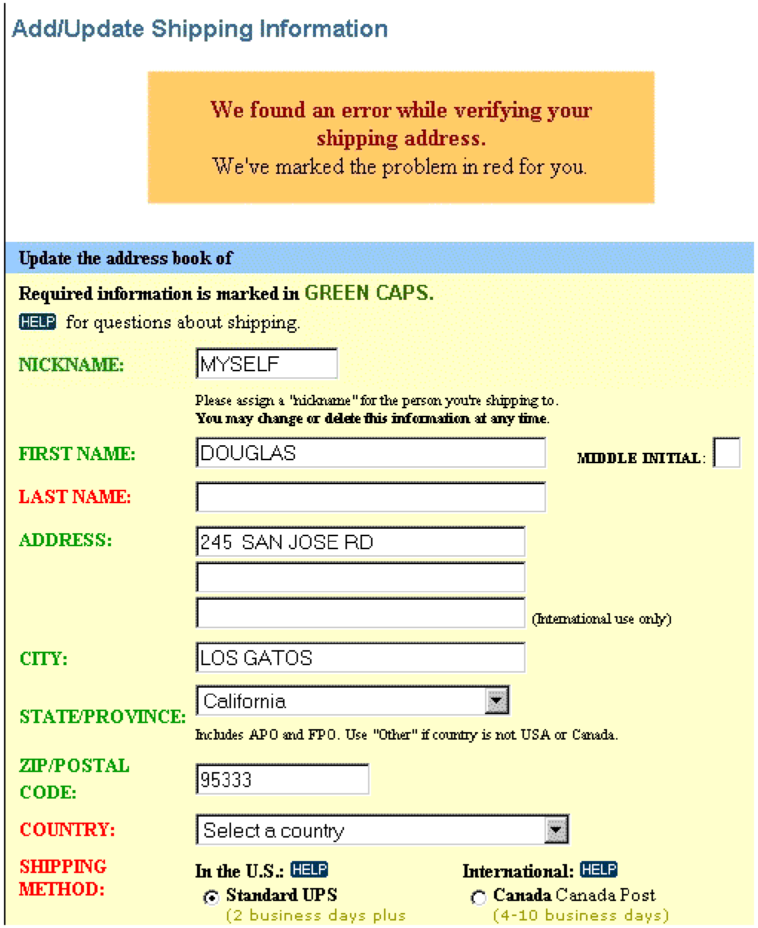
Dual / Redundant Encoding

Apples to Apples

Pandemic

http://danielsolisblog.blogspot.com/2011_03_01_archive.html

Dual / Redundant Encoding



Add/Update Shipping Information

We found an error while verifying your shipping address.
We've marked the problem in red for you.

Update the address book of

Required information is marked in GREEN CAPS.
HELP for questions about shipping.

NICKNAME: MYSELF
Please assign a "nickname" for the person you're shipping to.
You may change or delete this information at any time.

FIRST NAME: DOUGLAS MIDDLE INITIAL:

LAST NAME:

ADDRESS: 245 SAN JOSE RD
(International use only)

CITY: LOS GATOS

STATE/PROVINCE: California
Includes APO and FPO. Use "Other" if country is not USA or Canada.

ZIP/POSTAL CODE: 95333

COUNTRY: Select a country

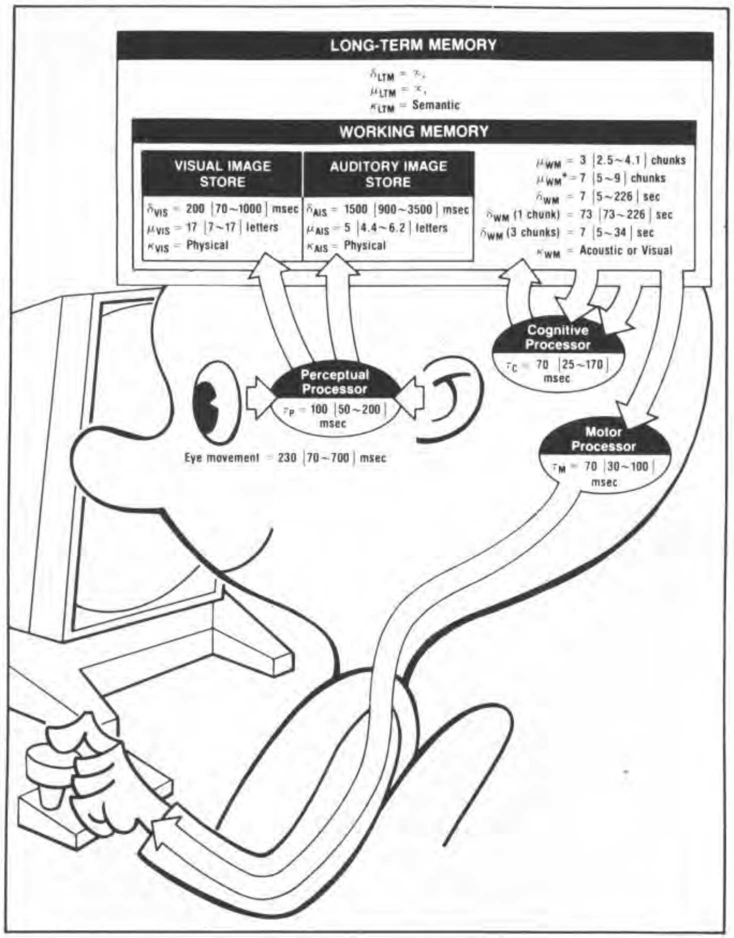
SHIPPING METHOD: **In the U.S.:** HELP **International:** HELP
Standard UPS (2 business days plus **Canada** Canada Post (4-10 business days)

Today

Some example models of human performance

Visual System	Biological Model
Model Human Processor	Higher-Level Model
Fitts's Law	Model by Analogy
Gestalt Principles	Predict Interpretation

The Model Human Processor



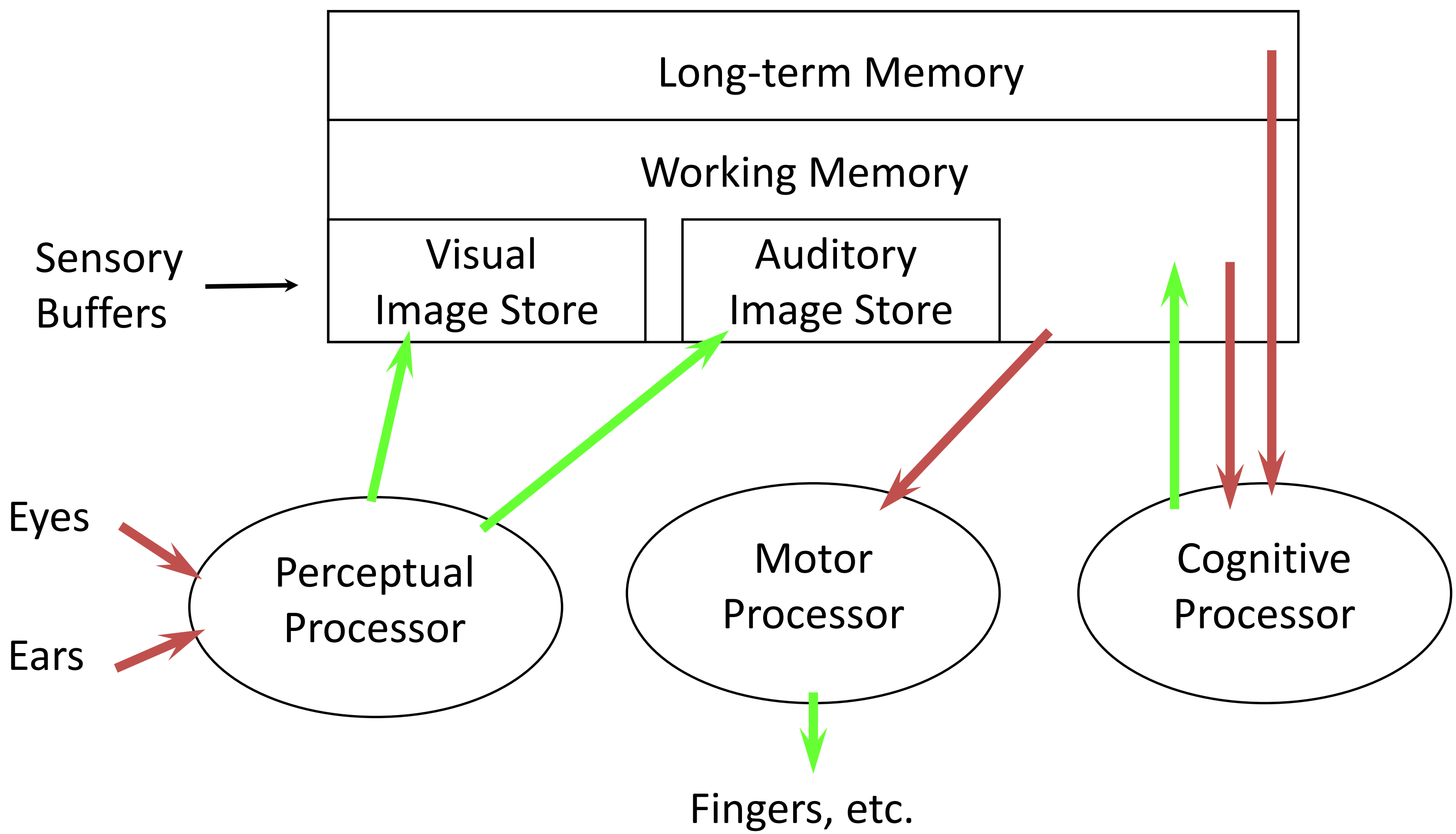
Developed by Card, Moran, & Newell (1983)

Based on empirical data

- Summarizing human behavior in a manner easy to consume and act upon

Same book that named human computer interaction

The Model Human Processor



Basics of Model Human Processor

- Sometimes serial, sometimes parallel
  - Serial in action and parallel in recognition
    - Pressing key in response to light
    - Driving, reading signs, hearing all simultaneously
- Parameters
  - Processors have cycle time, about 100-200ms
  - Memories have capacity, decay time, and type

A Working Memory Experiment

BMCIACSEI

BM CIA CSE I

IBM CIA CSE

Memory

- Working memory (also known as short-term)
  - Small capacity (7 ± 2 “chunks”)
    - 6174591765 vs. (617) 459-1765
    - IBMCIACSE vs. IBM CIA CSE
  - Rapid access (~ 70ms) and decay (~200 ms)
    - Pass to LTM after a few seconds of continued storage
- Long-term memory
  - Huge (if not “unlimited”)
  - Slower access time (~100 ms) with little decay

Activation Experiment

Volunteer

Activation Experiment

Volunteer

Start saying colors you see in list of words

- When slide comes up, as fast as you can
- There will be three columns of words

Say “done” when finished

- Everyone else time how long it takes

Activation Experiment

word	word	word
word	word	word
word	word	word
word	word	word
word	word	word

Activation Experiment

Volunteer

red	green	blue
yellow	yellow	red
blue	blue	blue
green	yellow	red
red	green	green

Activation Experiment

Do it again

Say “done” when finished

ivd	olftcs	fwax
ncudgt	zjdcv	lxngyt
mkbh	xbts	cfto
bhfe	cnhdes	fwa
cnofgt	uhths	dalcrd

Activation Experiment

Do it again

Say “done” when finished

red	red	green
blue	yellow	red
green	green	green
yellow	blue	blue
blue	yellow	yellow

Model Human Processor Operation

Recognize-Act Cycle of the Cognitive Processor

On each cycle, contents in working memory initiate actions associatively linked in long-term memory

Actions modify the contents of working memory

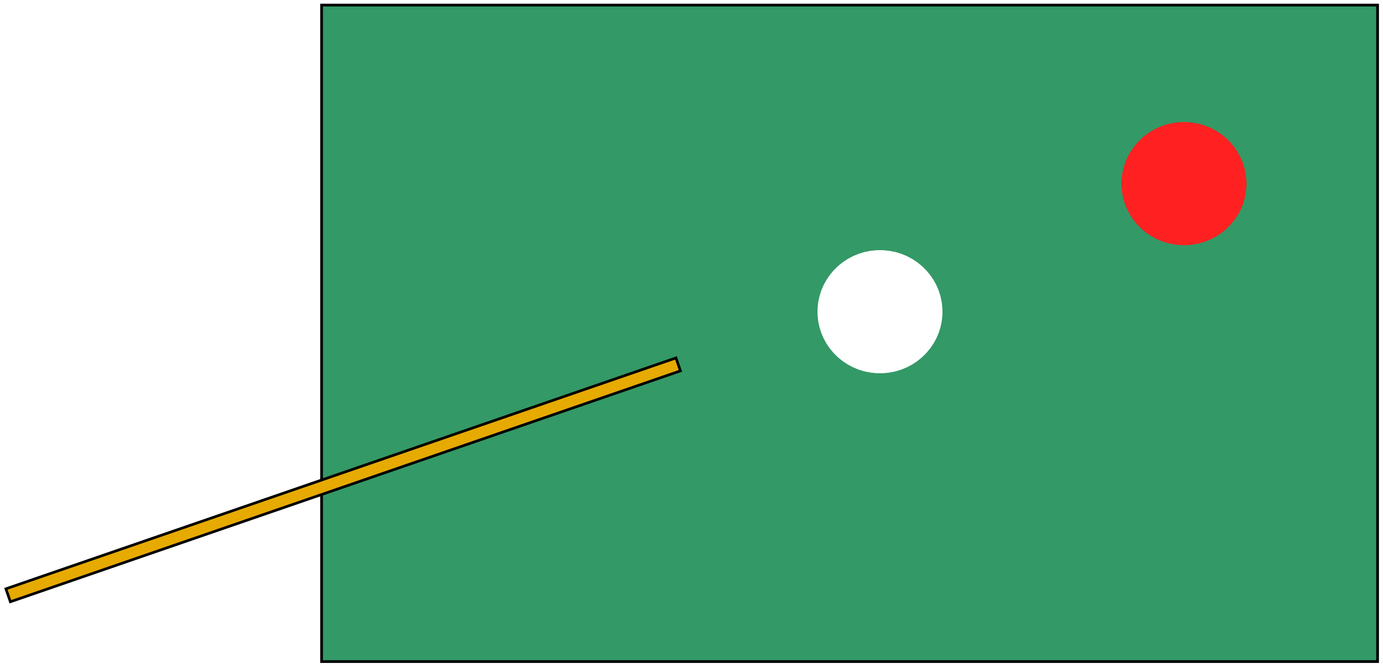
Discrimination Principle

Retrieval is determined by candidates that exist in memory relative to retrieval cues

Interference created by strongly activated chunks

See also Freudian slips

Perceptual Causality



How soon must the red ball move after cue ball collides with it?

Perceptual Causality

Stimuli that occur within one cycle of the perceptual processor fuse into a single concept

Requirement

- If you want to create the perception of causality, then you need to be sufficiently responsive

Caution

- Two stimuli intended to be distinct can fuse if the first event appears to cause the other

Today

Some example models of human performance

Visual System	Biological Model
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Fitts's Law (1954)

- Models time to acquire targets in aimed movement
  - Reaching for a control in a cockpit
  - Moving across a dashboard
  - Pulling defective items from a conveyor belt
  - Clicking on icons using a mouse
- Very powerful, widely used
  - Holds for many circumstances (e.g., under water)
  - Allows for comparison among different experiments
  - Used both to measure and to predict

Fitts’s Law (1954)

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James’s use of ’s is correct,
but most people say Fitts’ Law

Fitts's Law (1954)

Models time to acquire targets in aimed movement

- Reaching for a control in a cockpit
- Moving across a dashboard
- Pulling defective items from a conveyor belt
- Clicking on icons using a mouse

Very powerful, widely used

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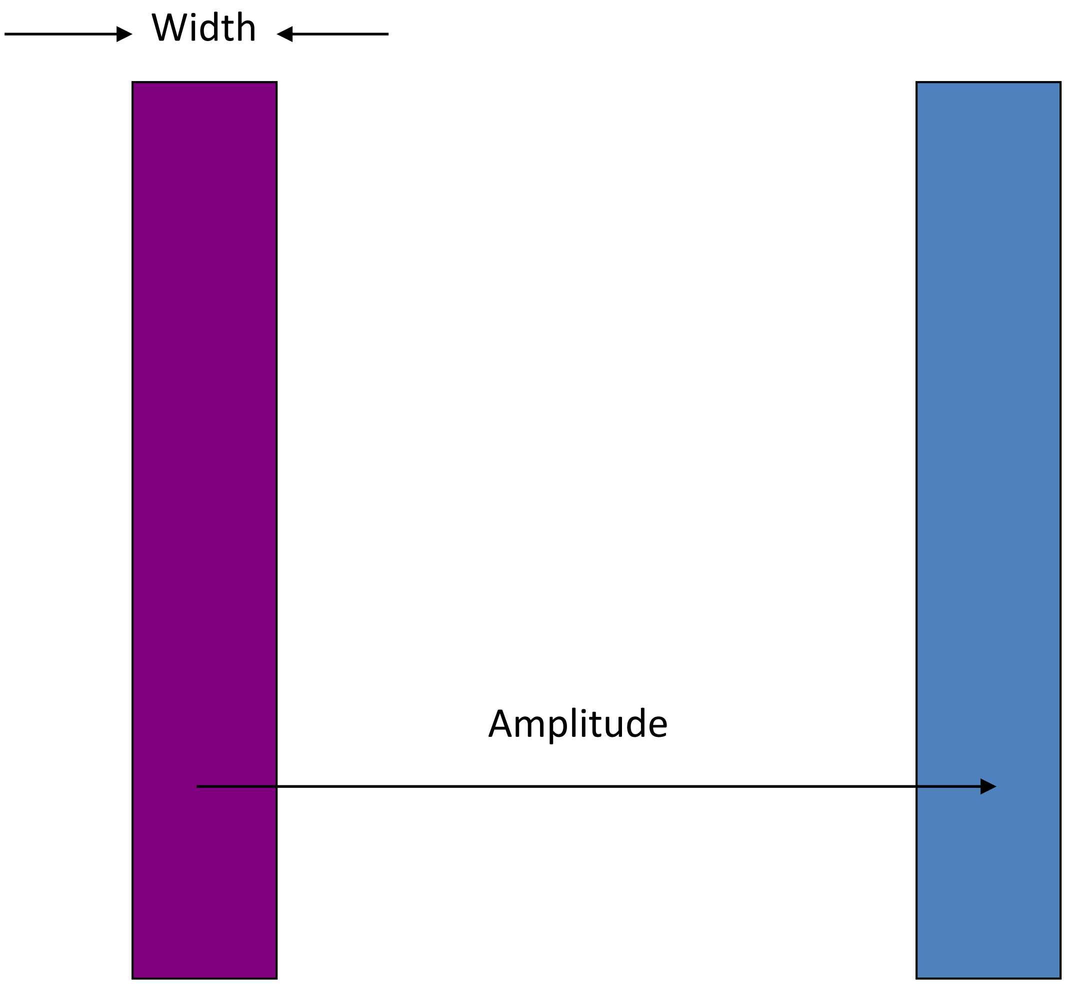
https://en.wikipedia.org/wiki/Fitts's_law

Reciprocal Point-Select Task



Closed Loop versus Open Loop

What is closed loop motion?

What is open loop motion?

Closed Loop versus Open Loop

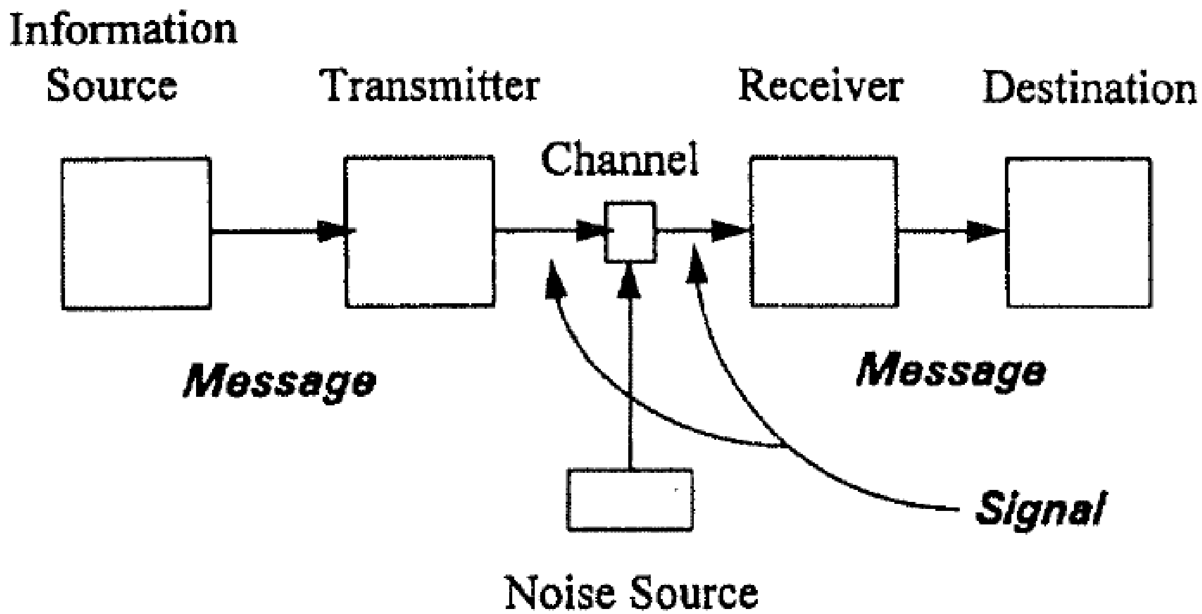
What is closed loop motion?

- Rapid aimed movements with feedback correction
- Fitts's law models this

What is open loop motion?

- Ballistic movements without feedback correction
- Example: Throwing a dart
- See Schmidt's Law (1979)

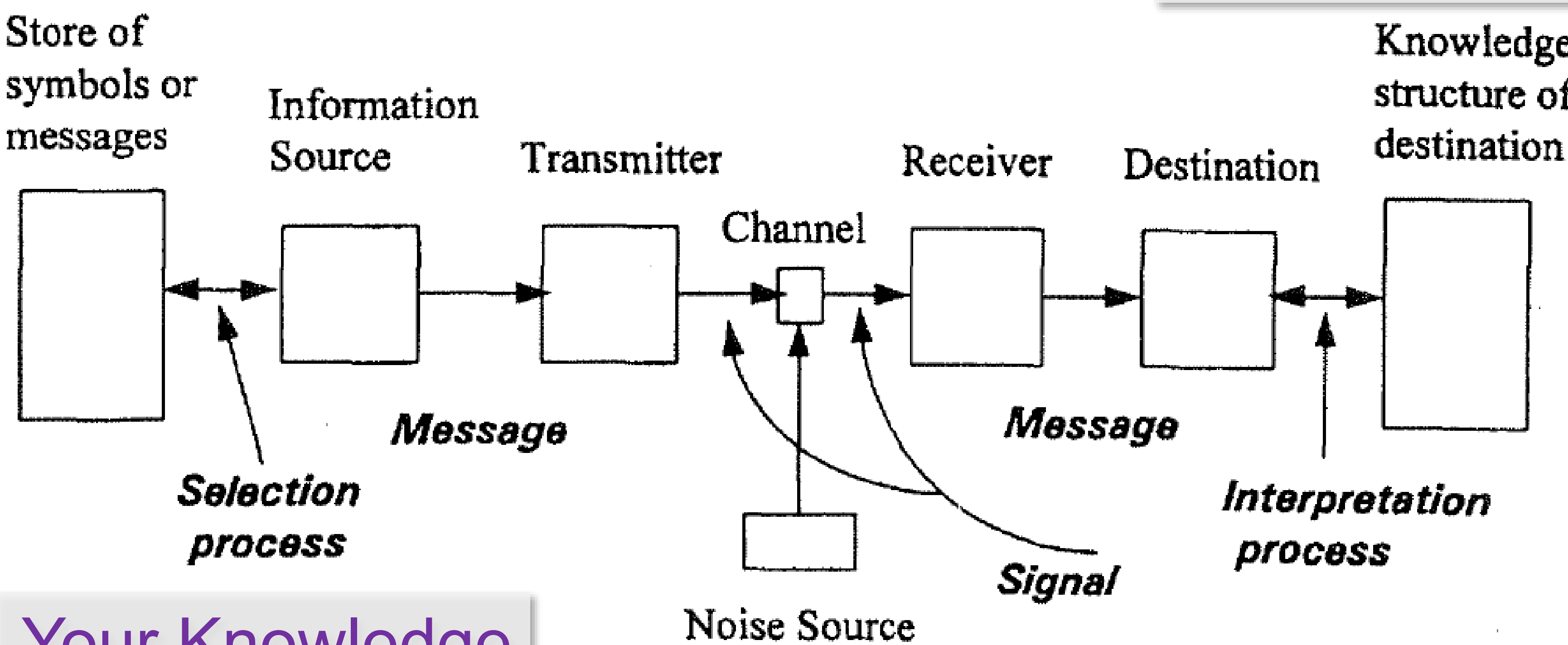
Model by Analogy



Analogy to Information Transmission
Shannon and Weaver, 1959

Model by Analogy

The Interface



Your Knowledge

Analogy to Information Transmission
Shannon and Weaver, 1959

Fitts's Law

$MT = a + b \log2(A / W + 1)$

What kind of equation does this remind you of?

Fitts's Law

MT = a + b log2(A / W + 1)

- What kind of equation does this remind you of?

y = mx + b

MT = a + bx, where x = log2(A / W + 1)

- x is called the Index of Difficulty (ID)
- As "A" goes up, ID goes up
- As "W" goes up, ID goes down

Index of Difficulty (ID)

log2(A / W + 1)

- Fitts's Law claims that the time to acquire a target increases linearly with the log of the ratio of the movement distance (A) to target width (W)

Why is it significant that it is a ratio?

Index of Difficulty (ID)

log2(A / W + 1)

- Fitts's Law claims that the time to acquire a target increases linearly with the log of the ratio of the movement distance (A) to target width (W)

Why is it significant that it is a ratio?

- Units of A and W don't matter
- Allows comparison across experiments

Index of Difficulty (ID)

log2(A / W + 1)

- Fitts's Law claims that the time to acquire a target increases linearly with the log of the ratio of the movement distance (A) to target width (W)

ID units typically in "bits"

- Because of association with information capacity and somewhat arbitrary use of base-2 logarithm

Index of Performance (IP)

MT = a + b log2(A / W + 1)

- b is slope

1/b is called Index of Performance (IP)

- If MT is in seconds, IP is in bits/second

Also called “throughput” or “bandwidth”

- Consistent with analogy of the interaction as an information channel from human to target

A Fitts's Law Experiment

Experimental Design and Analysis

Factorial Design

- Experiment with more than one manipulation

Within vs. Between Participant Design

- Statistical power versus potential confounds

Carryover Effects and Counterbalanced Designs

A	B	C	D
C	D	A	B
D	C	B	A
B	A	D	C

Latin Square Design

"Beating" Fitts's law

It is the law, right?

- $MT = a + b \log2(A / W + 1)$

So how can we reduce movement time?

- Reduce A
- Increase W

Fitts's Law Related Techniques

Put targets closer together

Make targets bigger

Make cursor bigger

- Area cursors
- Bubble cursor

Use impenetrable edges

Fitts’s Law Examples

Which will be faster on average?

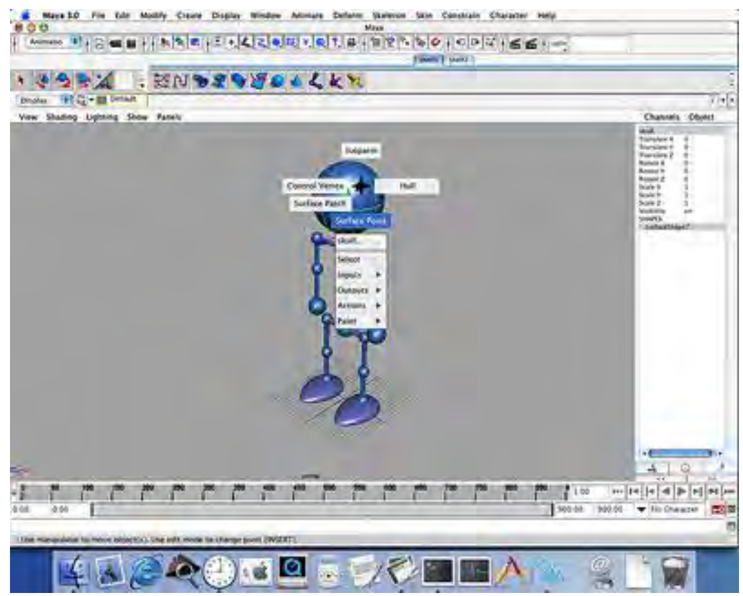
Pop-up Linear Menu

Pop-up Pie Menu

Pie Menus in Use

Rainbow 6

The Sims



Maya

Fitts's Law Examples

Which will be faster on average?

Pop-up Linear Menu

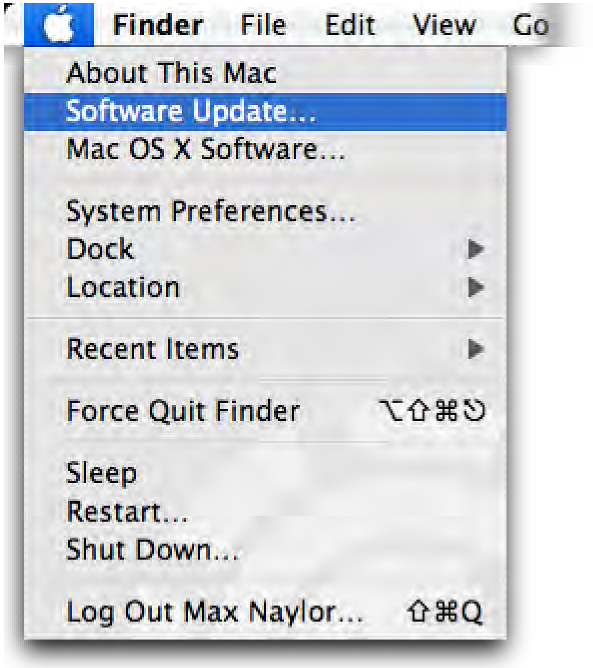
- Today
- Sunday
- Monday
- Tuesday
- Wednesday
- Thursday
- Friday
- Saturday

Pop-up Pie Menu

What about adaptive menus?

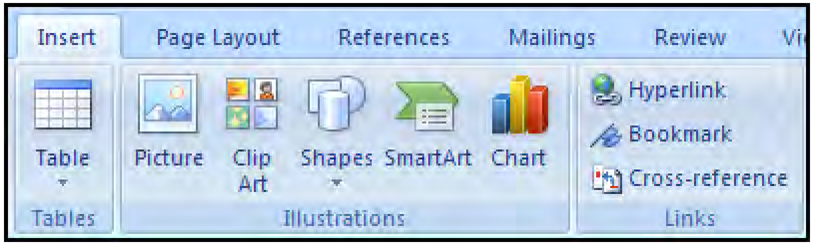
Fitts's Law in Windowing

Windows 95: Missed by a pixel
Windows XP: Good to the last drop

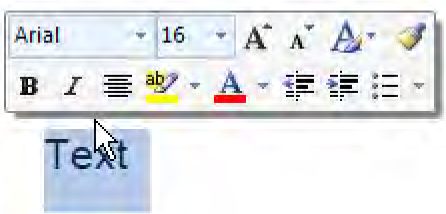


Macintosh Menu

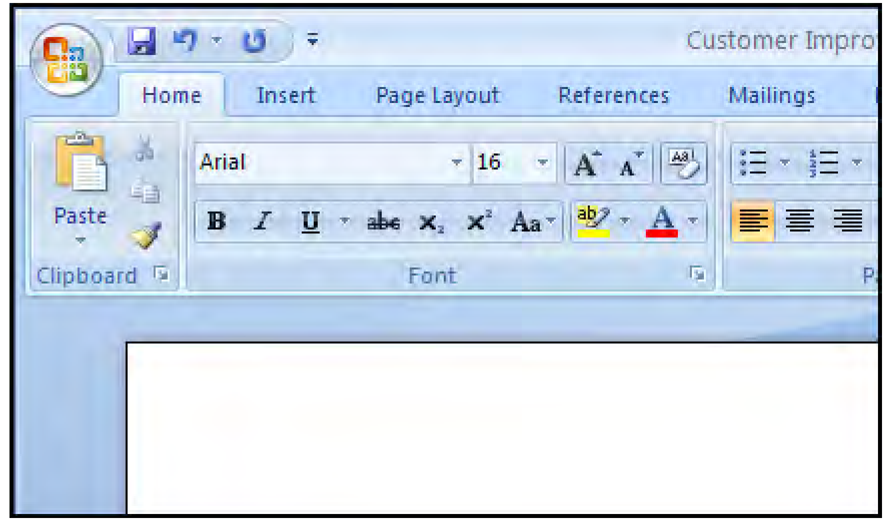
Fitts's Law in MS Office 2007



Larger, labeled controls
can be clicked more quickly



Mini toolbar is close to the cursor

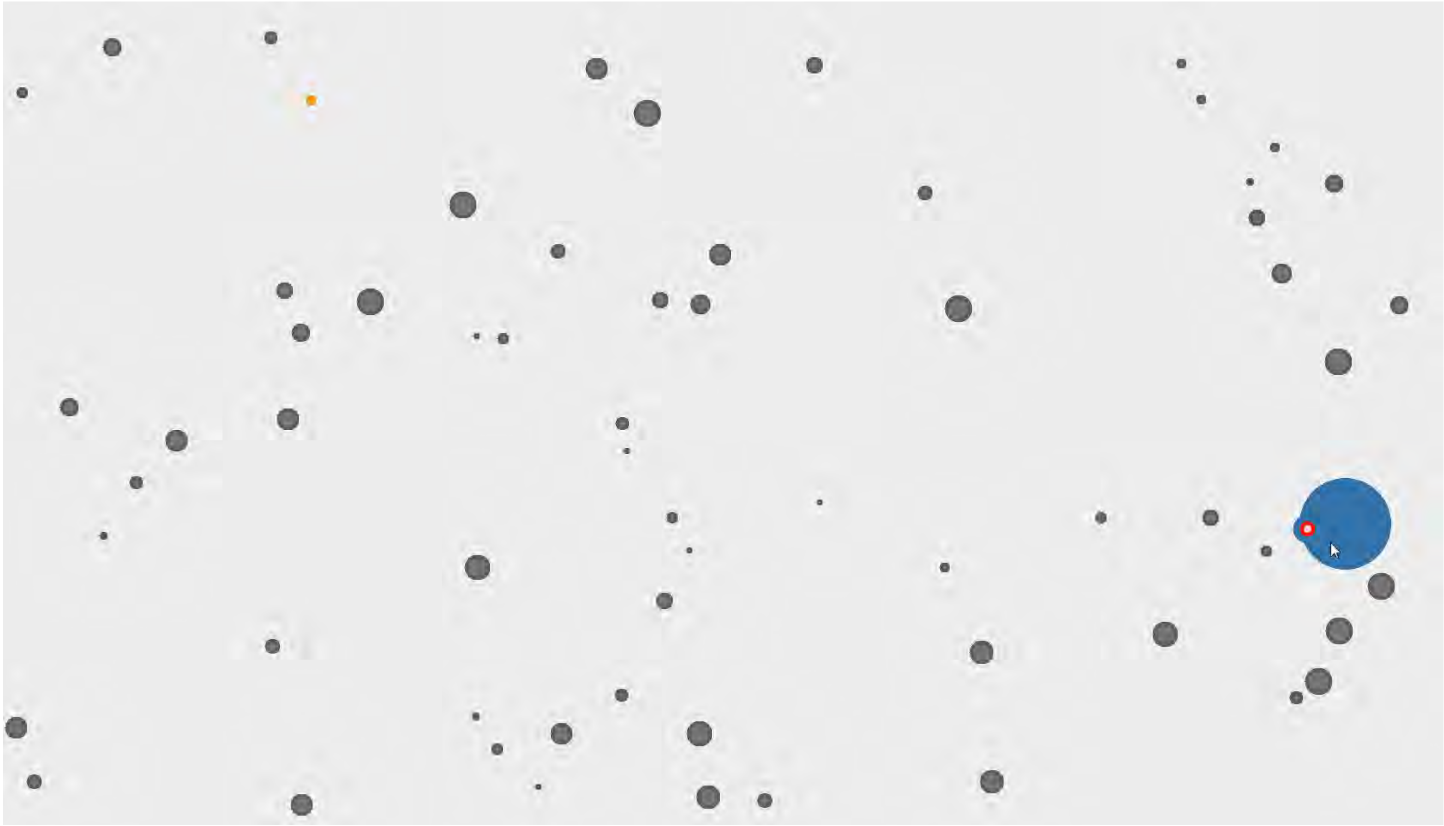


Magic Corner:
Office Button in the upper-left corner

Bubble Cursor

Grossman and Balakrishnan, 2005

Bubble Cursor



Grossman and Balakrishnan, 2005

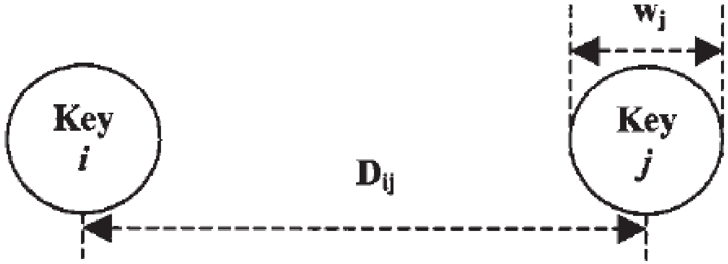
Bubble Cursor with Prefab

Dixon et al, 2012

Bubble Cursor with Prefab

Dixon et al, 2012

Fitts's Law and Keyboard Layout



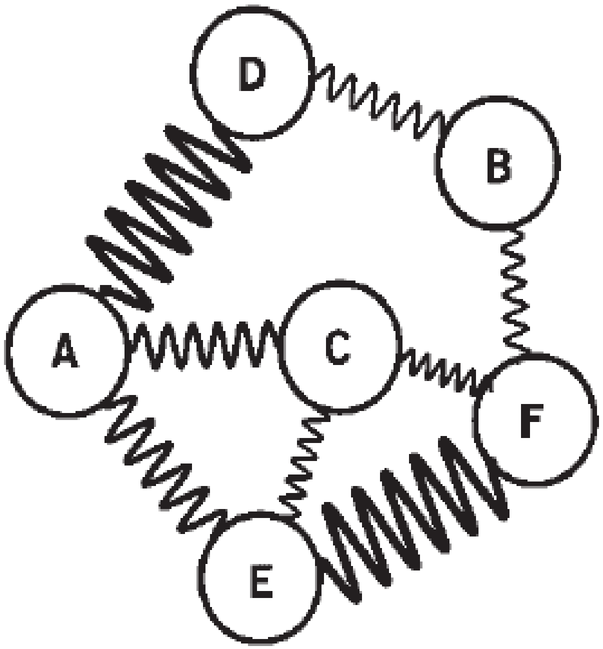
$$MT = a + b\log_2\left(\frac{D_{ij}}{W_j} + 1\right),$$

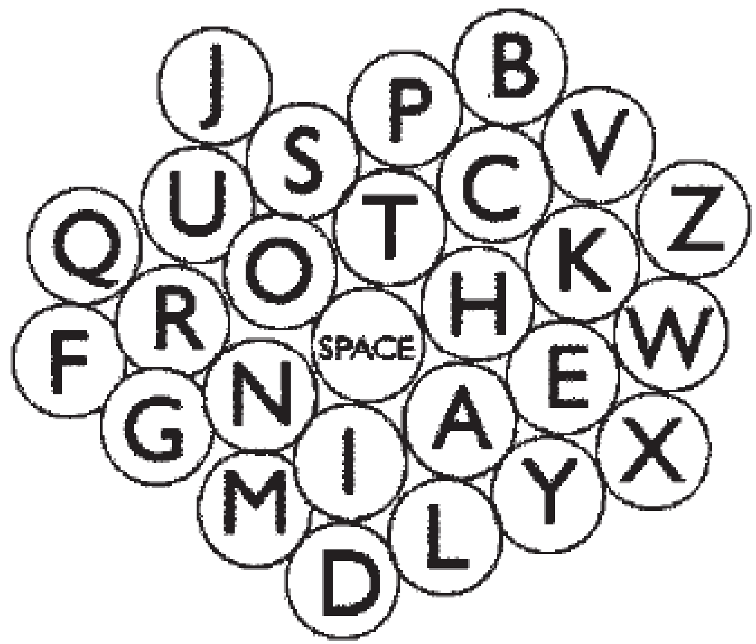
$$t = \sum_{i=1}^{27}\sum_{j=1}^{27}\frac{P_{ij}}{IP}\left[log_2\left(\frac{D_{ij}}{W_j} + 1\right)\right],$$

Zhai et. al (2002) pose stylus keyboard layout as an optimization of all key pairs, weighted by language frequency

Hooke's Keyboard

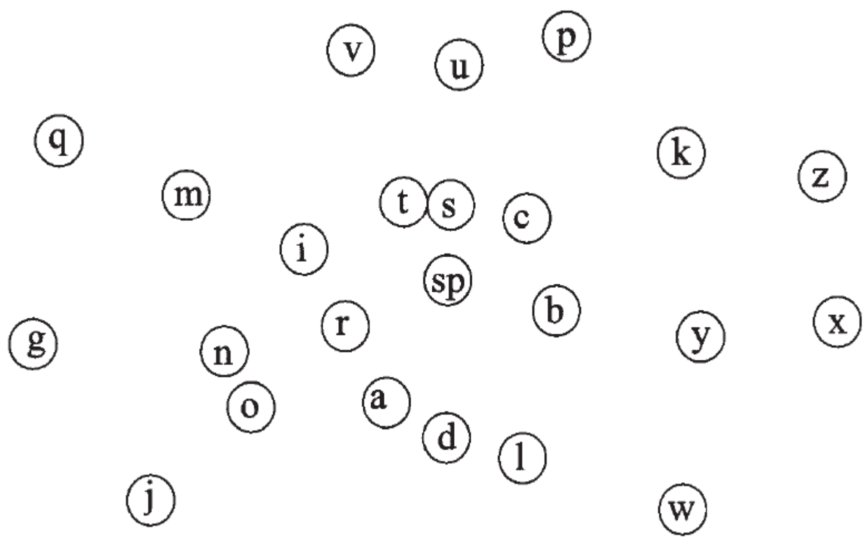
Optimizes a system of springs

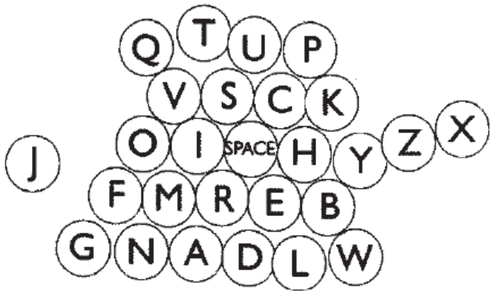


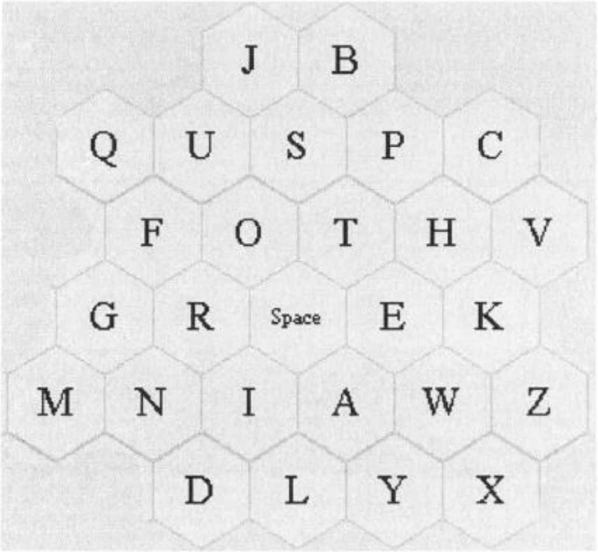


Metropolis Keyboard

Random walk minimizing scoring function



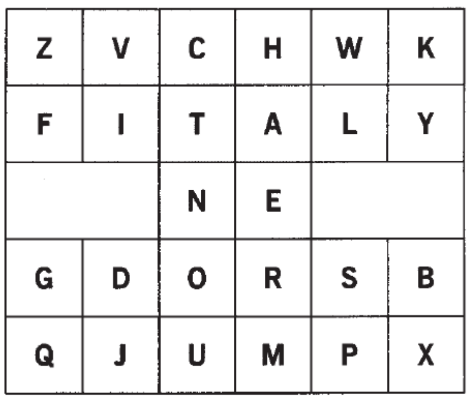




Considering Multiple Space Keys

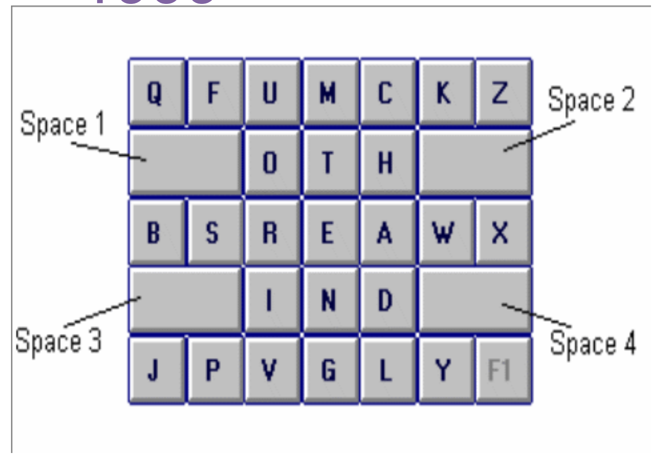
FITALY Keyboard

Textware Solutions



OPTI Keyboard

MacKenzie and Zhang 1999



Considering Multiple Space Keys

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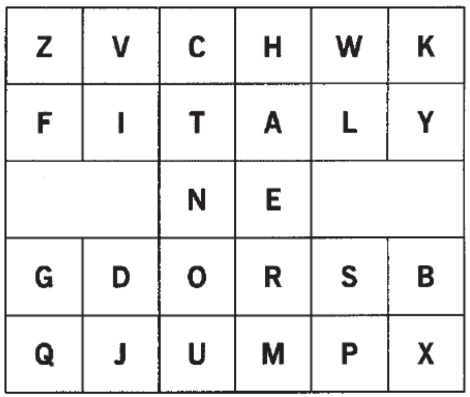

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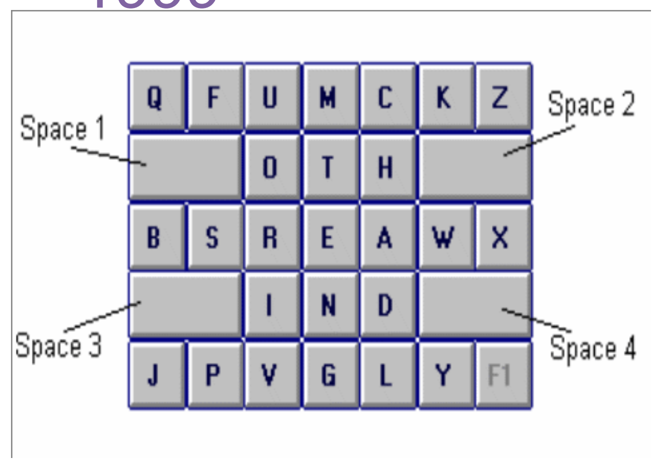
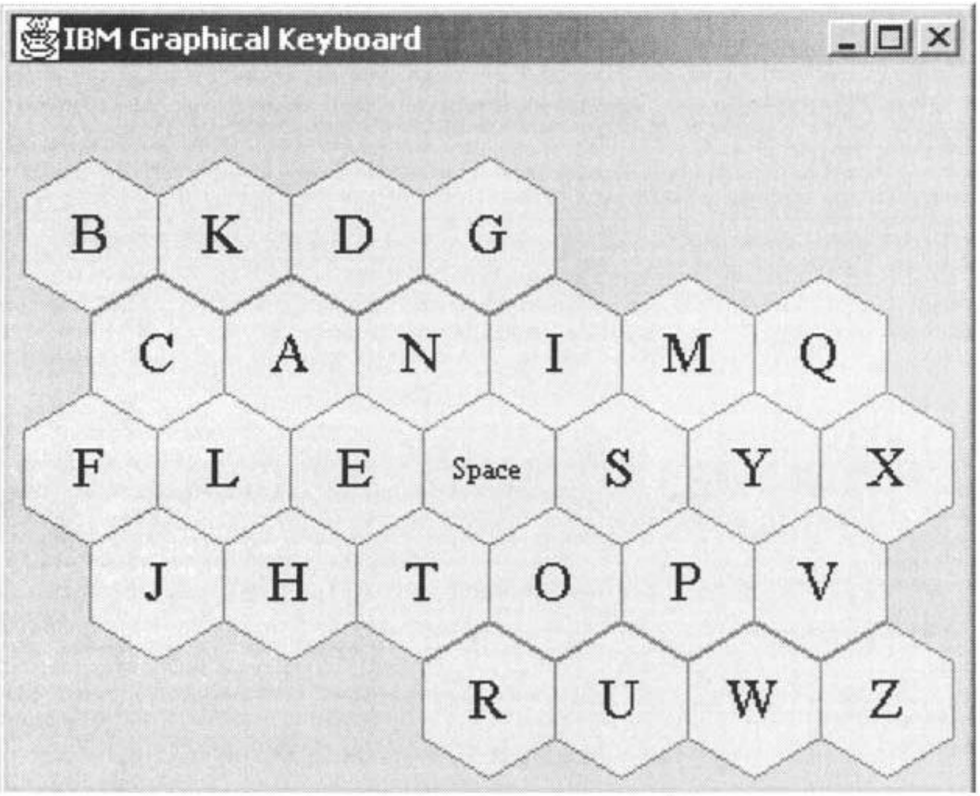


Correct choice of space key becomes important

Requires planning head to be optimal

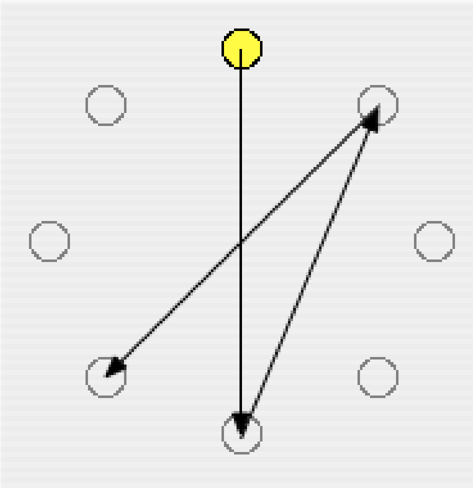
ATOMIK Keyboard

Optimized keyboard, adjusted for early letters in upper left and later letters in lower right

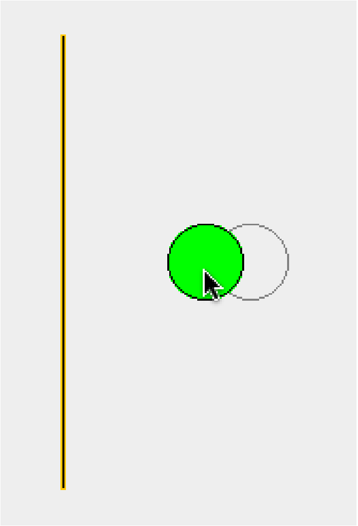


Using Motor Ability in Design

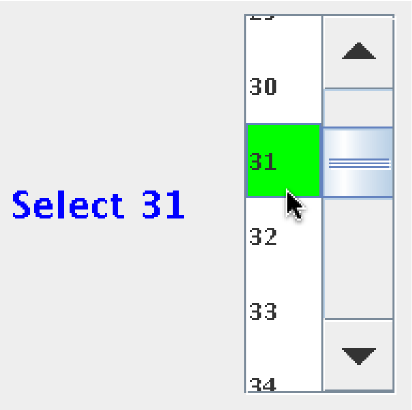
Pointing



Dragging



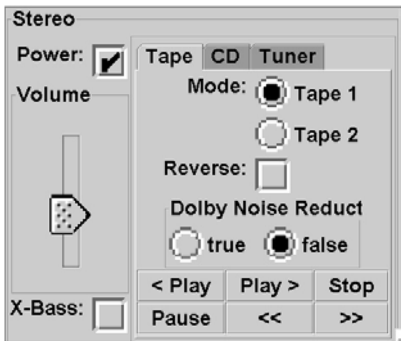
List Selection



Gajos et al 2007

Interface Generation As Optimization

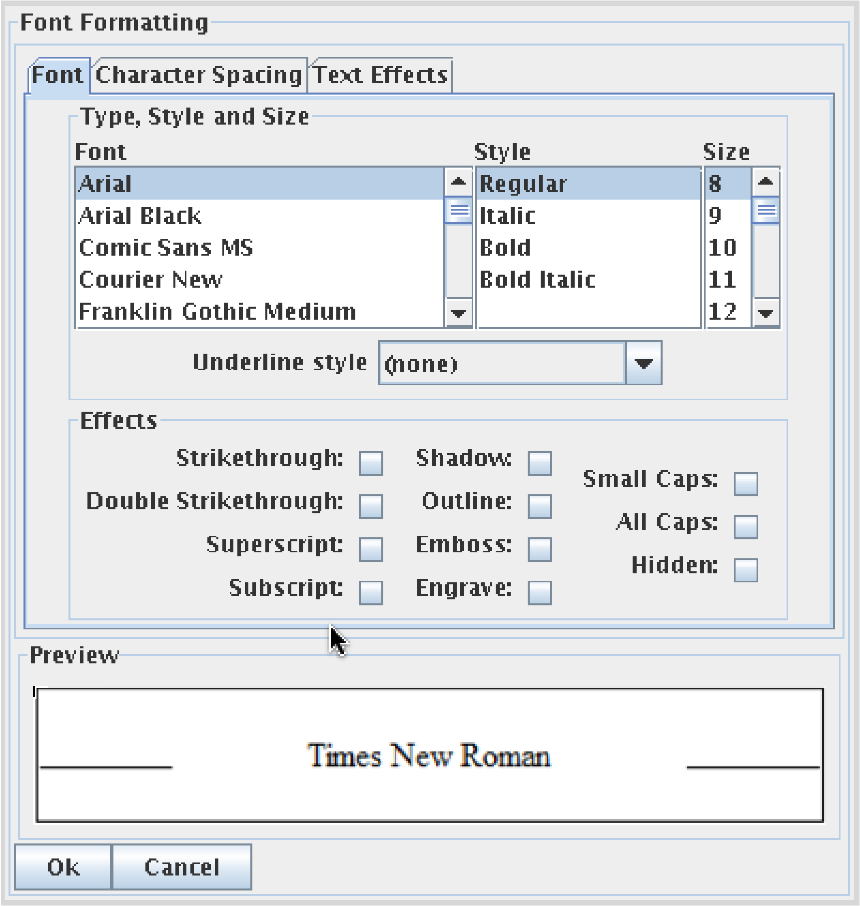
$(



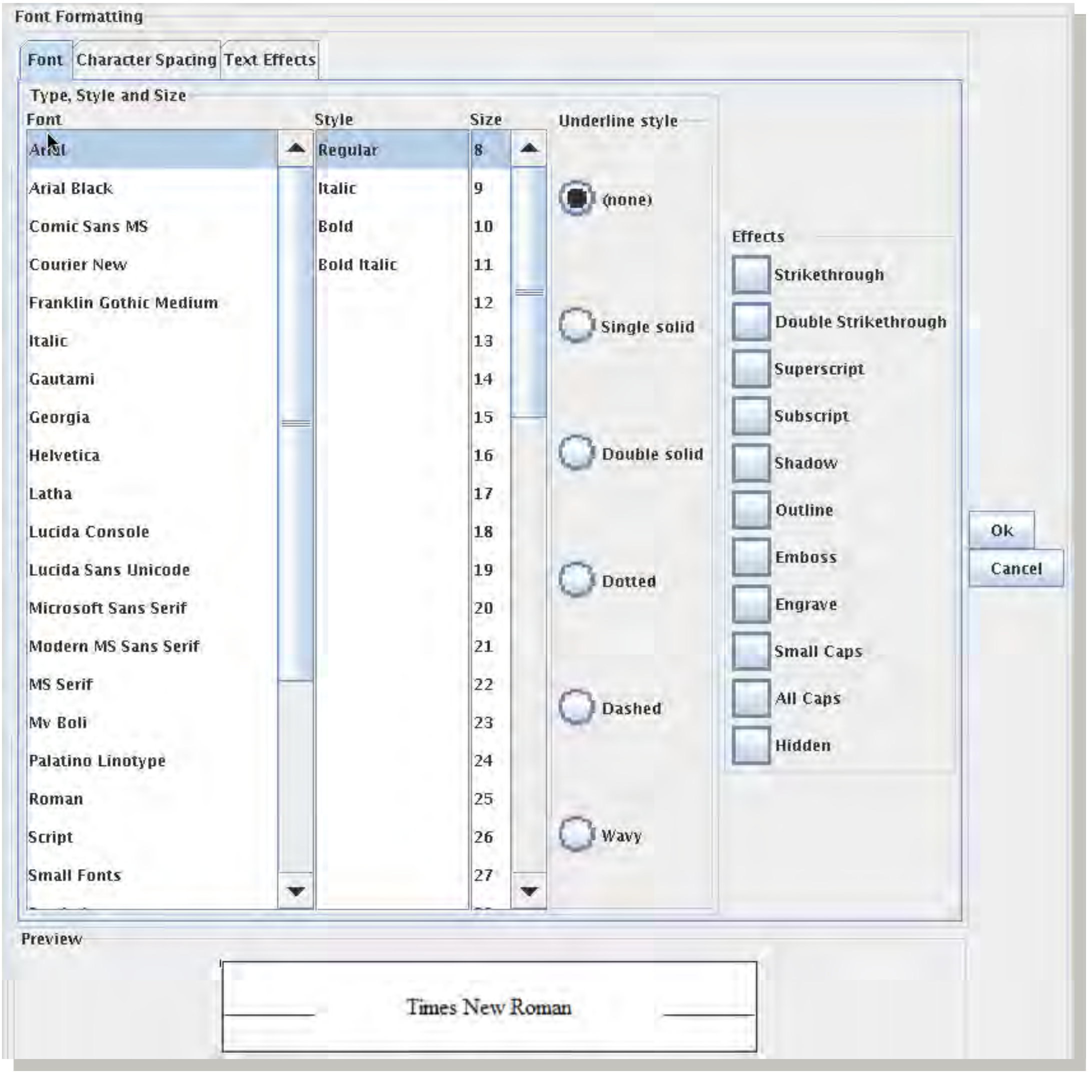
$) =

Estimated task completion time

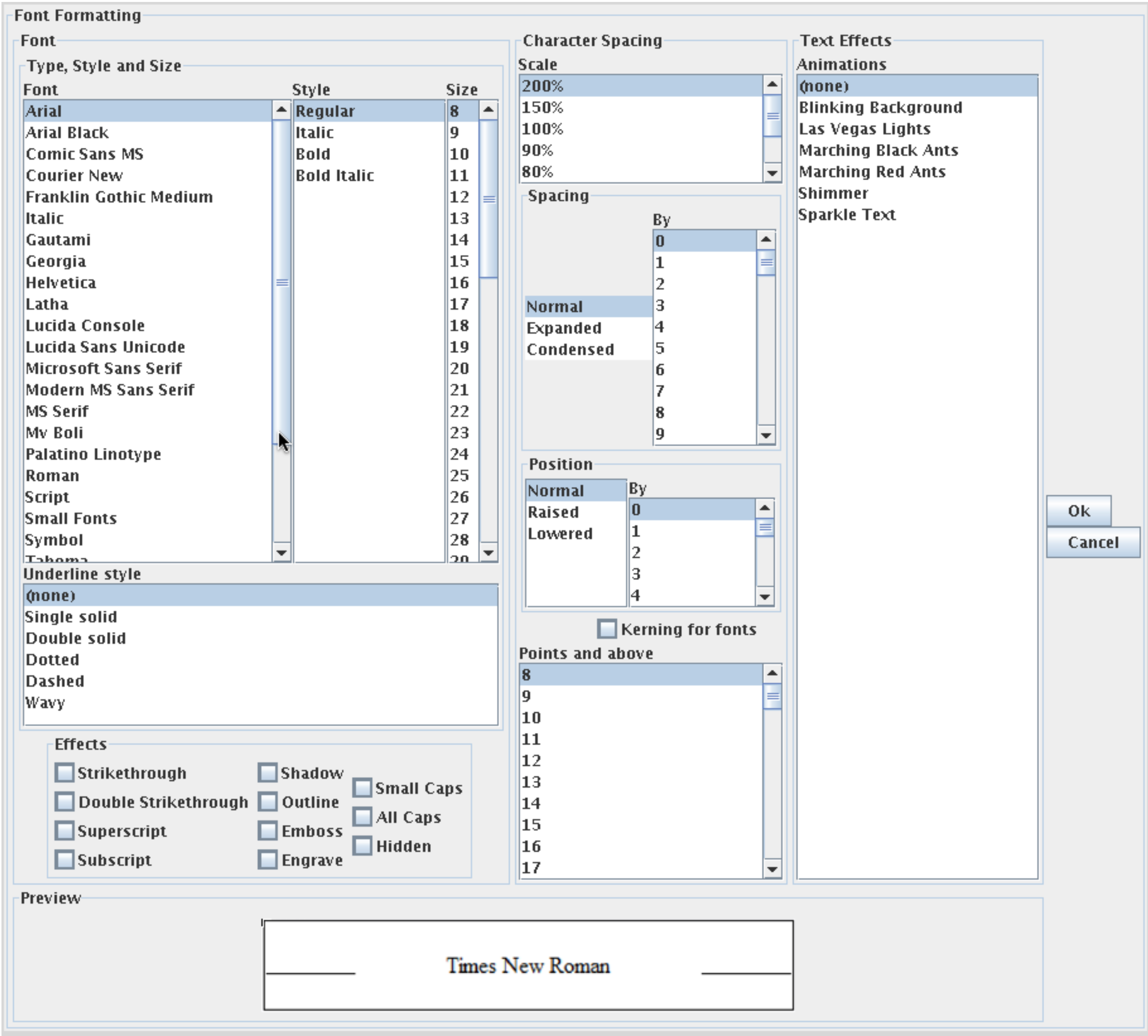
Manufacturer Interface



Person with Cerebral Palsy



Person with Muscular Dystrophy



Interface Generation As Optimization

In a study with 11 participants with diverse motor impairments:

Consistently faster with generated interfaces (26%)

Fewer errors with generated interfaces (73% fewer)

Strongly preferred generated interfaces

Fitts's Law Related Techniques

Gravity Fields

- Pointer gets close, gets "sucked in" to target

Sticky Icons

- When within target, pointer "sticks"

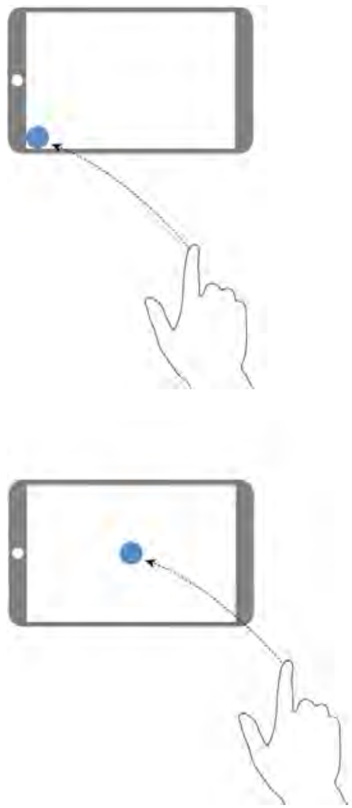
Constrained Motion

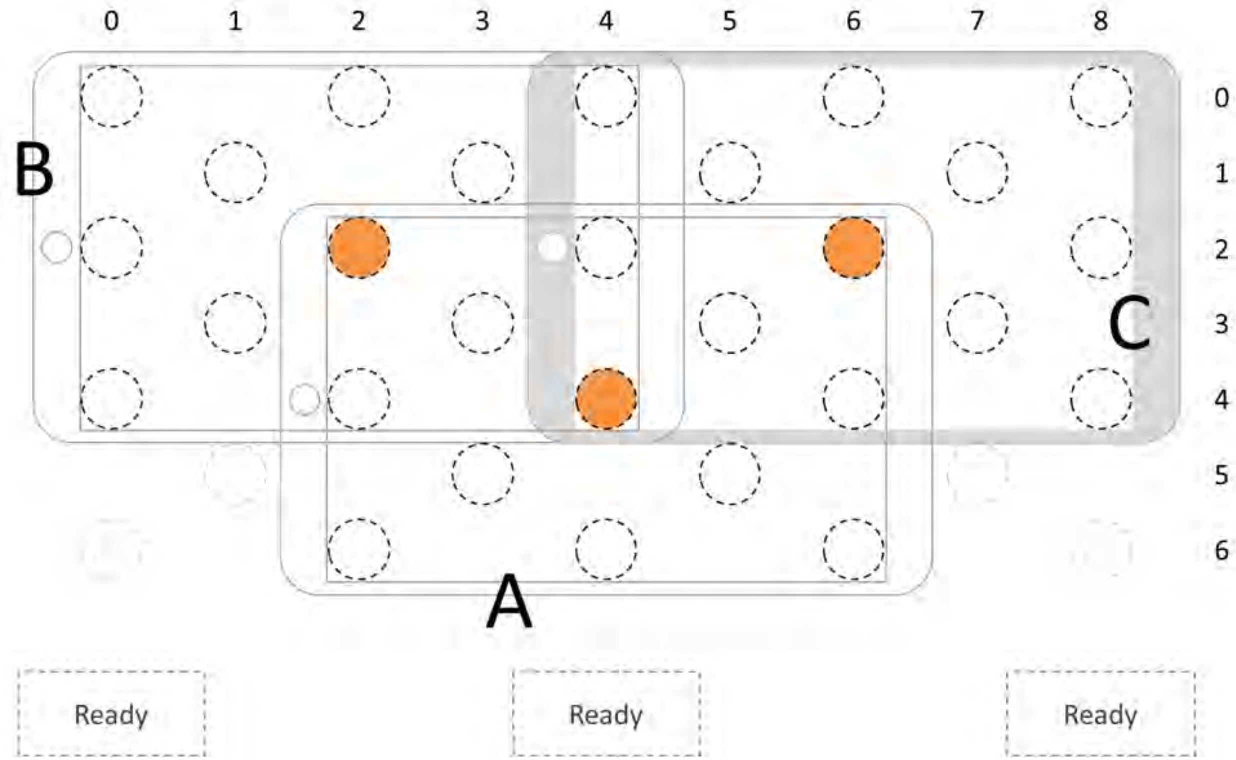
- Snapping,
  holding Shift to limit degrees of movement

Target Prediction

- Determine likely target,
  move it nearer or expand it

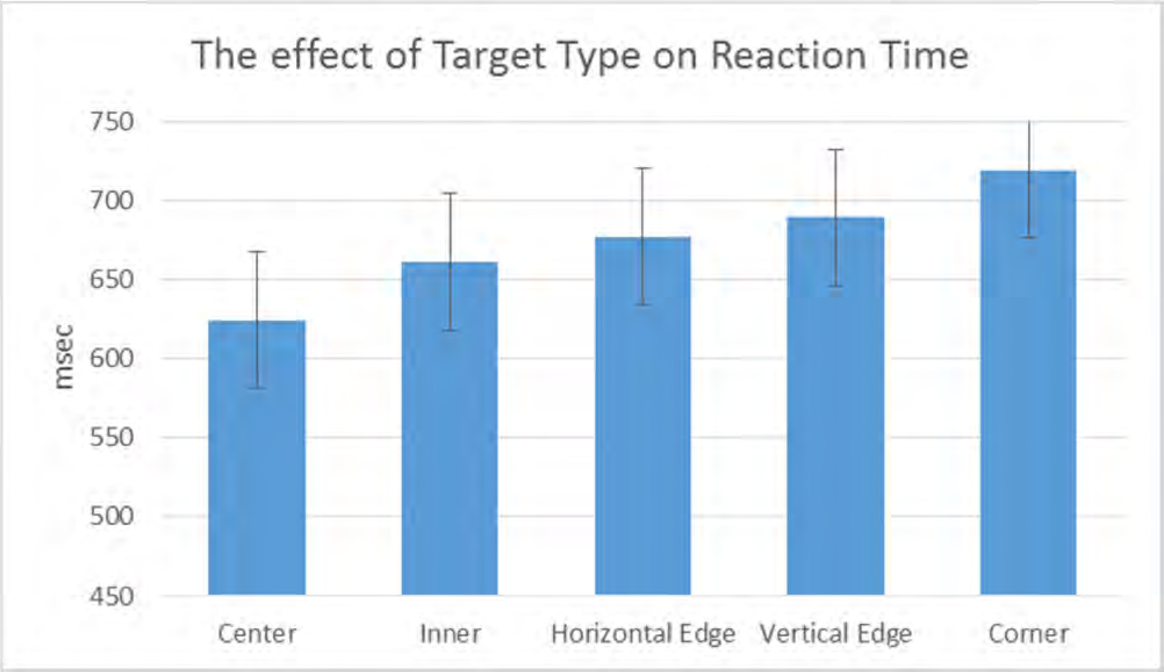
Fitts's Law, Edge Targets, and Touch





Fitts's Law, Edge Targets, and Touch

Avrahami finds edge targets are actually slower with touch devices, at same physical location



Are people border cautious?

Today

Some example models of human performance

Visual System	Biological Model
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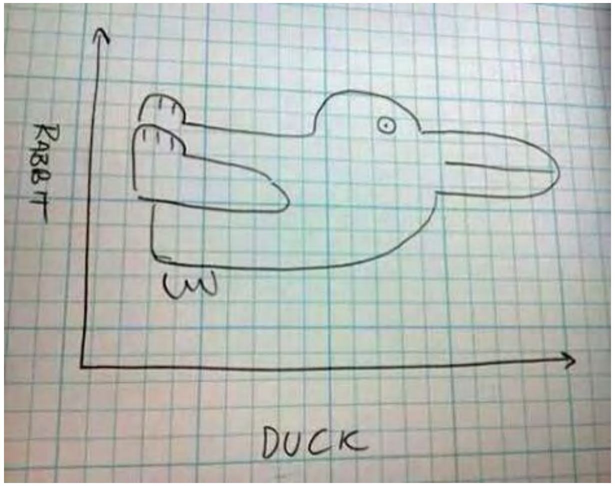
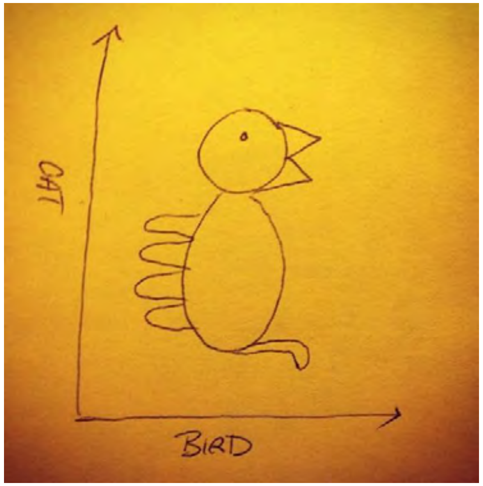
Gestalt Psychology

Described loosely in the context of this lecture and associated work, not a real definition

Perception is neither bottom-up nor top-down, rather both inform the other as a whole





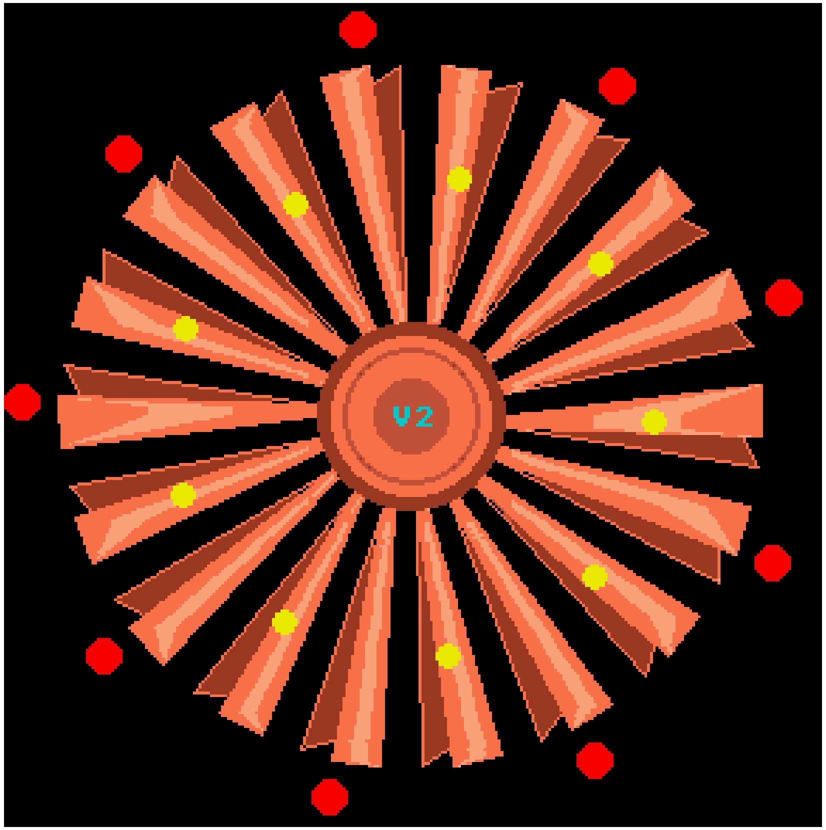
Gestalt Psychology

You can still see the dog…

Gestalt Psychology

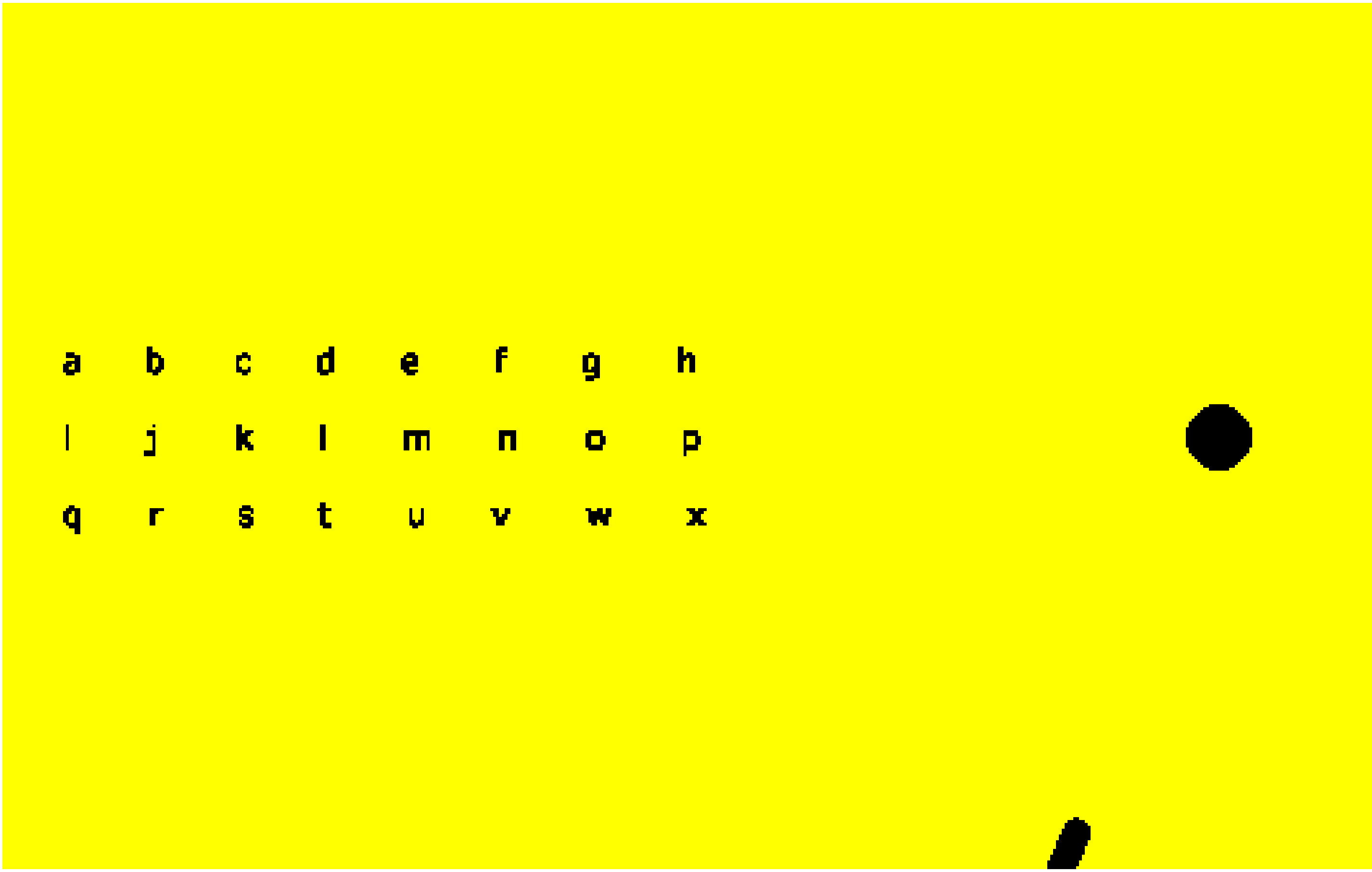
You can still see the dog…

Spinning Wheel



Follow the red dots vs follow the yellow dots

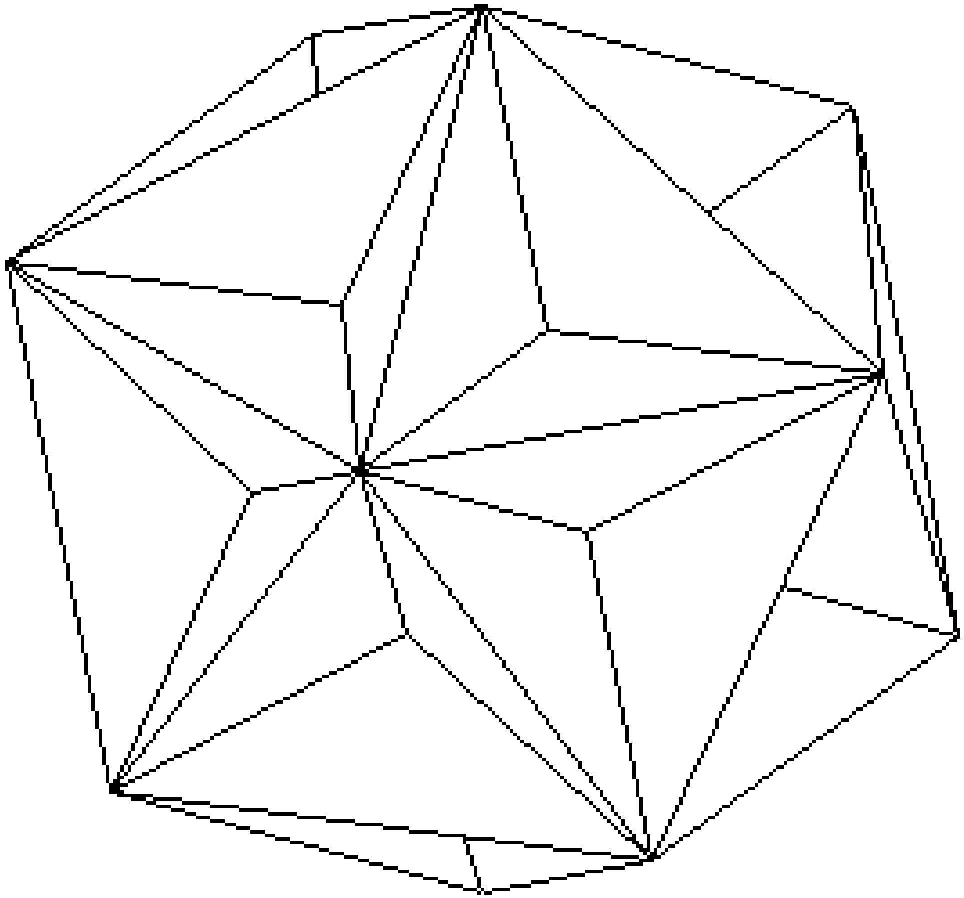
Blind Spot Interpolation



Use right eye, look at letters

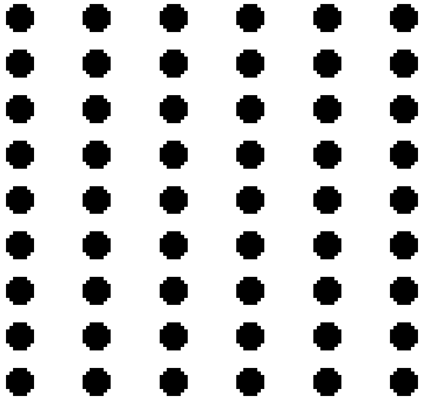
Painful Image Warning

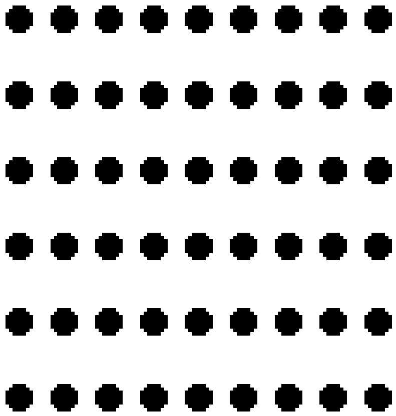
Difficult to Reconcile



Proximity

Objects close to each other form a group





Proximity

Using Lies in Research

By Nate Bolt • March 8, 2011

While it might be an uncomfortable topic, uncovering the lies behind a product or interface can be one of the most effective ways to turn ailing projects around.

Read More

Considerations for Mobile Design (Part 2): Dimensions

By David Leggett • March 1, 2011

In part two of this series, David helps readers adapt their design regimes to the (typically) small screens of mobile devices. Using responsive design, our experiences adapt to a variety of conditions.

Read More

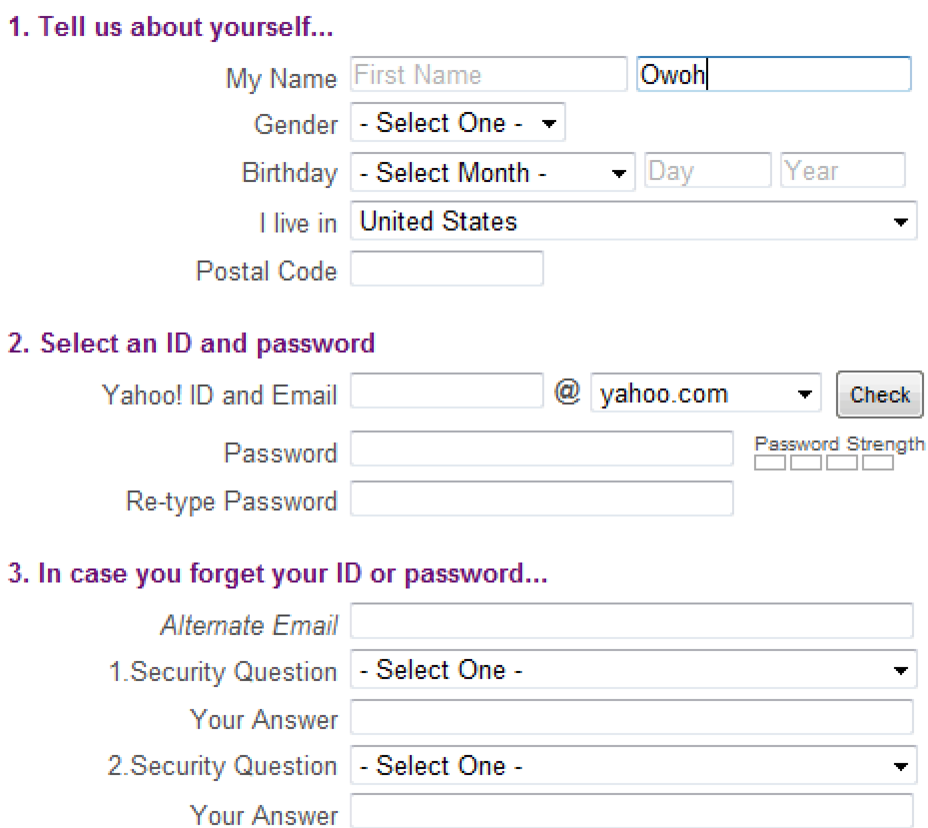
A Simple, Usable Review

By Paul Seys • February 24, 2011

In this detailed review, Paul Seys describes an up-and-coming UX title that's jam-packed with lessons for designers both new and established. Follow along to learn how author Giles Colborne's teaches his readers the essence of great design.

Read More

Proximity



1. Tell us about yourself...

My Name: First Name | Owoh

Gender: - Select One -

Birthday: - Select Month - | Day | Year

I live in: United States

Postal Code:

2. Select an ID and password

Yahoo! ID and Email: @ yahoo.com | Check

Password: Password Strength

Re-type Password:

3. In case you forget your ID or password...

Alternate Email:

1.Security Question: - Select One -

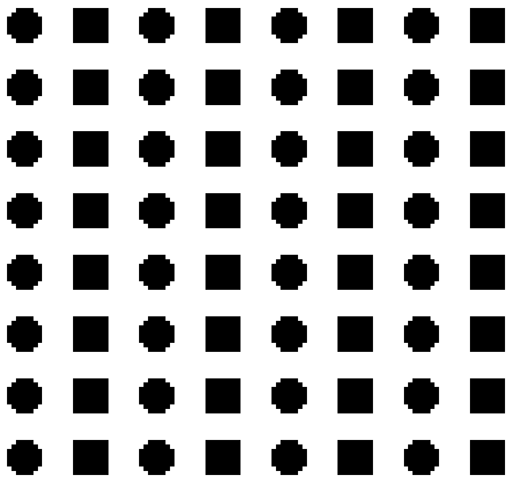
Your Answer:

2.Security Question: - Select One -

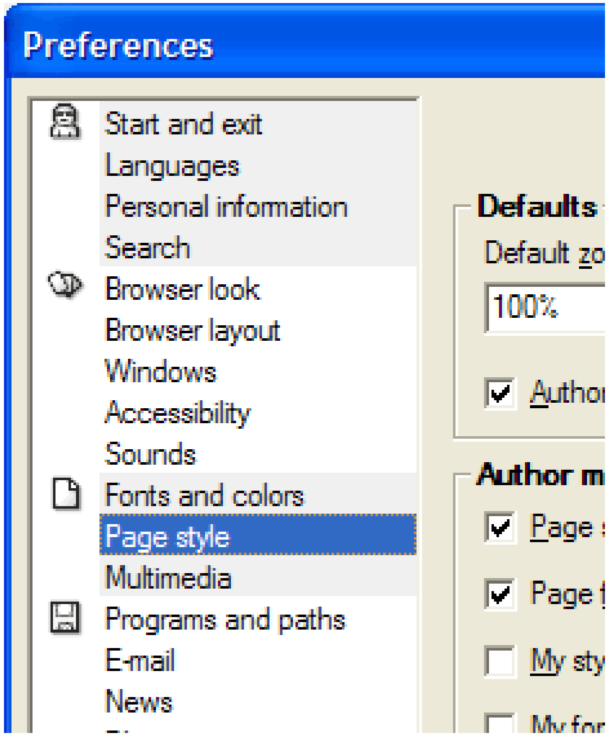
Your Answer:

Similarity

Objects that are similar form a group



Similarity


Preferences
Start and exit
Languages
Personal information
Search
Browser look
Browser layout
Windows
Accessibility
Sounds
Fonts and colors
Page style
Multimedia
Programs and paths
E-mail
News
Defaults
Default zo
100%
Author
Author m
Page
Page
My sty

Proximity and Similarity

Proximity and Similarity

After discovering that one of these accesses a menu, people will expect they all access a menu. They are the same.

Closure

Even incomplete objects are perceived as whole

- Increases regularity of stimuli

Closure

The Sims

IBM®

Rainbow 6

Symmetry

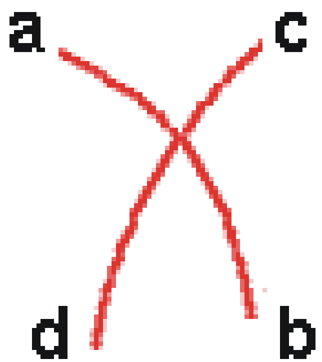
Objects are perceived as symmetrical and forming around a center point

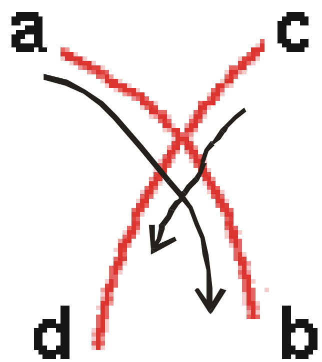
If you fight symmetry, be sure you have a reason

Continuity

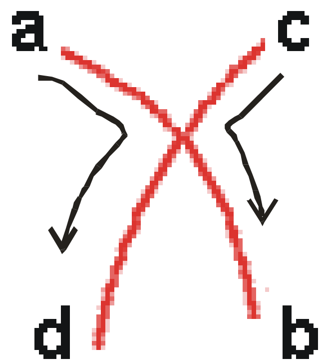
Objects perceived as grouped when they align

- Remain distinct even with overlap
- Preferred over abrupt directional changes





what most people see



not this

Continuity


nversie!
Met Concept7 realiseert Anderzorg toppositie in klanttevredenheid

Models from Different Perspectives

Some example models of human performance

Visual System	Biological Model
Model Human Processor	Higher-Level Model
Fitts’s Law	Model by Analogy
Gestalt Principles	Predict Interpretation

CSE 440: Introduction to HCI

User Interface Design, Prototyping, and Evaluation

Lecture 08:
Human Performance

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50

CSE 440: Introduction to HCI

User Interface Design, Prototyping, and Evaluation

Lecture 09:
Paper Prototyping
and Testing

James Fogarty
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Tuesday / Thursday
10:30 to 11:50

Is My Design Good?

This is not a meaningful question

- It can and will be answered with “Yes”

At least consider asking:

- “What are three good things about this design?”
- “What are three bad things about this design?”

But really the answer is “it depends”

- Remember that designs are used for tasks
- We should ask this in the context of tasks

Fidelity in Prototyping

High Fidelity

- Prototypes look like the final product

Low Fidelity

- Designer sketches with many details missing

We have discussed the value of staying lightweight in sketching, but this also applies to prototyping

High-Fidelity Prototypes Warp

Time and creativity

- Require precision (e.g., must choose a font)
- Specifying details takes time
- Can lose track of the big picture

Perceptions of a person reviewing or testing

- Representation communicates “finished”
- Comments often focus on color, fonts, alignment

Low-Fidelity Prototypes

Traditional methods take too long

- Sketches → Prototype → Evaluate → Iterate

Instead simulate the prototype

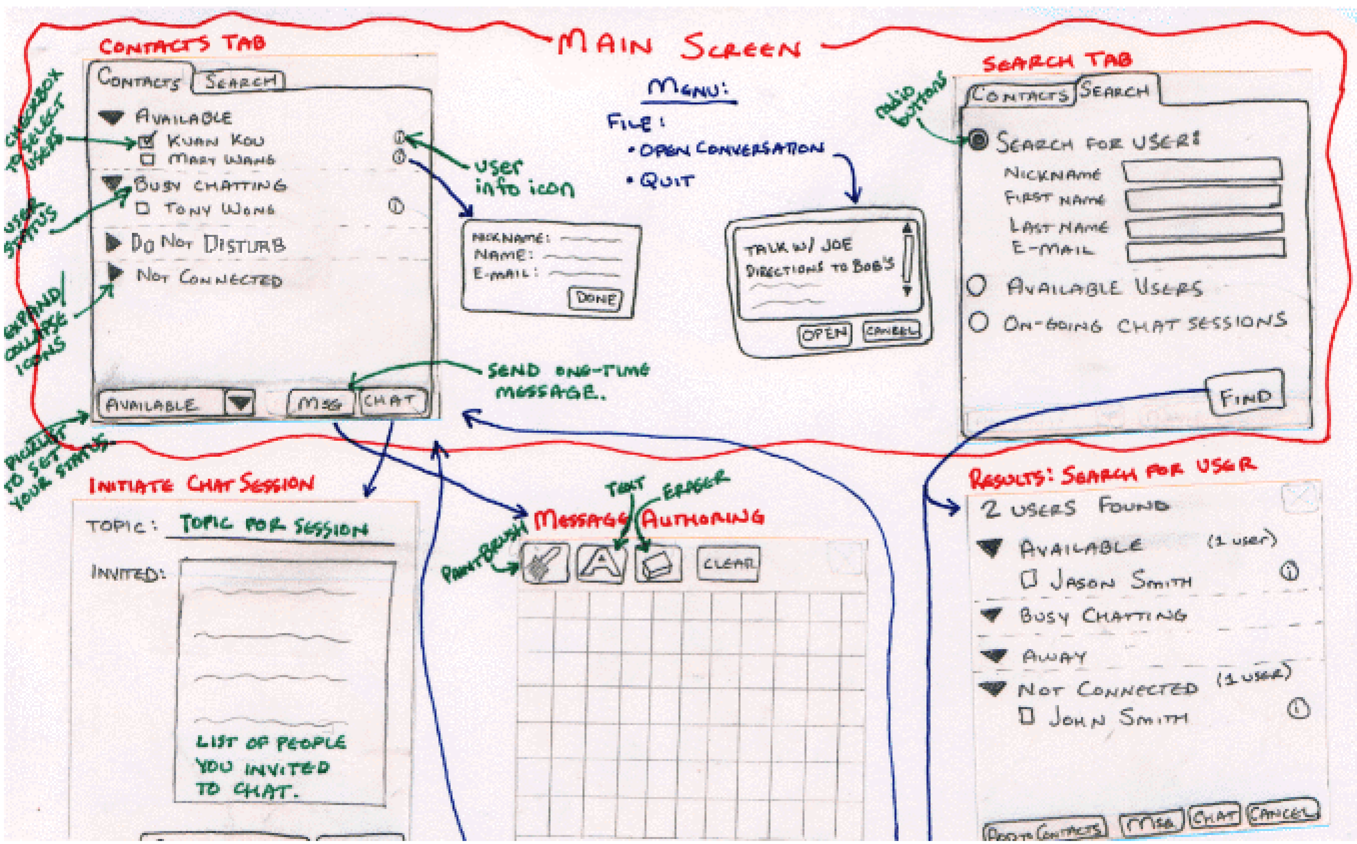
- Sketches → Evaluate → Iterate

Sketches act as prototypes

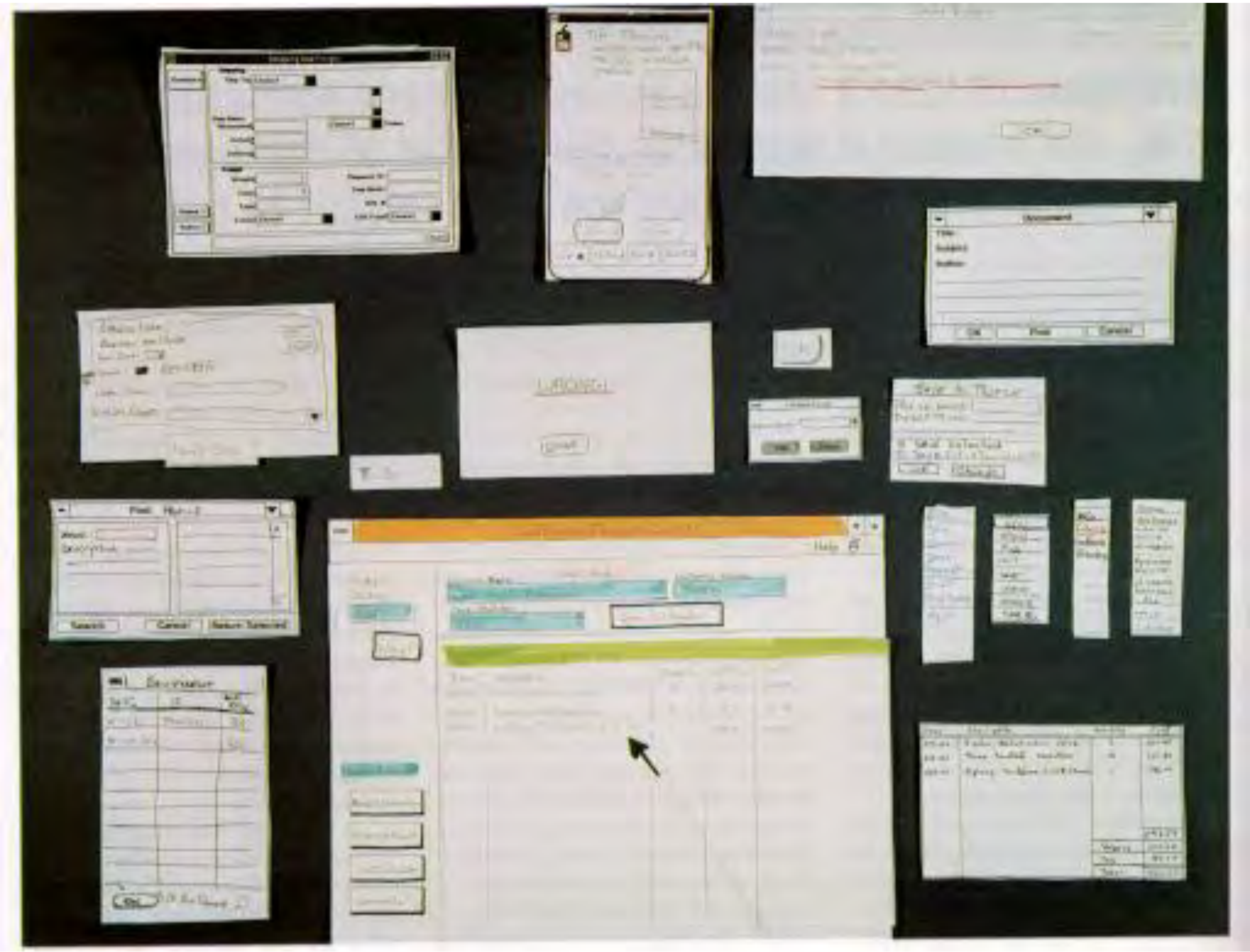
- A designer “plays computer”
- Other design team members observe & record

Kindergarten implementation skills reduce barriers to participation in design and testing

Sketches


MAIN SCREEN
CONTACTS TAB
Contacts
Search
Available
Kuan Kou
Mary Wang
Busy chatting
Tony Wong
Do Not Disturb
Not Connected
Available
MSG
CHAT
Checkbox to select users
user status
expand/collapse icons
picklist to set your status
user info icon
Nickname:
Name:
E-mail:
Done
send one-time message.
Menu:
File:
• Open Conversation
• Quit
Talk w/ Joe
Directions to Bob's
Open
Cancel
SEARCH TAB
radio buttons
Search for user:
Nickname
First Name
Last Name
E-mail
Available Users
On-going chat sessions
Find
INITIATE CHAT SESSION
Topic:
Topic for session
Invited:
List of people you invited to chat.
Text
Eraser
Paintbrush
MESSAGE AUTHORING
Clear
RESULTS: SEARCH FOR USER
2 users found
Available
(1 user)
Jason Smith
Busy Chatting
Away
Not Connected
(1 user)
John Smith
Add to Contacts
MSG
Chat
Cancel

Paper Prototype



Basic Materials

Heavy, white paper

Index cards

Post-its

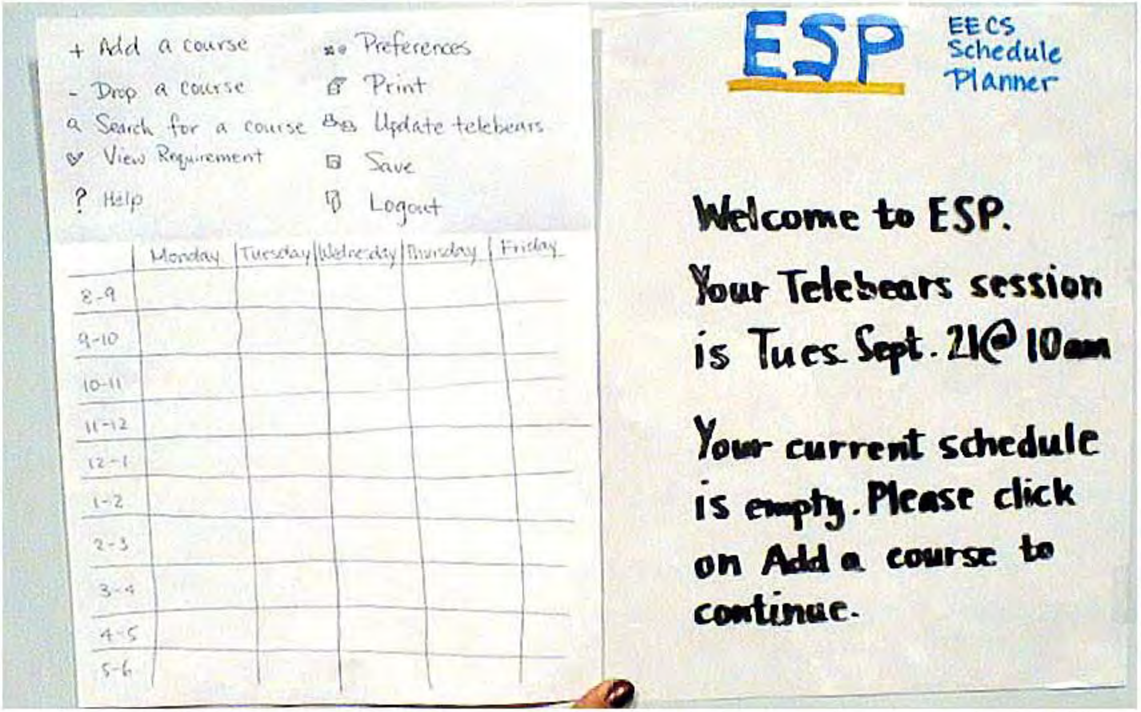
Tape, stick glue, correction tape

Pens and markers in many colors and sizes

Overhead transparencies

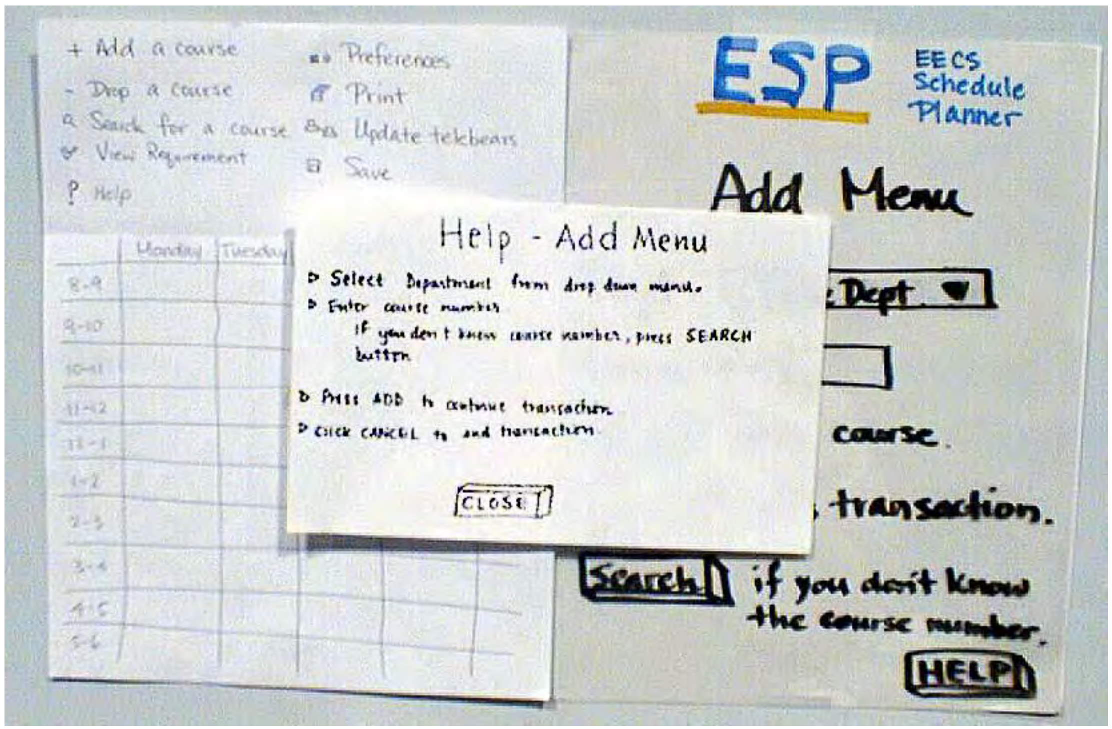
Scissors, X-Acto knife

Paper Prototype



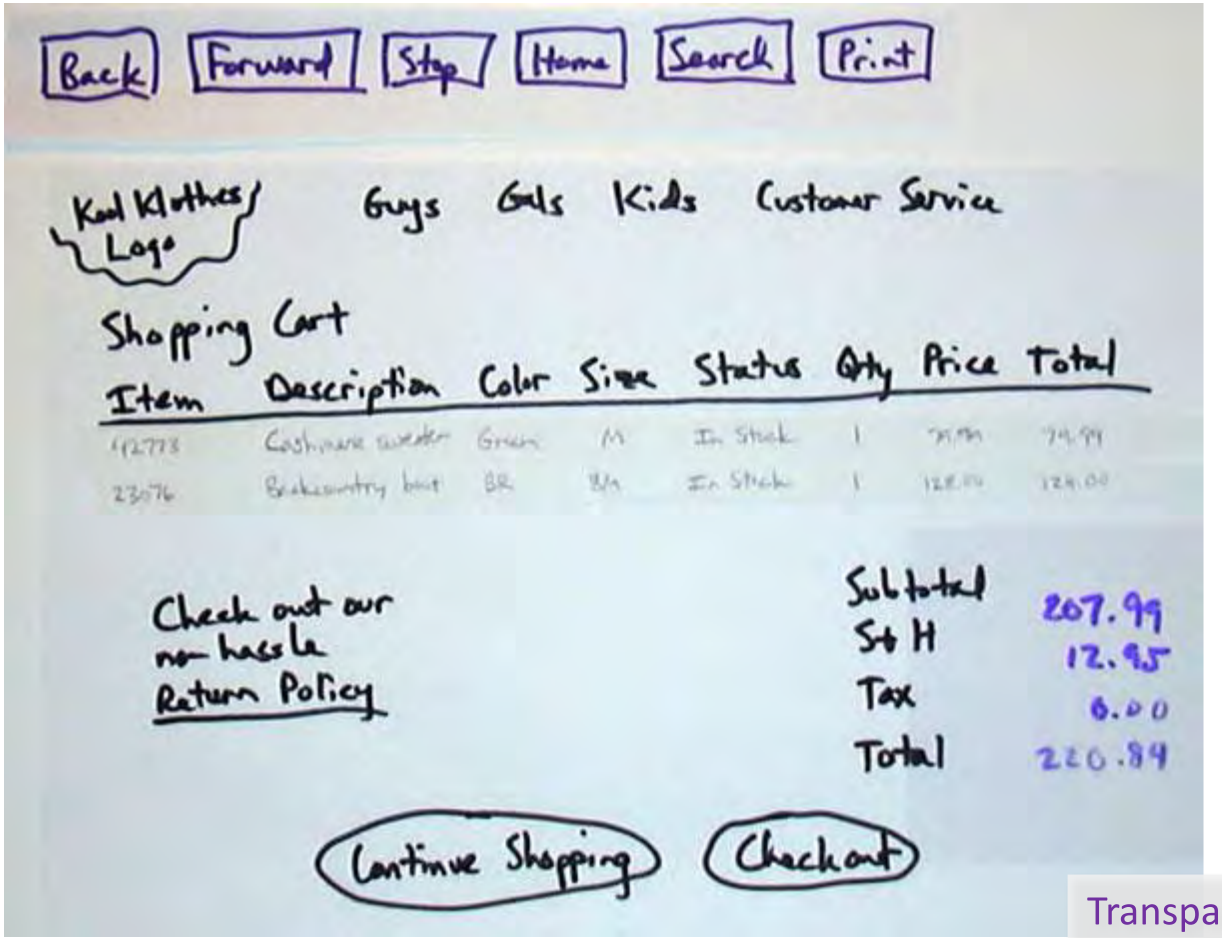
"Screen" faked with pre-constructed pieces

Paper Prototype



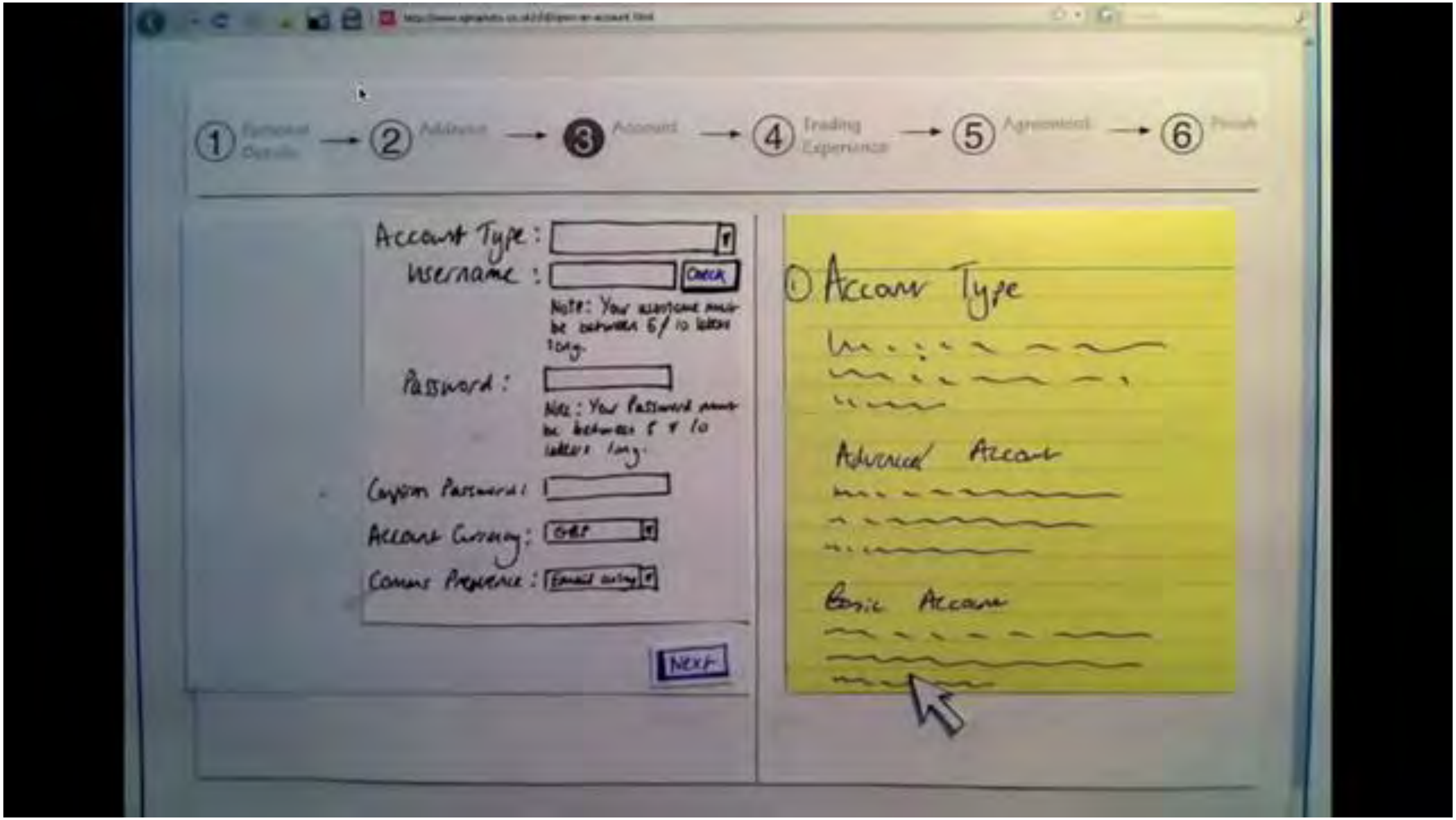
New pieces added in response to interaction

Paper Prototype

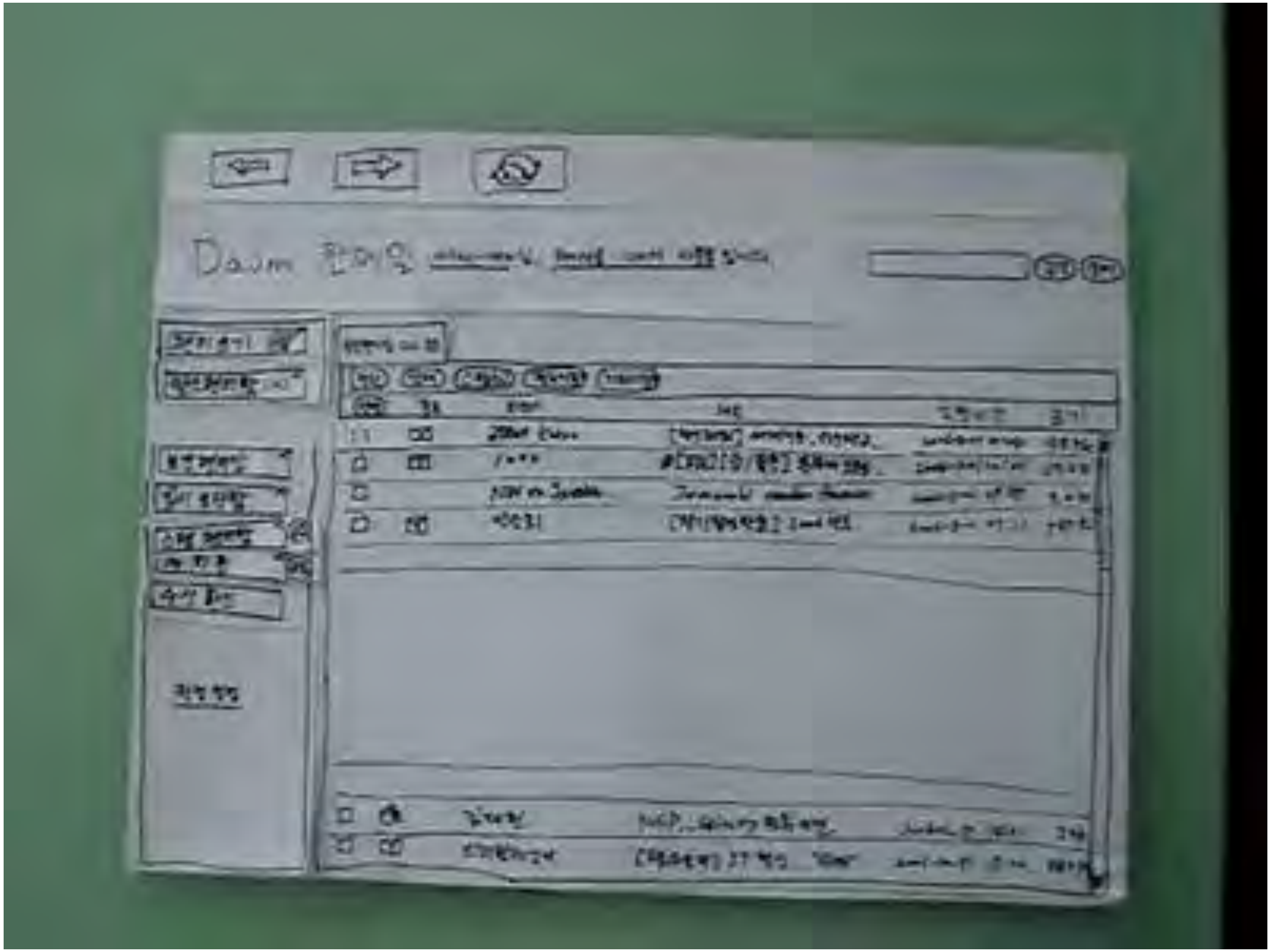


Transparencies allow flexible use of text

Paper Prototype as Communication



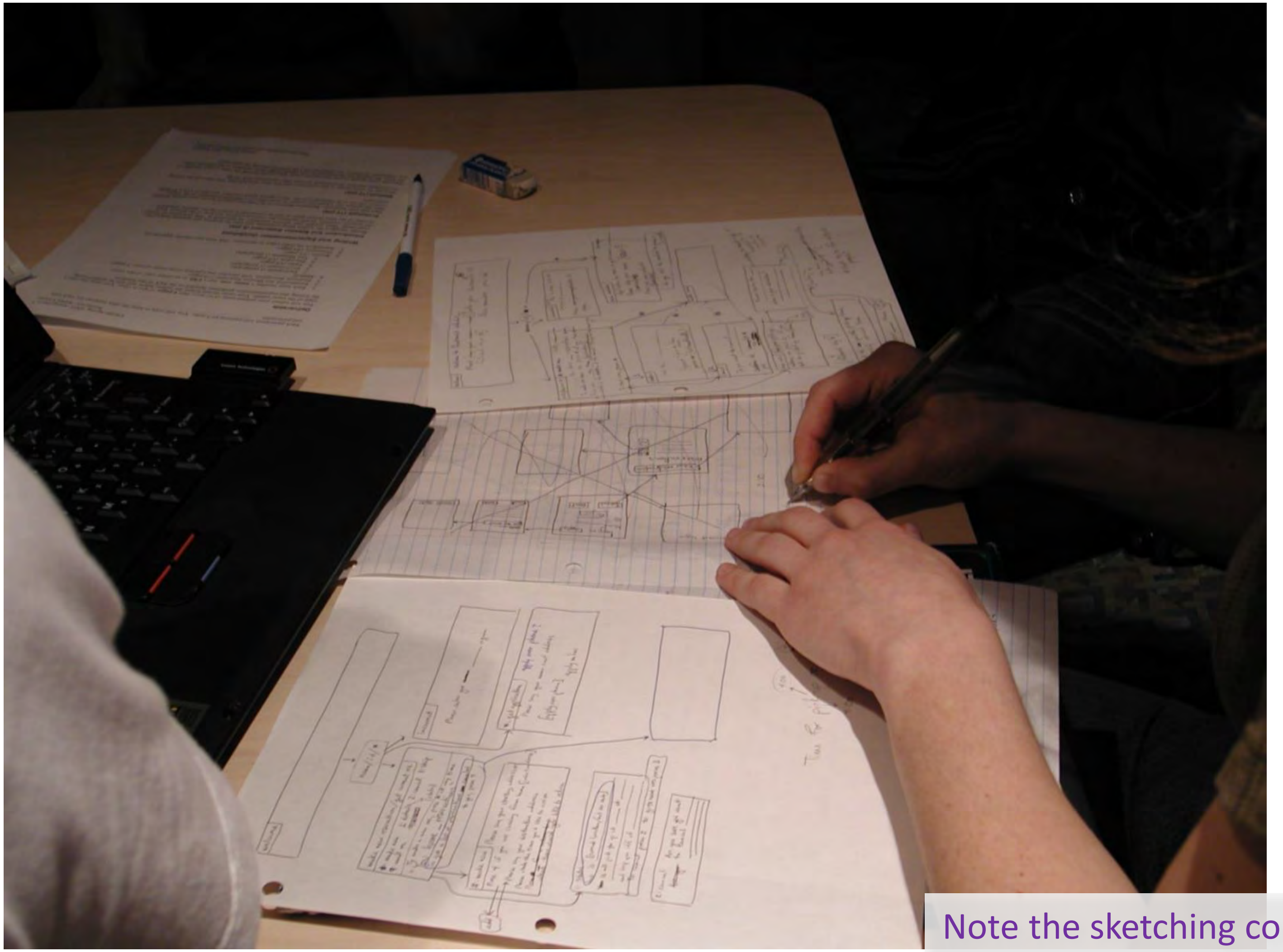
Paper Prototype as Evaluation



Constructing the Prototype

- Set a deadline
  - Do not think too long
  - Instead build it, then learn and iterate as you go
- Put different screen regions on cards
  - Anything that moves, changes, appears/disappears
- Ready responses for actions
  - Have those pull-down menus already made
  - Planned tasks can guide this
- Use photocopier to make many versions

Constructing the Prototype



Note the sketching continues

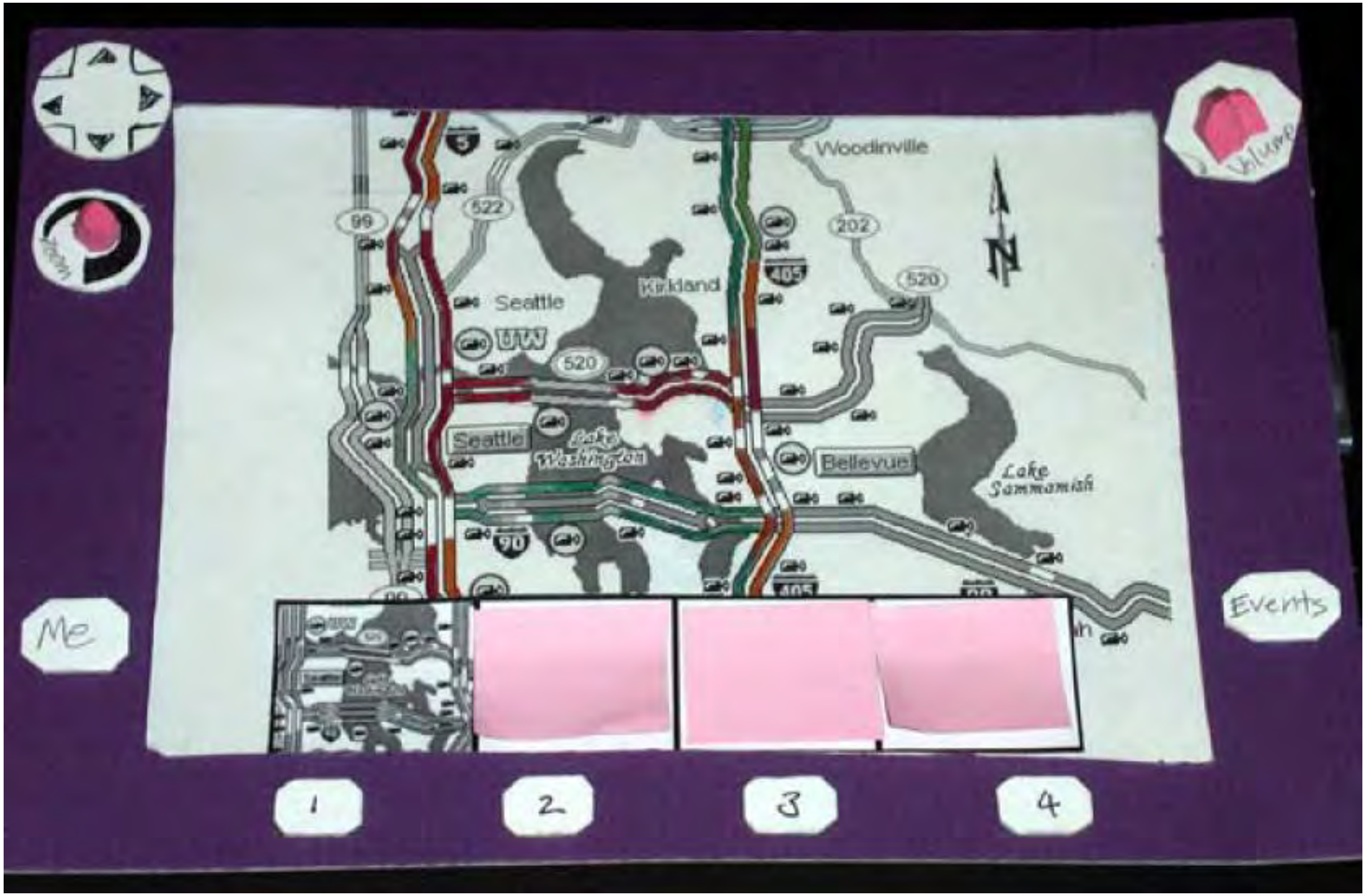
Constructing the Prototype

Planning what is needed given tasks

Constructing the Prototype

Prototyping physical form

Constructing the Prototype



Prototyping physical form

Constructing the Prototype

Remember your target platform constraints

Constructing the Prototype

Remember your target platform constraints

Why Usability Test?

Find and fix problems in a design

- Removes the expert blind spot
- Obtain data to unify team around changes
- Uncover unexpected behaviors

Results drive changes, sometimes innovations

In the long run, this is a win-win

- Both improves design and saves money

Deciding What Data to Collect

Process data

- Observations of what people do and think
- Focused on improving this process

Summary, statistical, or bottom-line data

- Summary of what happened
(time, errors, success)
- Focused on measurement

Deciding What Data to Collect

Process data

- Observations of what people do and think
- Focused on improving this process

Summary, statistical, or bottom-line data

- Summary of what happened (time, errors, success)
- Focused on measurement

Focus on process data

- Gives overview of where the problems are
- More useful than “too slow” or “too many errors”

Not a Scientific Experiment

- Focus is on improving the design
  - Experimental control is not as necessary
  - Data measurement is not as precise
  - Number of participants is fairly small
- Changes can be made
  - Fix the obviously broken design
  - Quickly explore alternatives
  - Modify the focus of testing between participants

Task-Based Usability

Set up an overall context

“We are interested in improving people’s ability to save, update, and use contacts in their phones.”

Then prescribe tasks

1. Try to find the contacts list in the phone
2. View the contact information for John Smith
3. Change John Smith’s number to 555-555-5555

Tasks can be chained to naturally lead to next

Stages of a Usability Test

Preparation

Introducing the Test

Conducting the Test

Debriefing

Analyzing the Data

Creating the Report

Preparing for a Test

Select your participants

Friends and family are not your design targets

Understand background, consider recruiting questionnaire

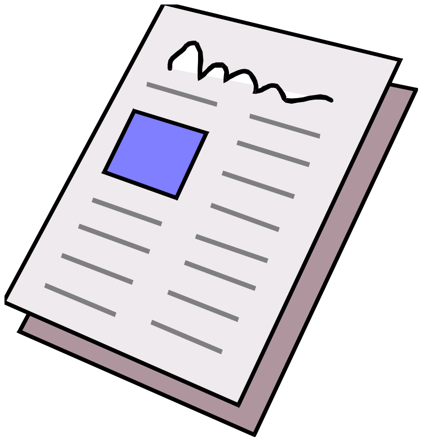
Prepare tasks and paper prototype

Practice to avoid “bugs” in your prototype

Usability Test Proposal

A report that contains

- Objective, Description of System, Environment and Materials, Participants, Methodology, Tasks, Test Measures



Work through it with colleagues to debug test

Reuse when presenting report of testing results

Introducing the Test

Address Feelings of Judgment

"Today we are interested in learning about X.
That's where you come in!"

"I did not develop X.
I just want to know what the problems are with X."

"It is X being tested here, not you."

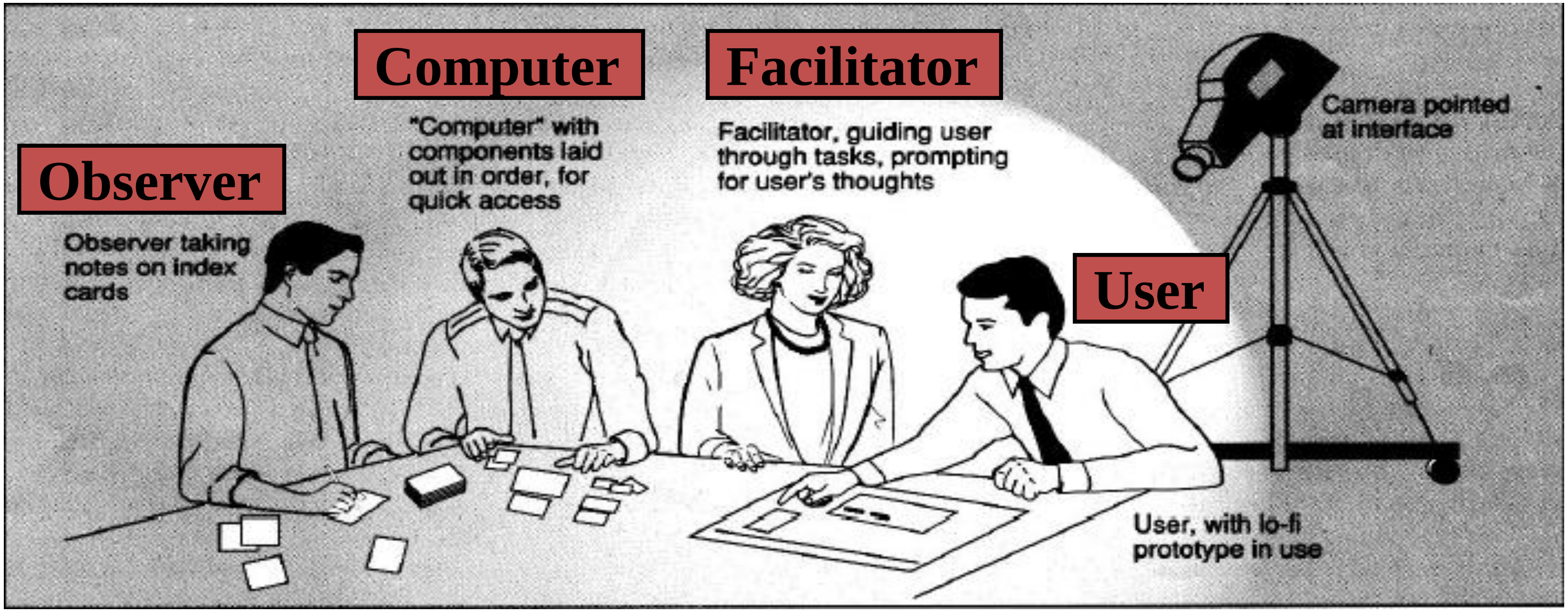
Introducing the Test

Set Expectations for Process

"It is essential you think out loud while working with X. Tell me constantly what you are thinking, looking for, wondering, confused about, surprised, and so on. If you stop talking, I will prompt you to talk."

"I will not be able to answer your questions when you start using X. Do you have any questions now?"

Conducting a Test



See the Gommol reading tips on a test session

Rettig, 1994

Talk-Aloud Prompts

"Tell me what you are trying to do."

"Please keep talking."

"Tell me what you are thinking."

"Are you looking for something? What?"

"What did you expect to happen just now?"

"What do you mean by that?"

"Talk-aloud" is similar but distinct from "think-aloud"

Most do not know or care about the difference,
so you may see the terms used interchangeably

Insight Problems

When people are trying to figure something out, talking aloud can prevent needed "insight"

If your participant is really baffled, it might not be the best time to prompt them to keep talking

- Wait for a natural break, and then ask "What were you thinking just there?"

Retrospective talk-aloud

- Record session,
  talk through immediately afterward

Answering Questions

Remember the purpose of this test

- You would not be there "in real life"
- You want to see if they can figure it out
- You want to see how hard it is
- You want to see how catastrophic the outcome is

But you do not want to punish the person or completely undermine the rest of the session

- Note any help you provide as a major failure
- Do not allow observing engineers to help

Debriefing

Give them more details about what you were interested in discovering, with their help

Answer any questions they have

- Now you can show them how to accomplish the tasks, talk about what you learned from the test

Thank them for their time

- Appropriate to give some compensation

Analyzing and Reporting the Results

Tests yield many forms of data

Quantitative counts

- time, success/failure
- confusions, errors, workarounds

Observations

- notes about when, where, why, how above occur

Participant comments and feedback

- during session of via a questionnaire

Analyzing and Reporting the Results

Summarize the data

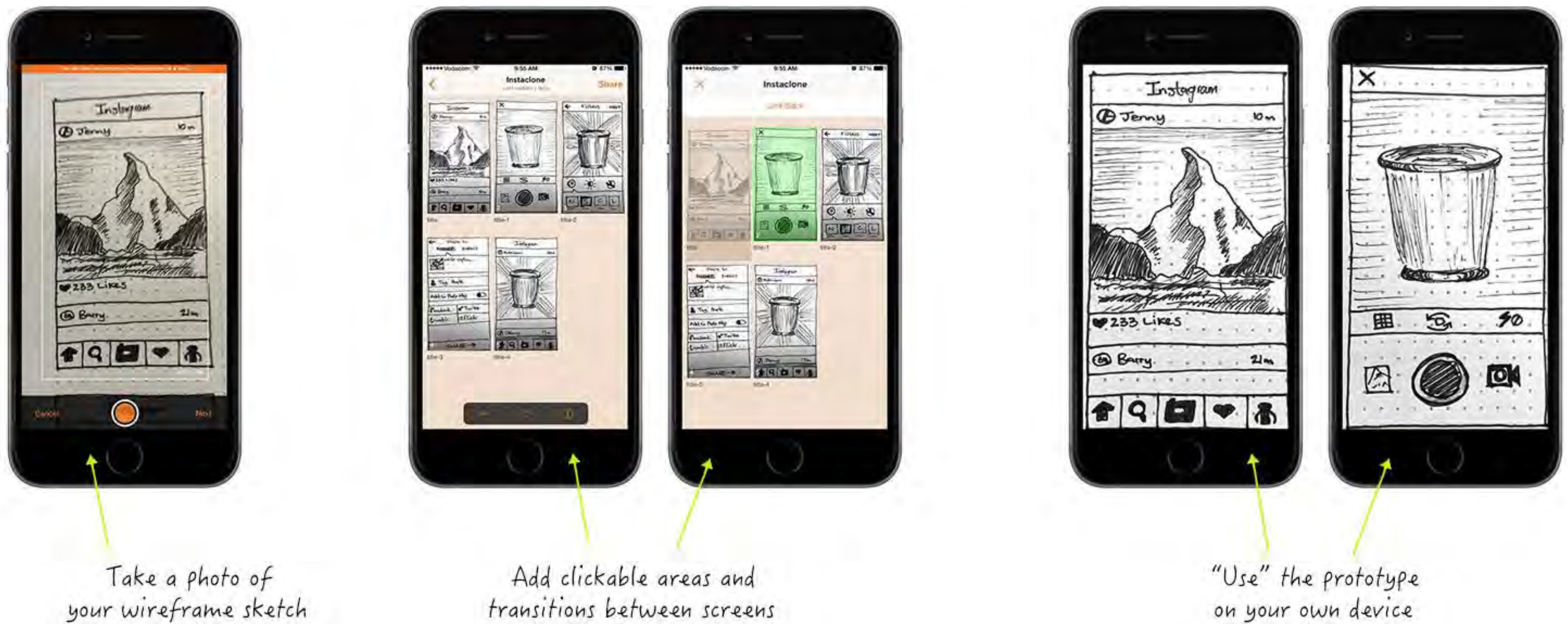
Make a list of critical incidents

- can be positive and negative
- include references back to original data
- try to judge why each difficulty occurred

Sort and prioritize findings

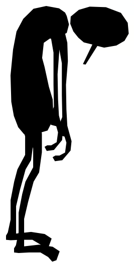
- what does data tell you
- what are the important results
- anything missing from test

Careful Certain Temptations



POP

Ethical Considerations



Testing is stressful, can be distressing

- people can leave in tears

You have a responsibility to alleviate

- make voluntary with informed consent
- avoid pressure to participate
- let them know they can stop at any time
- stress that you are testing the system, not them
- make collected data as anonymous as possible

Human Subjects Approvals

Research requires human subjects review of process

This does not formally apply to your design work

But understand why we do this and check yourself

Companies are judged in the eye of the public

Public Announcement

WE WILL PAY YOU $4.00 FOR ONE HOUR OF YOUR TIME

Persons Needed for a Study of Memory

*We will pay five hundred New Haven men to help us complete a scientific study of memory and learning. The study is being done at Yale University.

*Each person who participates will be paid $4.00 (plus 50c carfare) for approximately 1 hour's time. We need you for only one hour: there are no further obligations. You may choose the time you would like to come (evenings, weekdays, or weekends).

*No special training, education, or experience is needed. We want:

Factory workers	Businessmen	Construction workers
City employees	Clerks	Salespeople
Laborers	Professional people	White-collar workers
Barbers	Telephone workers	Others

All persons must be between the ages of 20 and 50. High school and college students cannot be used.

*If you meet these qualifications, fill out the coupon below and mail it now to Professor Stanley Milgram, Department of Psychology, Yale University, New Haven. You will be notified later of the specific time and place of the study. We reserve the right to decline any application.

*You will be paid $4.00 (plus 50c carfare) as soon as you arrive at the laboratory.

TO:
PROF. STANLEY MILGRAM, DEPARTMENT OF PSYCHOLOGY, YALE UNIVERSITY, NEW HAVEN, CONN. I want to take part in this study of memory and learning. I am between the ages of 20 and 50. I will be paid $4.00 (plus 50c carfare) if I participate.

NAME (Please Print). . . . .

ADDRESS . . . .

TELEPHONE NO. . . . . Best time to call you . . . .

AGE . . . . OCCUPATION . . . . SEX . . . . . .
CAN YOU COME:

WEEKDAYS . . . . EVENINGS . . . . . . WEEKENDS . . . .

CSE 440: Introduction to HCI

User Interface Design, Prototyping, and Evaluation

Lecture 09:
Paper Prototyping
and Testing

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50

CSE 440: Introduction to HCI

User Interface Design, Prototyping, and Evaluation

Lecture 10:
Interface
Implementation

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50

Tools and Interfaces

Why Interface Tools?

Case Study of Model-View-Controller

Case Study of Animation

Sapir-Whorf Hypothesis

Thoughtfulness in Tools

Case Study in Self-Tracking

Sequential Programs

Program takes control, prompts for input

Person waits
on the program

Program says when
it is ready for more
input, which the
person then provides

Sequential Programs

```
while true {
   print “Prompt for Input”
   input = read_line_of_text()
   output = do_work()
   print output
}
```

Person is literally modeled as a file

Event-Driven Programming

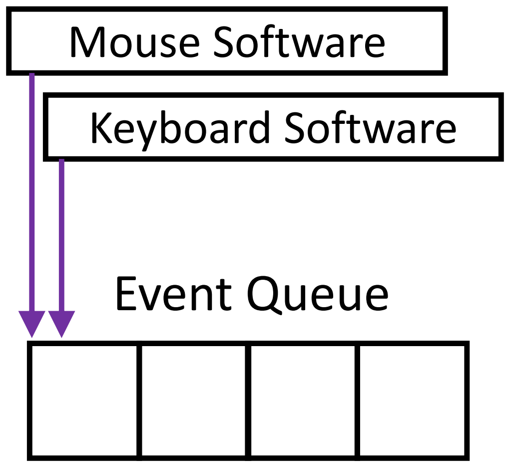
A program waits for a person to provide input

All communication done via events

- “mouse down”, “item drag”, “key up”

All events go to a queue

- Ensures events handled in order
- Hides specifics from applications



How many of these queues? How can you tell?

Basic Interactive Software Loop

```
do {
   e = read_event();
   dispatch_event(e);
   if (damage_exists())
      update_display();
} while (e.type != WM_QUIT);
```

} input

} processing

} output

All interactive software has this somewhere

Basic Interactive Software Loop

Have you ever written this loop?

Basic Interactive Software Loop

Have you ever written this loop?

Contrast with:

> "One of the most complex aspects of Xlib programming is designing the event loop, which must take into account all of the possible events that can occur in a window."
>
> Nye & O'Reilly, X Toolkit Intrinsics Programming Manual, vol. 4, 1990, p. 241.

Understanding Tools

We use tools because they

- Identify common or important practices
- Package those practices in a framework
- Make it easy to follow those practices
- Make it easier to focus on our application

What are the benefits of this?

Understanding Tools

We use tools because they

- Identify common or important practices
- Package those practices in a framework
- Make it easy to follow those practices
- Make it easier to focus on our application

What are the benefits of this?

- Being faster allows more iterative design
- Implementation is generally better in the tool
- Consistency across applications using same tool

Understanding Tools

Why is designing tools difficult?

- Need to understand the core practices and problems
- Those are often evolving with technology and design

Example: Responsiveness in event-driven interface

- Event-driven interaction is asynchronous
- How to maintain responsiveness in the interface while executing some large computation?

Understanding Tools

Why is designing tools difficult?

- Need to understand the core practices and problems
- Those are often evolving with technology and design

Example: Responsiveness in event-driven interface

- Cursor:
  - WaitCursor vs. CWaitCursor vs. In Framework
- Progress Bar:
  - Data Races vs. Idle vs. Loop vs. Worker Objects

Fundamental Tools Terminology

Threshold vs. Ceiling

- Threshold: How hard to get started
- Ceiling: How much can be achieved
- These depend on what is being implemented

Path of Least Resistance

- Tools influence what interfaces are created

Moving Targets

- Changing needs make tools incomplete or obsolete

Myers et al, 2000
http://dx.doi.org/10.1145/344949.344959

Tools and Interfaces

Why Interface Tools?

Case Study of Model-View-Controller

Case Study of Animation

Sapir-Whorf Hypothesis

Thoughtfulness in Tools

Case Study in Self-Tracking

Model-View-Controller

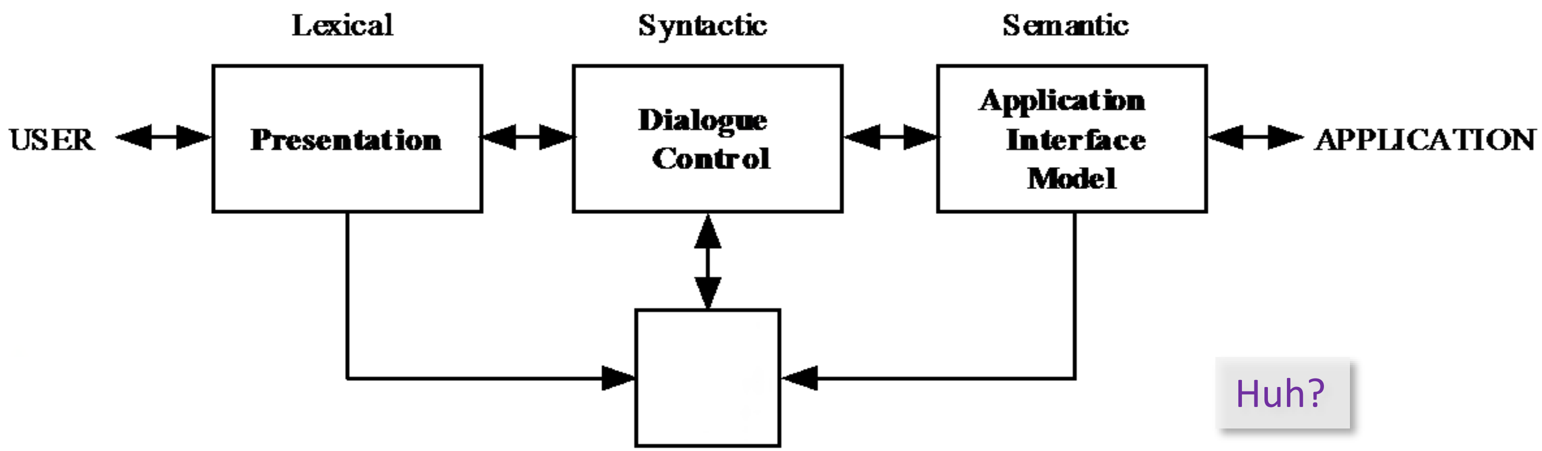
How to organize the code of an interface?

This is a surprisingly complicated question, with unstated assumptions requiring significant background to understand and resolve

Seeheim Model

Buxton, 1983
http://dx.doi.org/10.1145/988584.988586

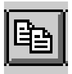
Results from 1985 workshop on user interface management systems, driven by goals of portability and modifiability, based in separating the interface from application functionality



Huh?

Seeheim Model

Lexical - Presentation

External presentation of interface — e.g., “add” vs. “append” vs. “^a” vs. 

Generates the display, receive input — e.g., how to make a “menu” or “button”

Syntactic - Dialog Control

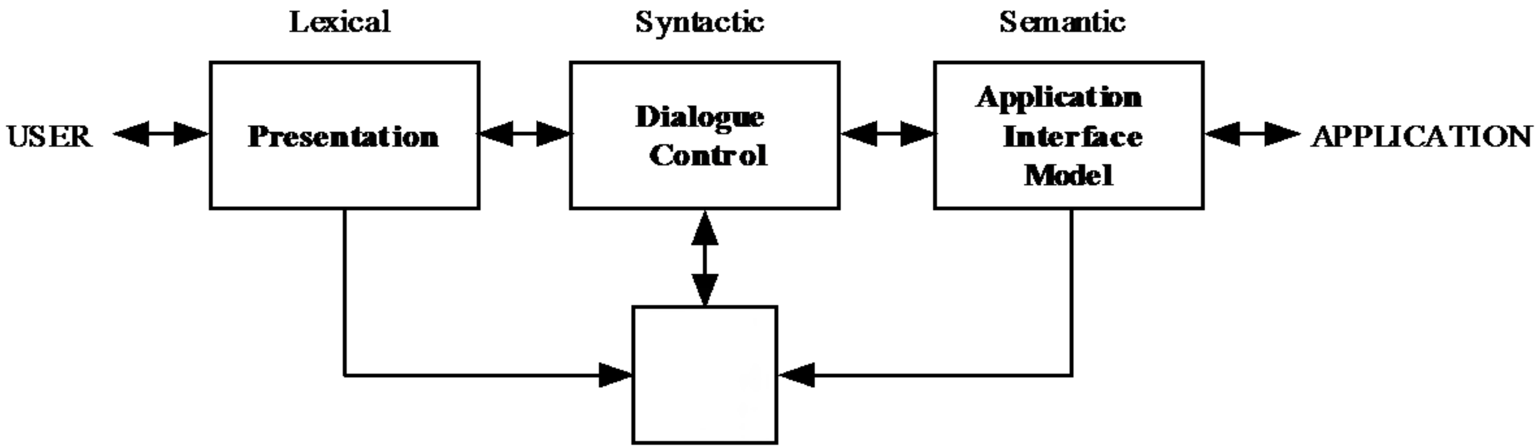
Parsing of tokens into syntax — e.g., three-state model, interface modes

Maintain state

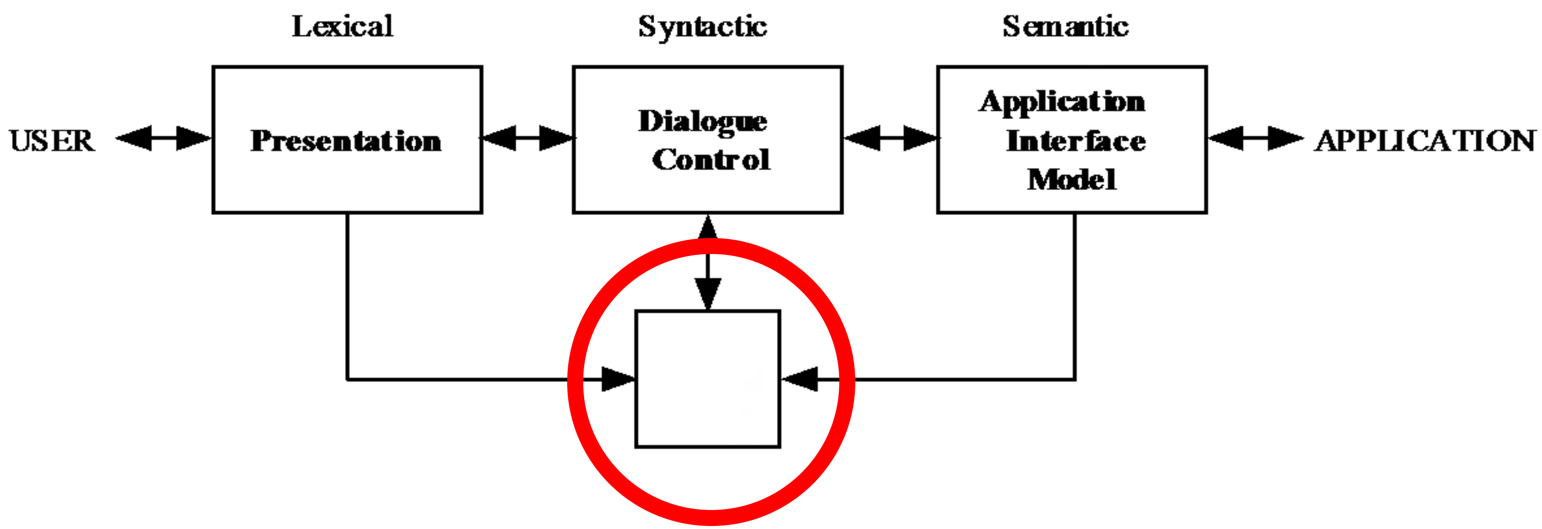
Semantic - Application Interface Model

Defines interaction between interface and rest of software — e.g., drag-and-drop target highlighting

Seeheim Model

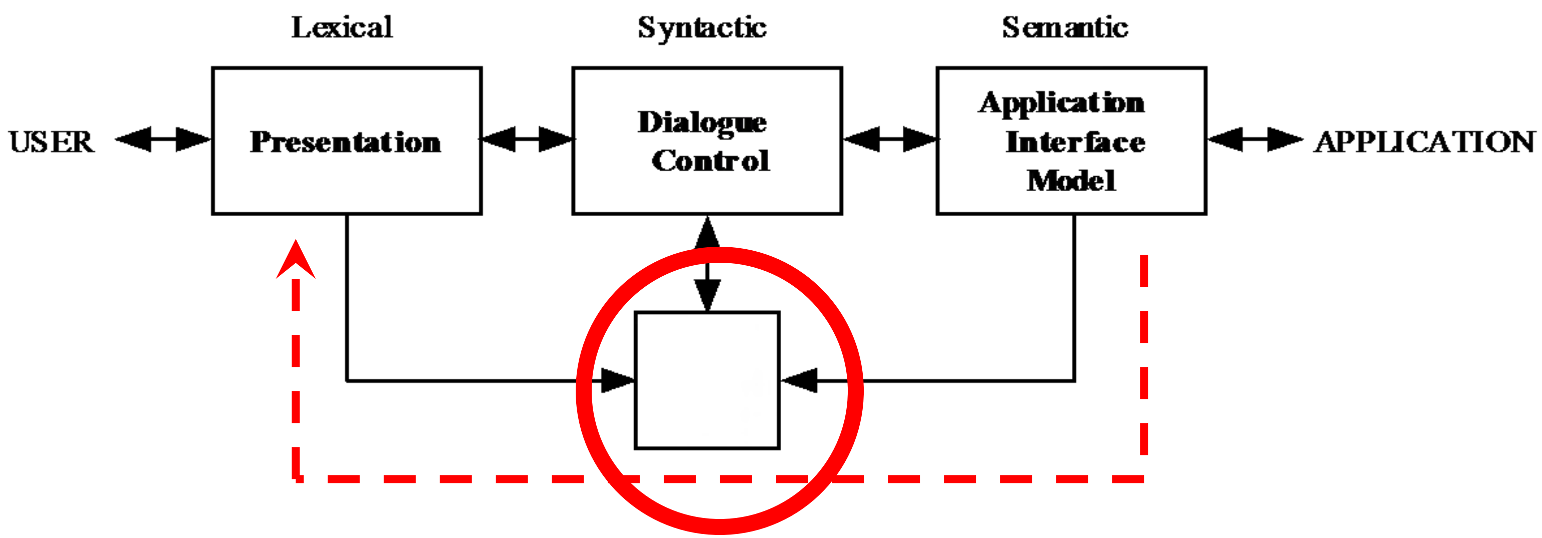


Seeheim Model



Huh?

Seeheim Model



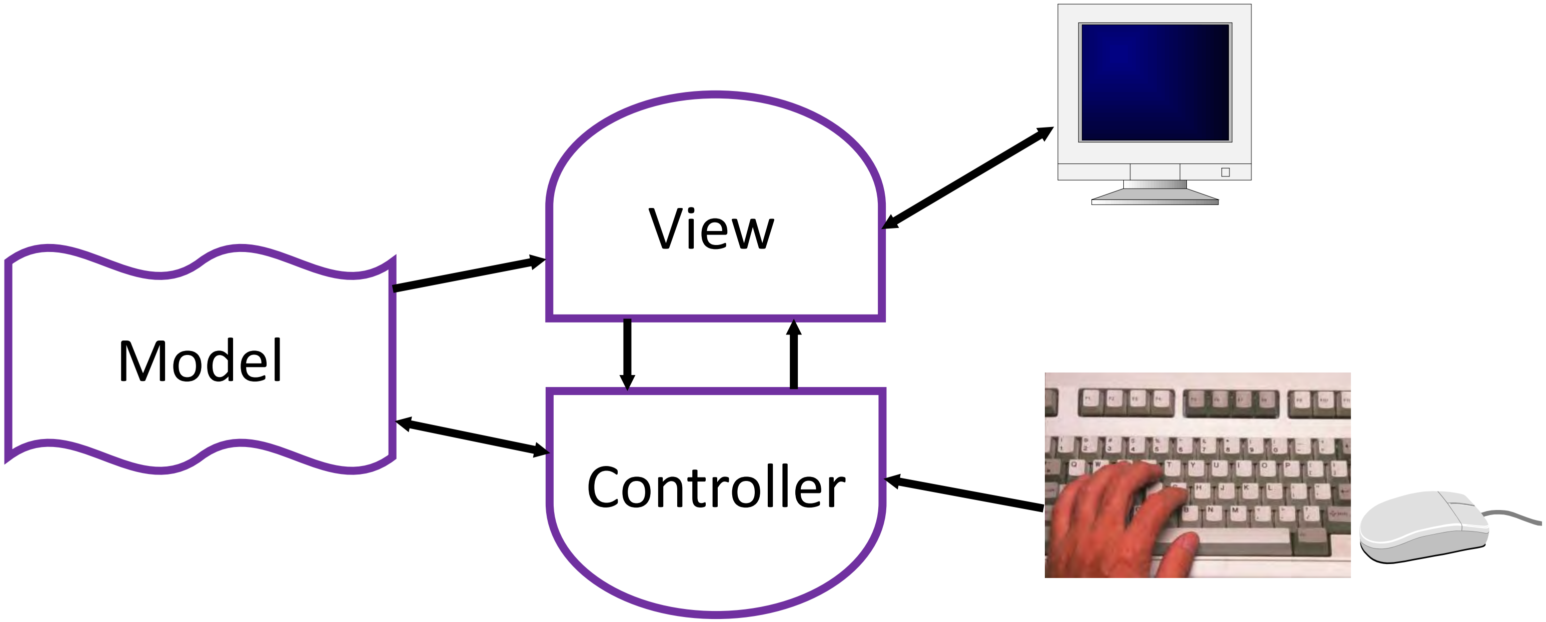
Rapid Semantic Feedback

In practice, all of the code goes in here

Model-View-Controller

Introduced by Smalltalk developers at PARC

Partitions application to be scalable, maintainable



View / Controller Relationship

In theory:

Pattern of behavior in response to input events (i.e., concerns of the controller) are independent of visual geometry (i.e., concerns of the view)

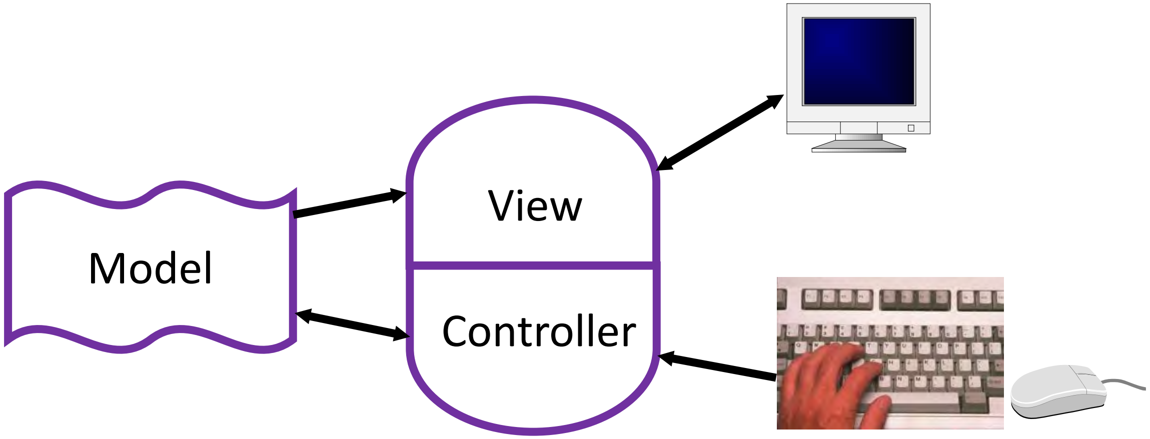
Controller contacts view to interpret what input events mean in context of a view (e.g., selection)

View / Controller Relationship

In practice:

View and controller often tightly intertwined, almost always occur in matched pairs

Many architectures combine into a single class



Model-View-Controller

MVC separates concerns and scales better than global variables or putting everything together

Separation eases maintenance

- Can add new fields to model, new views can leverage, old views will still work

- Can replace model without changing views

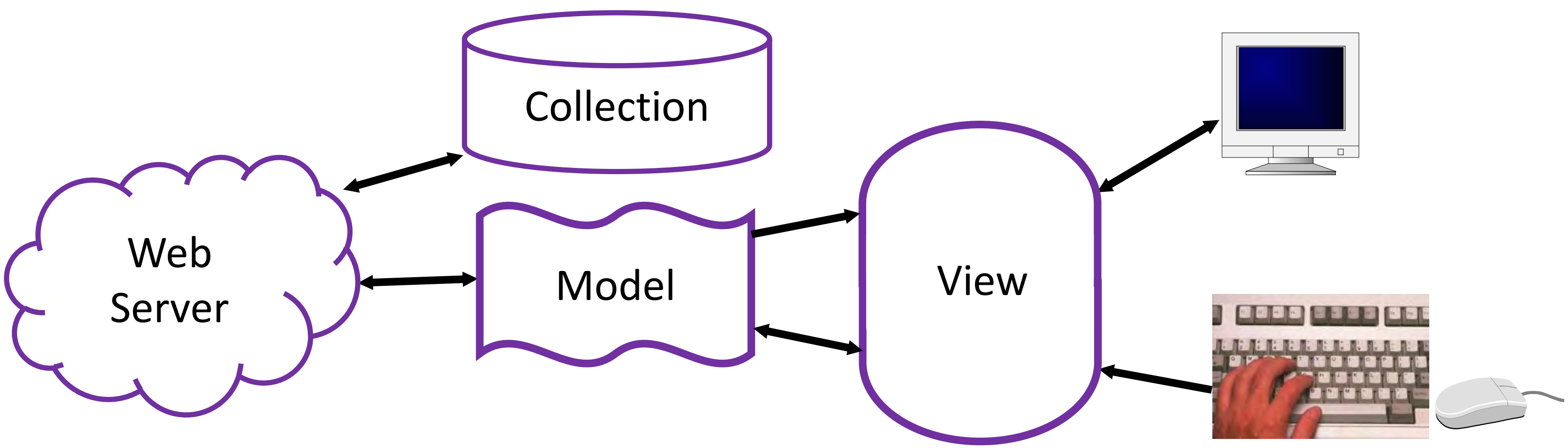
Separation of “business logic” can require care

- May help to think of model as the client model

Model-View-Collection on the Web

Core ideas manifest differently according to needs

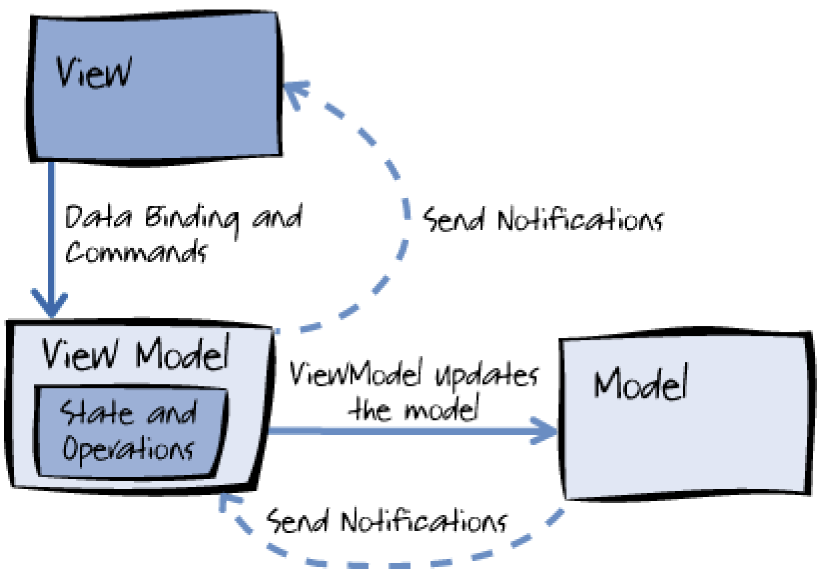
- For example, backbone.js implements client views of models, with REST API calls to web server
- Web tools often implement views as templates



Model View View-Model

Design to support data-binding
by minimizing functionality in view

Also allows greater separation of expertise



Tools and Interfaces

Why Interface Tools?

Case Study of Model-View-Controller

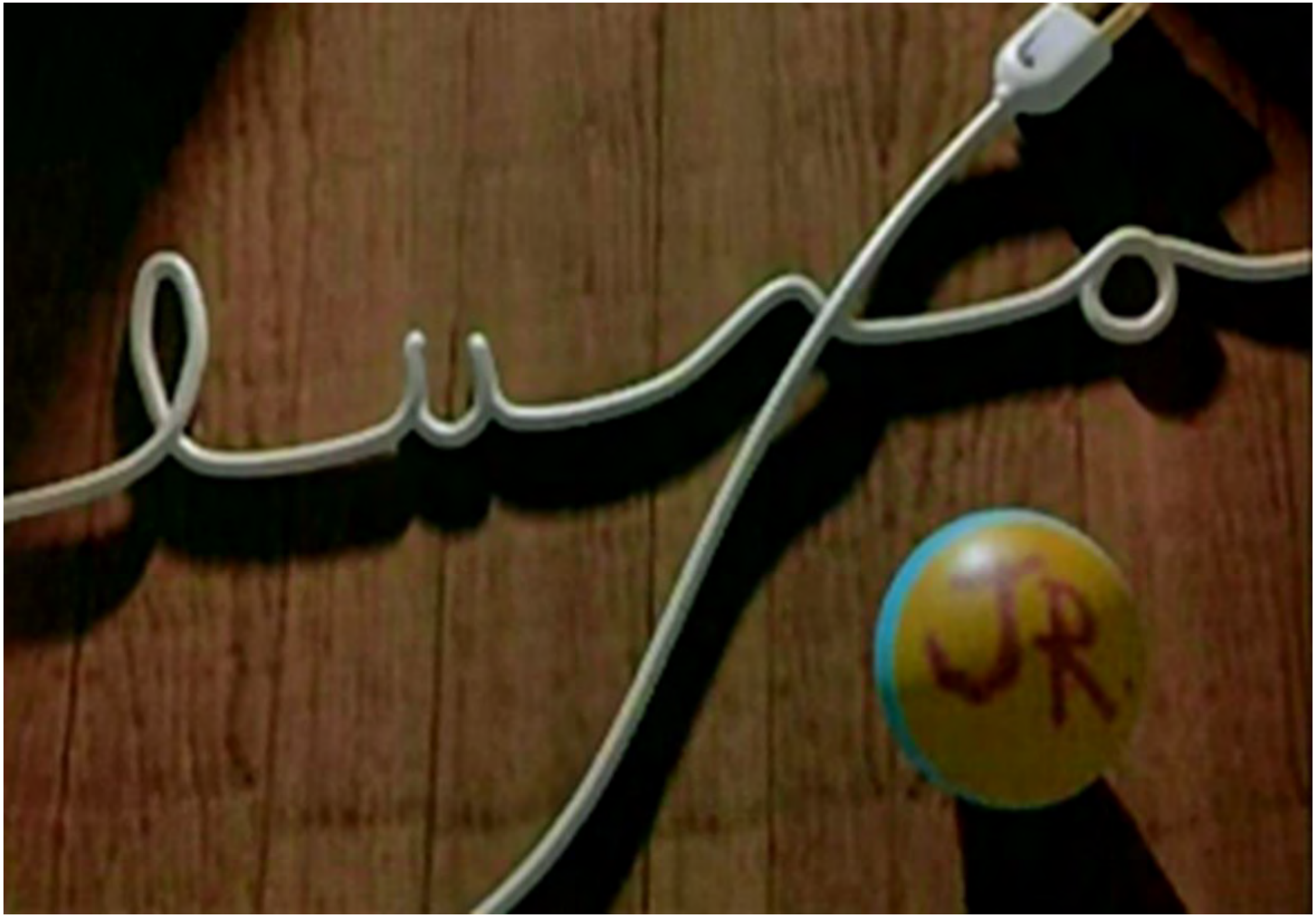
Case Study of Animation

Sapir-Whorf Hypothesis

Thoughtfulness in Tools

Case Study in Self-Tracking

Luxor Jr.



Animation Case Study

Principles of Traditional
Animation Applied to
3D Computer Animation

Lasseter, 1987

http://dx.doi.org/10.1145/37402.37407

Computer Graphics, Volume 21, Number 4, July 1987

PRINCIPLES OF TRADITIONAL ANIMATION APPLIED TO 3D COMPUTER ANIMATION

John Lasseter
Pixar
San Rafael
California

"There is no particular mystery in animation... it's really very simple, and like anything that is simple, it is about the hardest thing in the world to do." Bill Tytla at the Walt Disney Studio, June 28, 1937. [14]

ABSTRACT

This paper describes the basic principles of traditional 2D hand drawn animation and their application to 3D computer animation. After describing how these principles evolved, the individual principles are detailed, addressing their meanings in 2D hand drawn animation and their application to 3D computer animation. This should demonstrate the importance of these principles to quality 3D computer animation.

CR Categories and Subject Descriptors:
I.3.6 *Computer Graphics* : Methodology and Techniques - Interaction techniques;
I.3.7 *Computer Graphics* : Three-dimensional Graphics and Realism - Animation;
J.5 *Computer Applications* : Arts and Humanities - Arts, fine and performing.

General Terms: Design, Human Factors.

Additional Keywords and Phrases: Animation Principles, Keyframe Animation, Squash and Stretch, Luxo Jr.

1. INTRODUCTION

Early research in computer animation developed 2D animation techniques based on traditional animation. [7] Techniques such as storyboarding [11], keyframe animation, [4,5] inbetweening, [16,22] scan/paint, and multiplane backgrounds [17] attempted to apply the cel animation process to the computer. As 3D computer animation research matured, more resources were devoted to image rendering than to animation. Because 3D computer animation uses 3D models instead of 2D drawings, fewer techniques from traditional animation were applied. Early 3D animation systems were script based [6], followed by a few spline-interpolated keyframe systems. [22] But these systems were developed by companies for internal use, and so very few traditionally trained animators found their way into 3D computer animation.

The last two years have seen the appearance of reliable, user friendly, keyframe animation systems from such companies as Wavefront Technologies Inc., [29] Alias Research inc., [2] Abel Image Research (RIP), [1] Vertigo Systems Inc., [28] Symbolics Inc., [25] and others. These systems will enable people to produce more high quality computer animation. Unfortunately, these systems will also enable people to produce more bad computer animation.

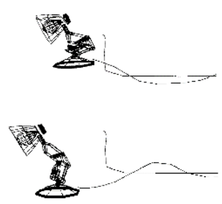
Much of this bad animation will be due to unfamiliarity with the fundamental principles that have been used for hand drawn character animation for over 50 years. Understanding these principles of traditional animation is essential to producing good computer animation. Such an understanding should also be important to the designers of the systems used by these animators.

In this paper, I will explain the fundamental principles of traditional animation and how they apply to 3D keyframe computer animation.

2. PRINCIPLES OF ANIMATION

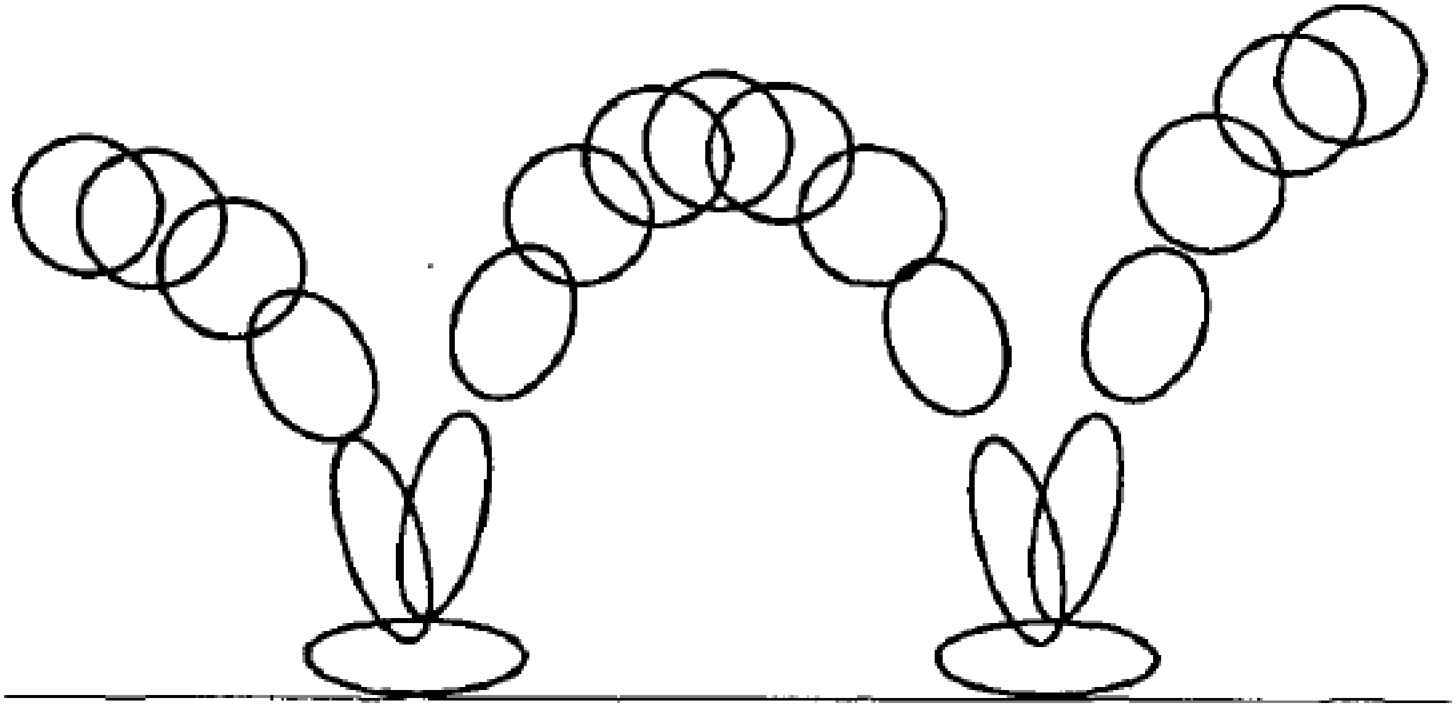
Between the late 1920's and the late 1930's animation grew from a novelty to an art form at the Walt Disney Studio. With every picture, actions became more convincing, and characters were emerging as true personalities. Audiences were enthusiastic and many of the animators were satisfied, however it was clear to Walt Disney that the level of animation and existing characters were not adequate to pursue new story lines-- characters were limited to certain types of action and, audience acceptance notwithstanding, they were not appealing to the eye. It was apparent to Walt Disney that no one could successfully animate a humanized figure or a life-like animal; a new drawing approach was necessary to improve the level of animation exemplified by the *Three Little Pigs* . [10]

FIGURE 1. Luxo Jr.'s hop with overlapping action on cord. Flip pages from last page of paper to front. The top figures are frames 1-5, the bottom are frames 6-10.

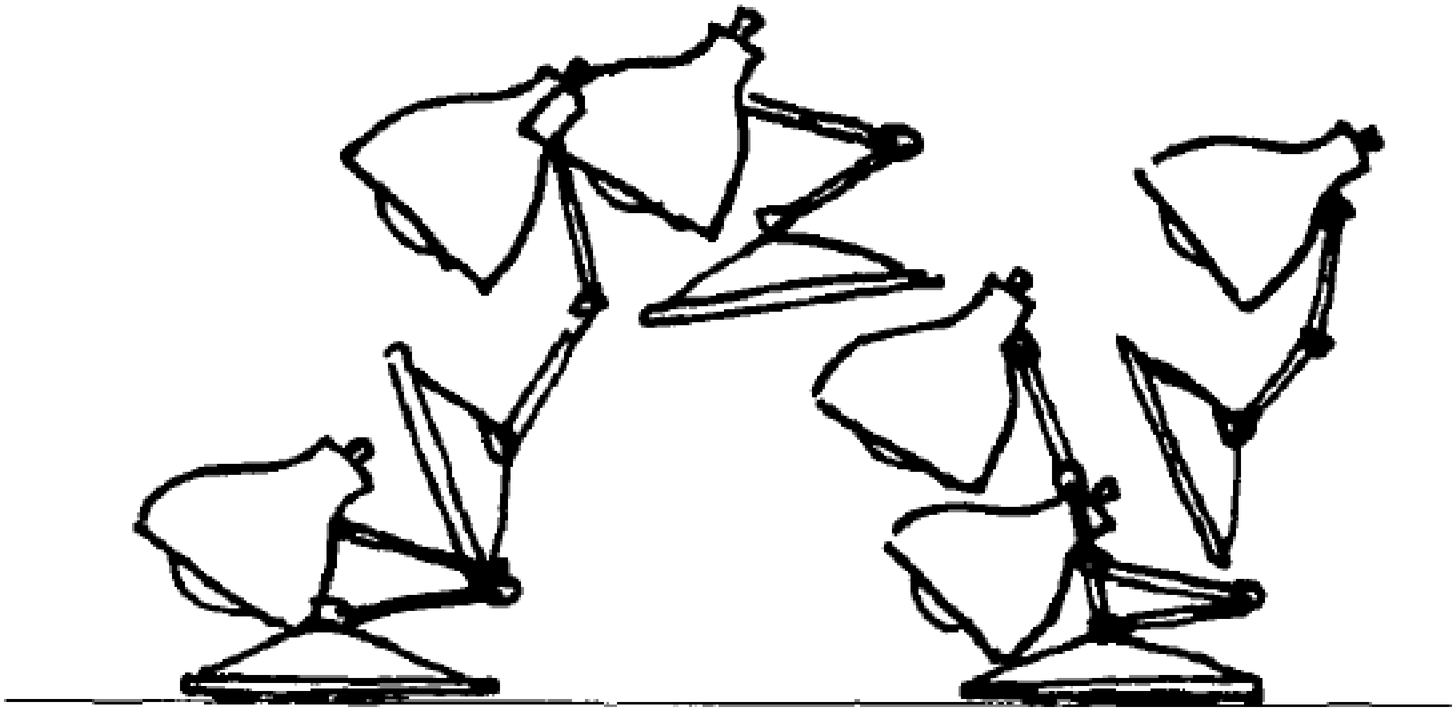


"Luxo" is a trademark of Jac Jacobsen Industries AS.

Squash and Stretch



Squash and Stretch



Squash and Stretch

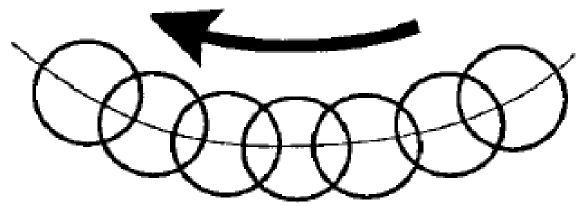


FIGURE 4a. In slow action, an object's position overlaps from frame to frame which gives the action a smooth appearance to the eye.

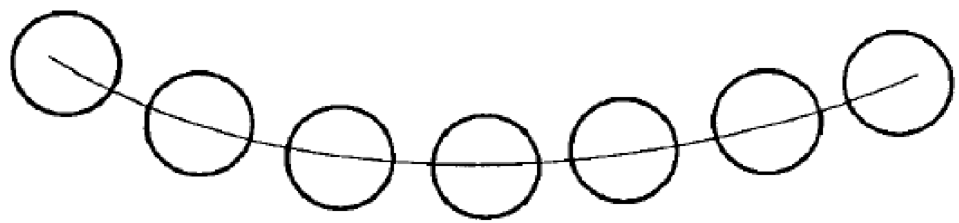


FIGURE 4b. Strobing occurs in a faster action when the object's positions do not overlap and the eye perceives seperate images.

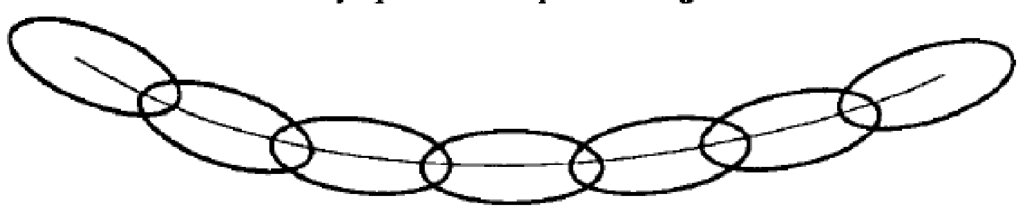


FIGURE 4c. Stretching the object so that it's positions overlap again will relieve the strobing effect.

Timing

Just two drawings of a head, the first showing it leaning toward the right shoulder and the second with it over on the left and its chin slightly raised, can be made to communicate a multitude of ideas, depending entirely on the Timing used. Each inbetween drawing added between these two "extremes" gives a new meaning to the action.

NO inbetweens........... The Character has been hit by a tremendous force. His head is nearly snapped off.

ONE inbetweens......... The Character has been hit by a brick, rolling pin, frying pan.

TWO inbetweens......... The Character has a nervous tic, a muscle spasm, an uncontrollable twitch.

THREE inbetweens..... The Character is dodging a brick, rolling pin, frying pan.

Timing

FOUR inbetweens........... The Character is giving a crisp order, "Get going!" "Move it!"

FIVE inbetweens........... The Character is more friendly, "Over here." "Come on-hurry!"

SIX inbetweens........... The Character sees a good looking girl, or the sports car he has always wanted.

SEVEN inbetweens........... The Character tries to get a better look at something.

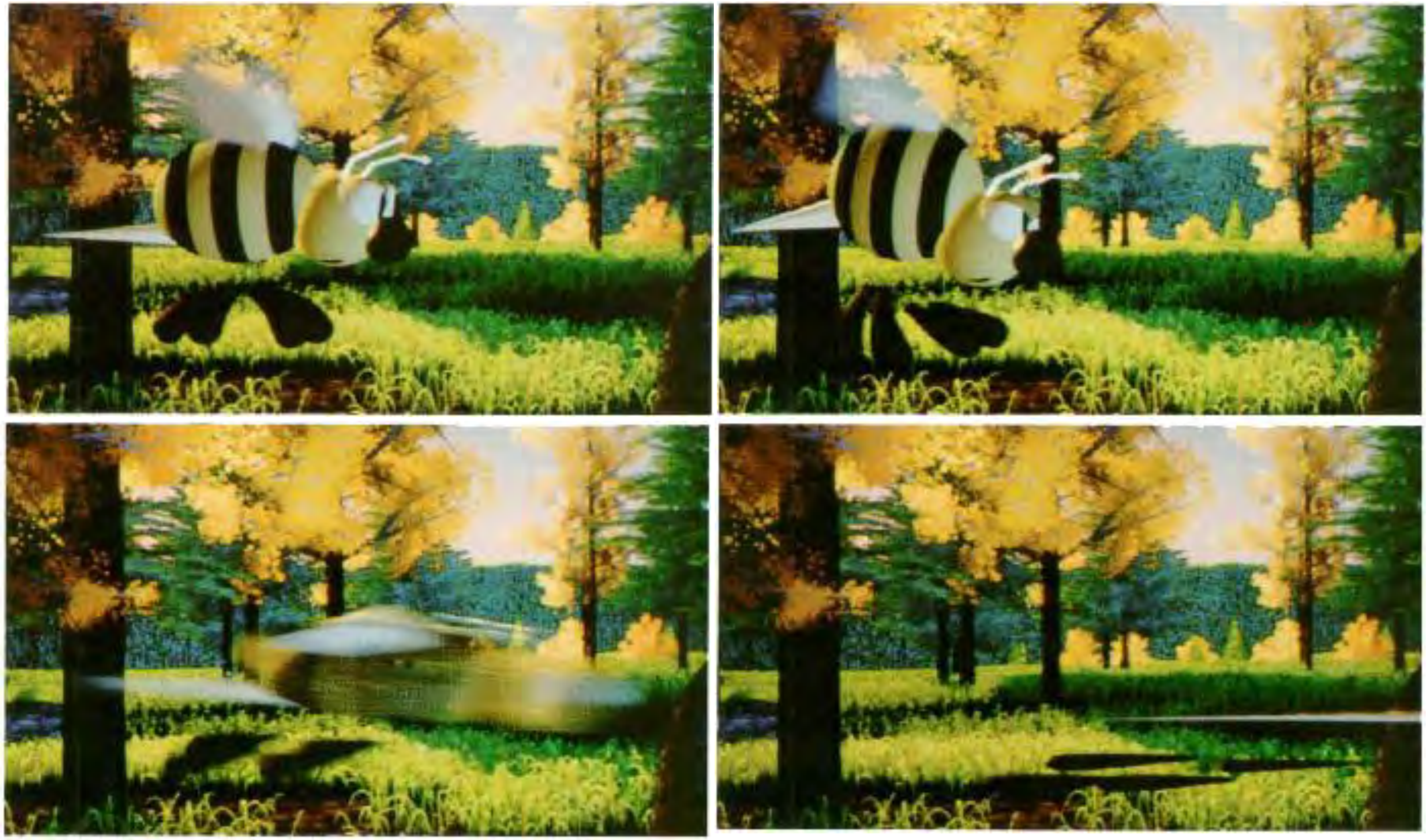
Timing

EIGHT inbetweens........... The Character searches for the peanut butter on the kitchen shelf.

NINE inbetweens...........The Character appraises, considering thoughtfully.

TEN inbetweens........... The Character stretches a sore muscle.

Anticipation



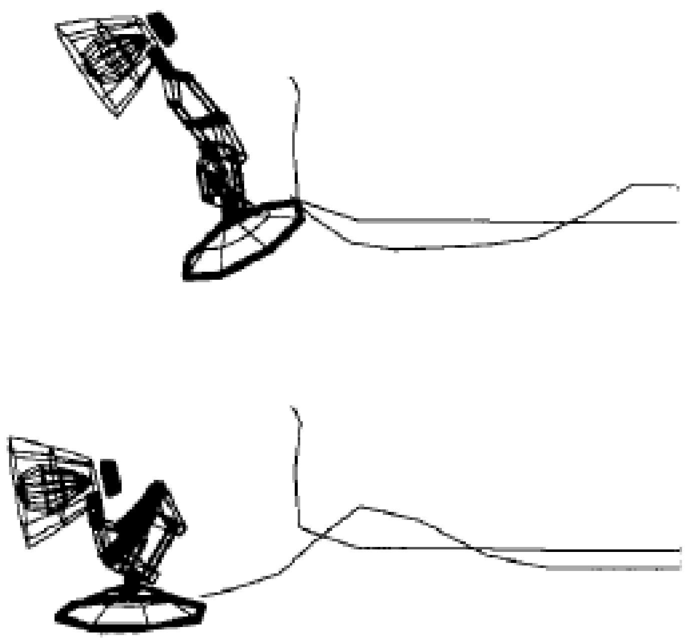
Staging

FIGURE 6. Andre's scratch was staged to the side (in "silhouette") for clarity and because that is where his itch was.

Staging

FIGURES 7-8. In *Luxo Jr.*, all action was staged to the side for clarity.

Follow Through, Overlap, Secondary



Pose-to-Pose, Slow In, Slow Out

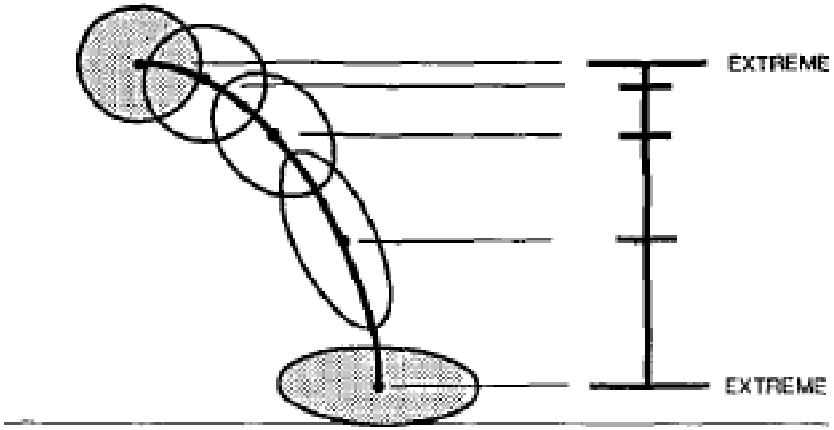
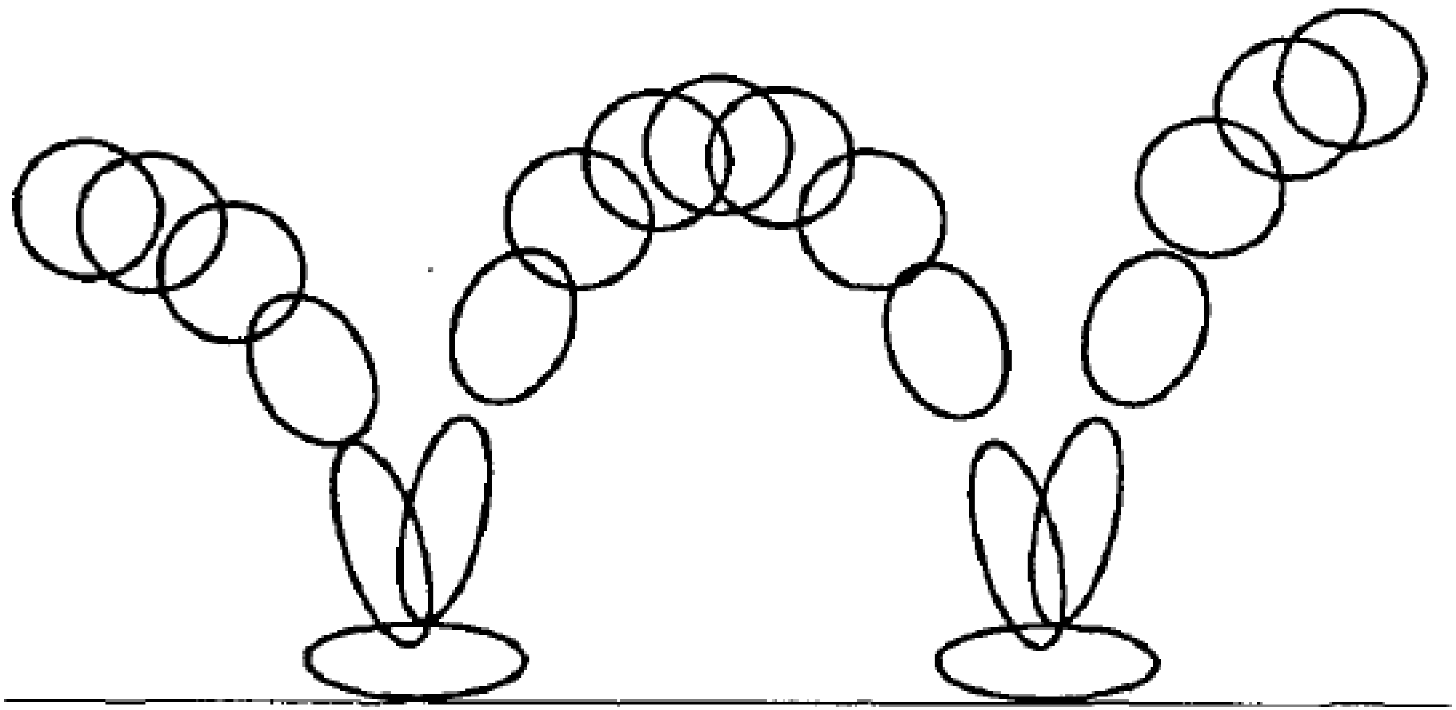


FIGURE 9. Timing chart for ball bounce.

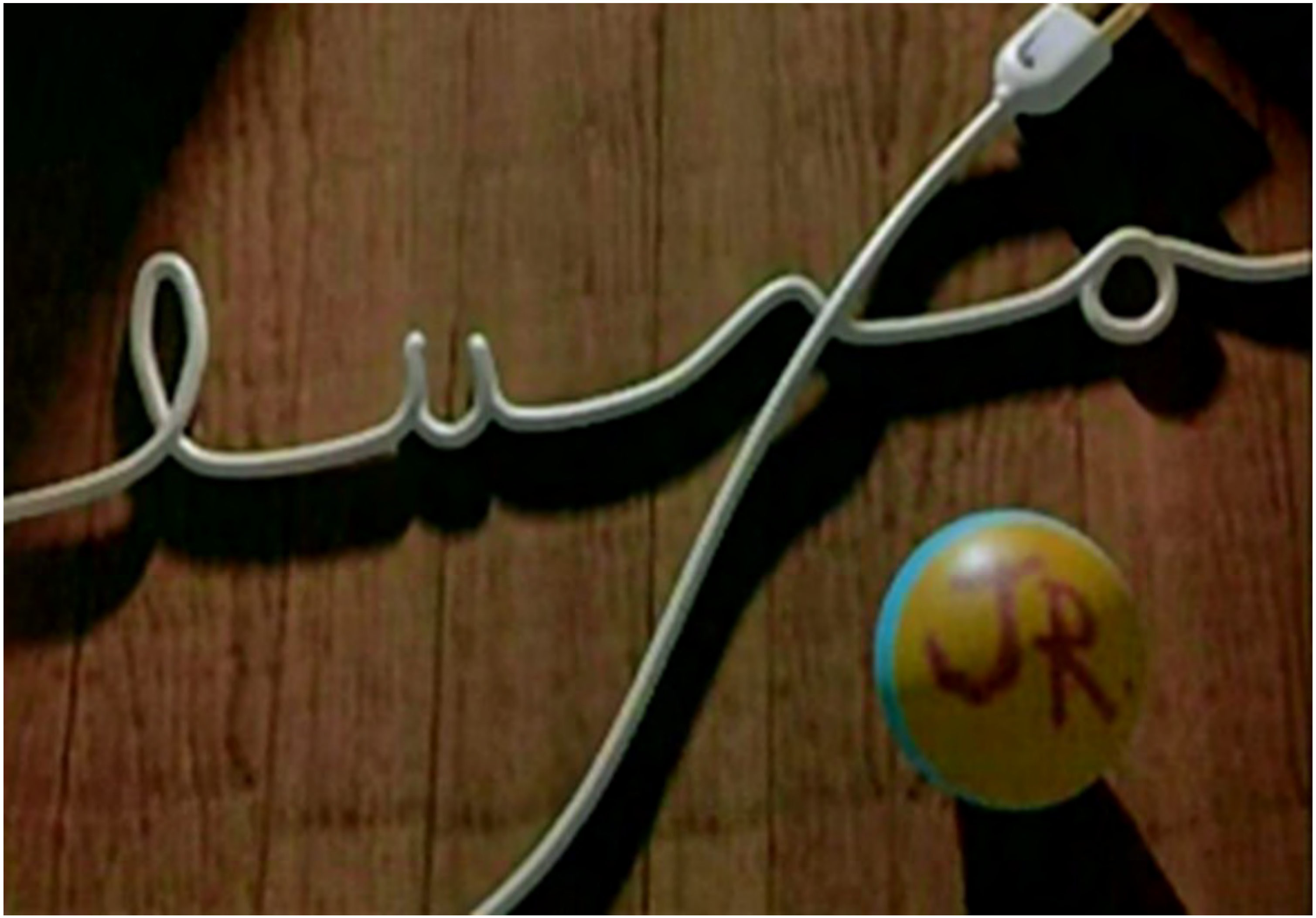
Objects with mass must accelerate and decelerate

Interesting frames are typically at ends, tweaks perception to emphasize these poses

Arcs



Luxor Jr.

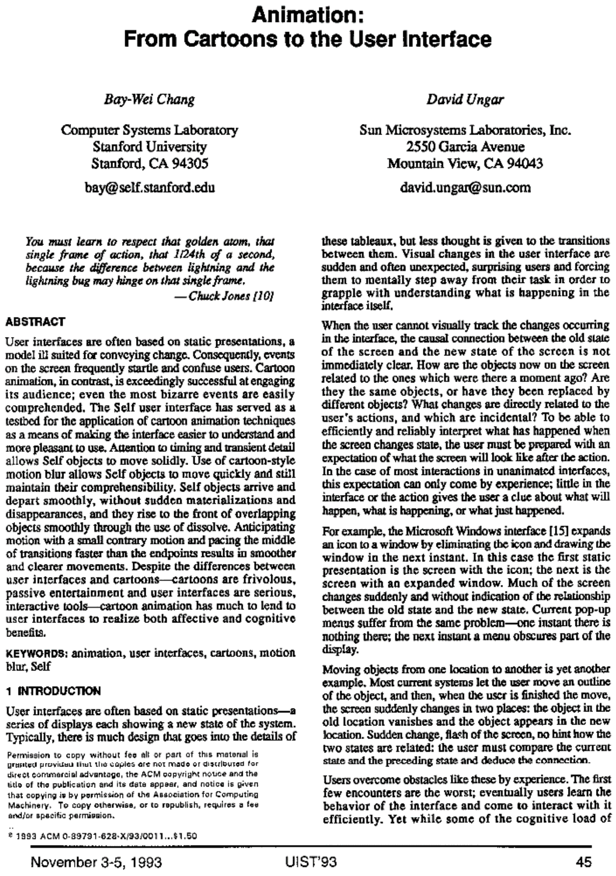


Animation Case Study

Animation: From Cartoons to the User Interface

Chang and Ungar, 1993

http://dx.doi.org/10.1145/168642.168647



Animation: From Cartoons to the User Interface

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You must learn to respect that golden atom, that single frame of action, that 1/24th of a second, because the difference between lightning and the lightning bug may hinge on that single frame.

—Chuck Jones [10]

ABSTRACT

User interfaces are often based on static presentations, a model ill suited for conveying change. Consequently, events on the screen frequently startle and confuse users. Cartoon animation, in contrast, is exceedingly successful at engaging its audience; even the most bizarre events are easily comprehended. The Self user interface has served as a testbed for the application of cartoon animation techniques as a means of making the interface easier to understand and more pleasant to use. Attention to timing and transient detail allows Self objects to move solidly. Use of cartoon-style motion blur allows Self objects to move quickly and still maintain their comprehensibility. Self objects arrive and depart smoothly, without sudden materializations and disappearances, and they rise to the front of overlapping objects smoothly through the use of dissolve. Anticipating motion with a small contrary motion and pacing the middle of transitions faster than the endpoints results in smoother and clearer movements. Despite the differences between user interfaces and cartoons—cartoons are frivolous, passive entertainment and user interfaces are serious, interactive tools—cartoon animation has much to lend to user interfaces to realize both affective and cognitive benefits.

KEYWORDS: animation, user interfaces, cartoons, motion blur, Self

1 INTRODUCTION

User interfaces are often based on static presentations—a series of displays each showing a new state of the system. Typically, there is much design that goes into the details of these tableaux, but less thought is given to the transitions between them. Visual changes in the user interface are sudden and often unexpected, surprising users and forcing them to mentally step away from their task in order to grapple with understanding what is happening in the interface itself.

When the user cannot visually track the changes occurring in the interface, the causal connection between the old state of the screen and the new state of the screen is not immediately clear. How are the objects now on the screen related to the ones which were there a moment ago? Are they the same objects, or have they been replaced by different objects? What changes are directly related to the user's actions, and which are incidental? To be able to efficiently and reliably interpret what has happened when the screen changes state, the user must be prepared with an expectation of what the screen will look like after the action. In the case of most interactions in unanimated interfaces, this expectation can only come by experience; little in the interface or the action gives the user a clue about what will happen, what is happening, or what just happened.

For example, the Microsoft Windows interface [15] expands an icon to a window by eliminating the icon and drawing the window in the next instant. In this case the first static presentation is the screen with the icon; the next is the screen with an expanded window. Much of the screen changes suddenly and without indication of the relationship between the old state and the new state. Current pop-up menus suffer from the same problem—one instant there is nothing there; the next instant a menu obscures part of the display.

Moving objects from one location to another is yet another example. Most current systems let the user move an outline of the object, and then, when the user is finished the move, the screen suddenly changes in two places: the object in the old location vanishes and the object appears in the new location. Sudden change, flash of the screen, no hint how the two states are related: the user must compare the current state and the preceding state and deduce the connection.

Users overcome obstacles like these by experience. The first few encounters are the worst; eventually users learn the behavior of the interface and come to interact with it efficiently. Yet while some of the cognitive load of

Frames Three Principles

Solidity

- Desktop objects should appear to be solid objects

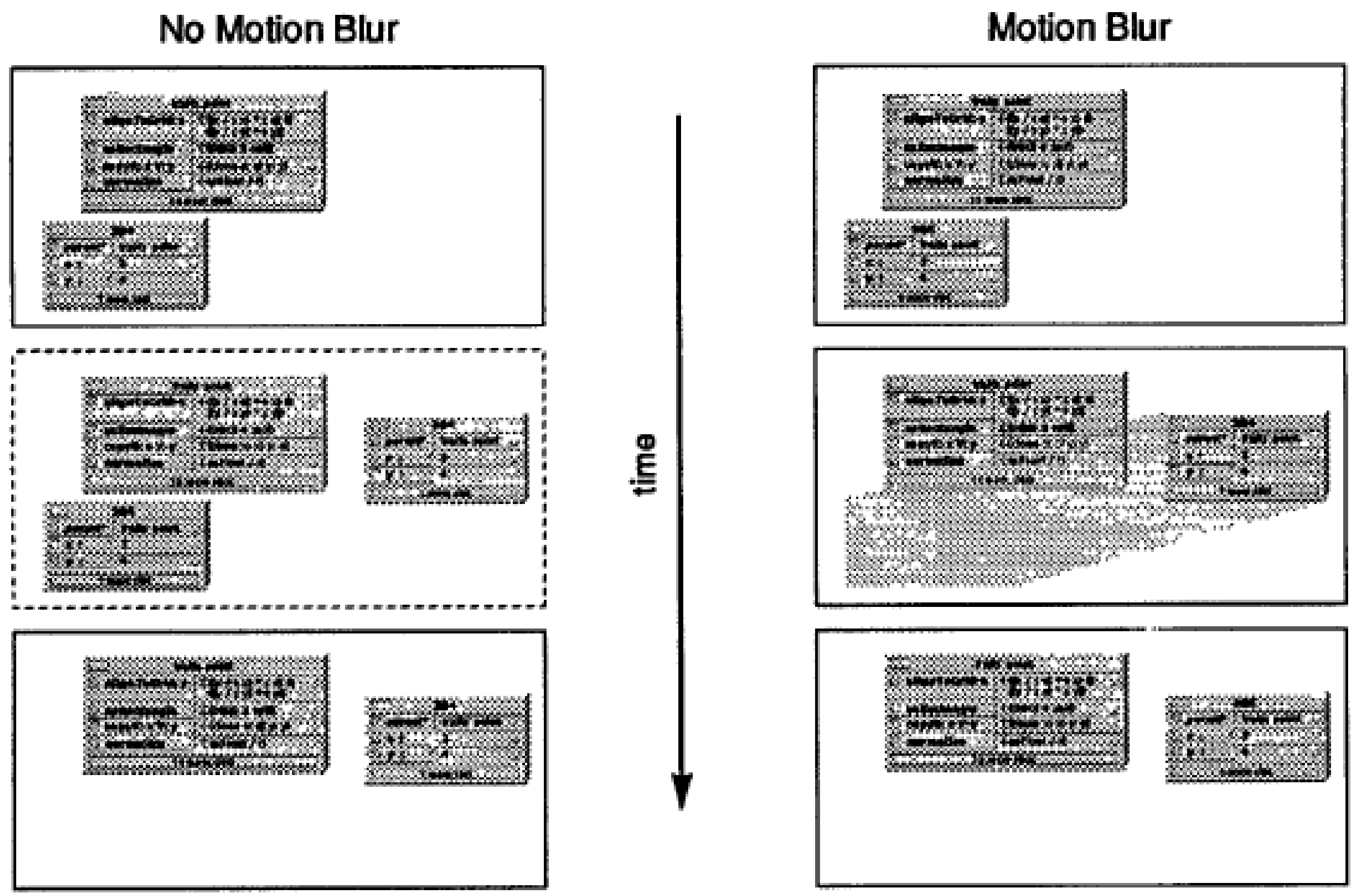
Exaggeration

- Exaggerate physical actions to enhance perception

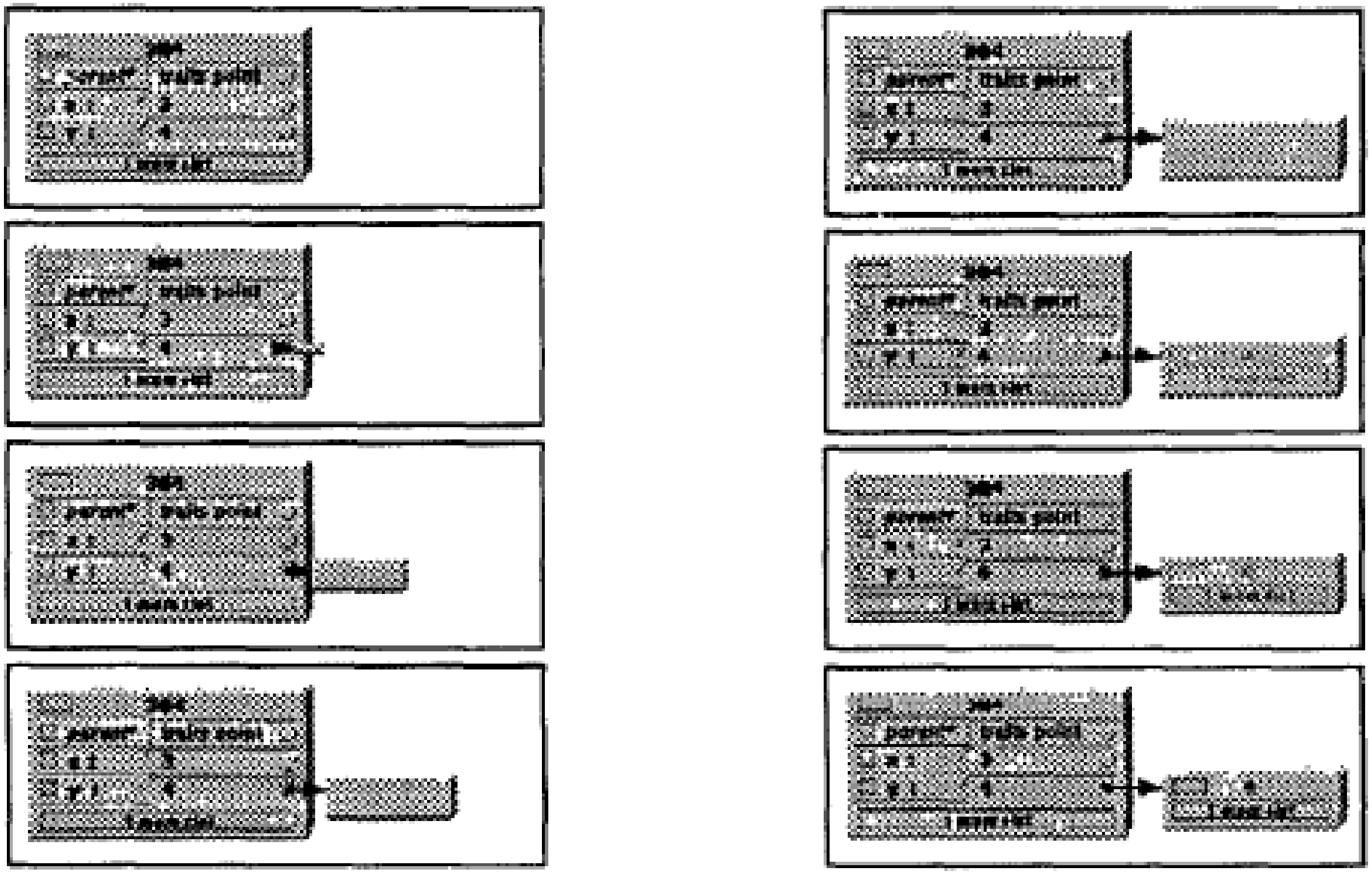
Reinforcement

- Use effects to drive home feeling of reality

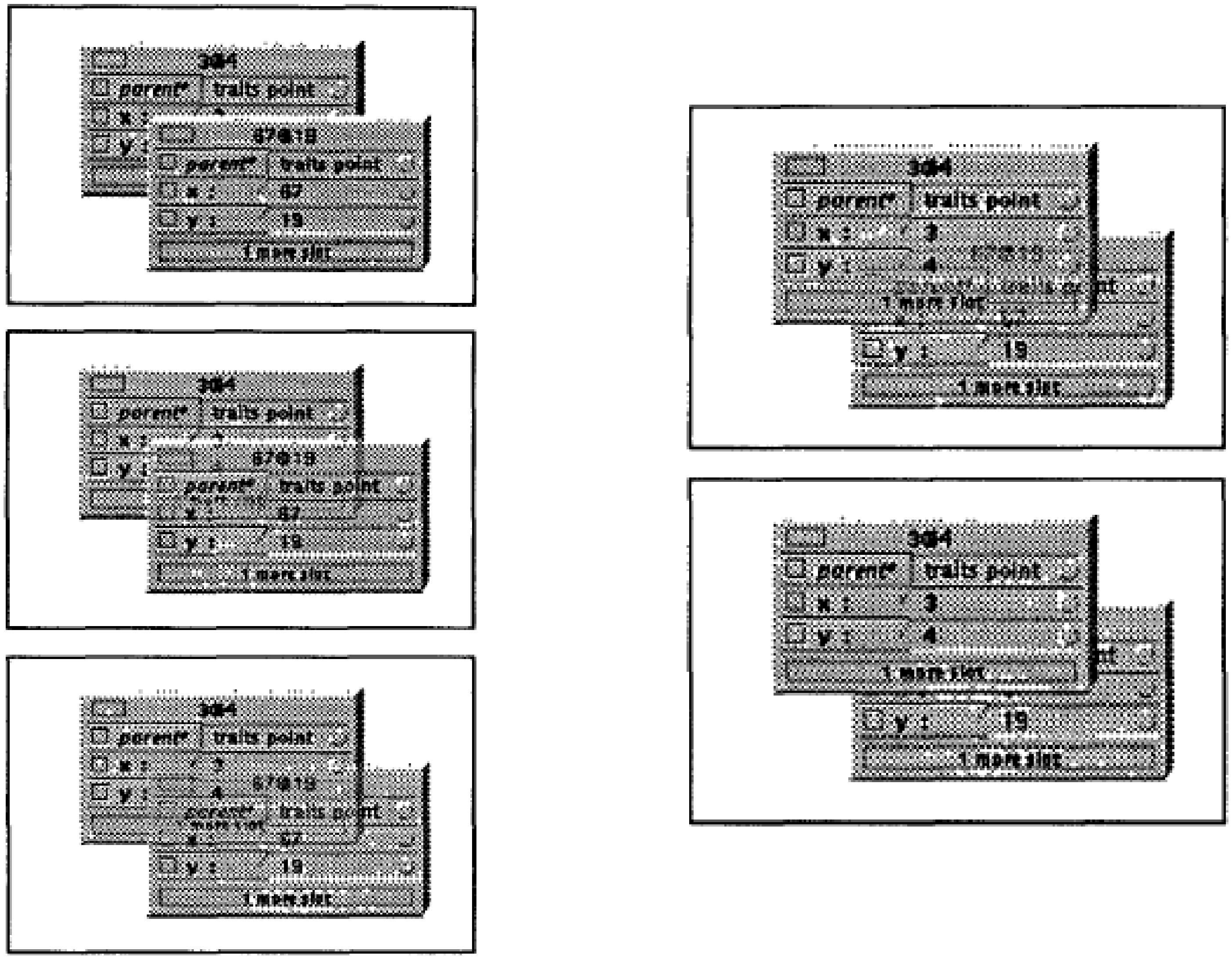
Solidity: Motion Blur



Solidity: Arrival and Departure



Solidity: Arrival and Departure



Exaggeration: Anticipation

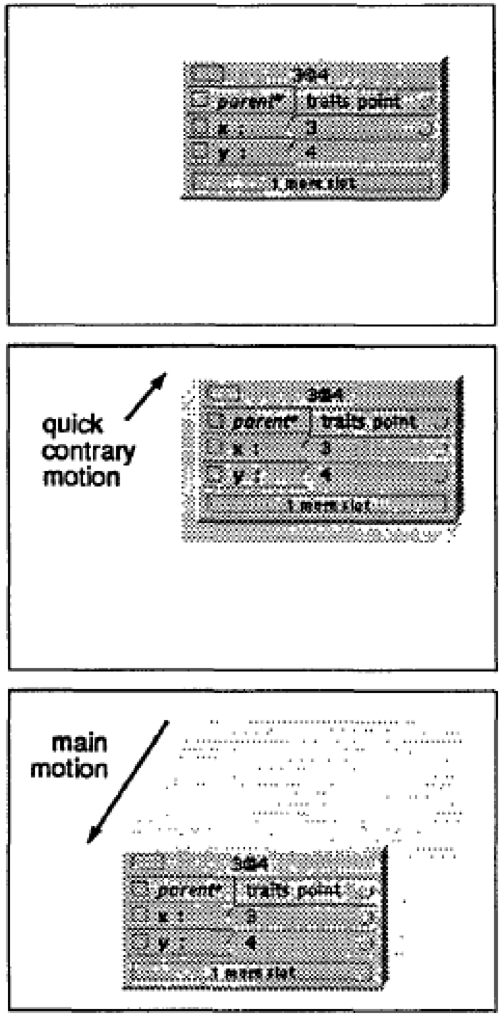


Figure 7. Objects anticipate major actions with a quick contrary motion that draws the user eye to the object in preparation for the main motion to come.

Reinforcement: Slow In Slow Out

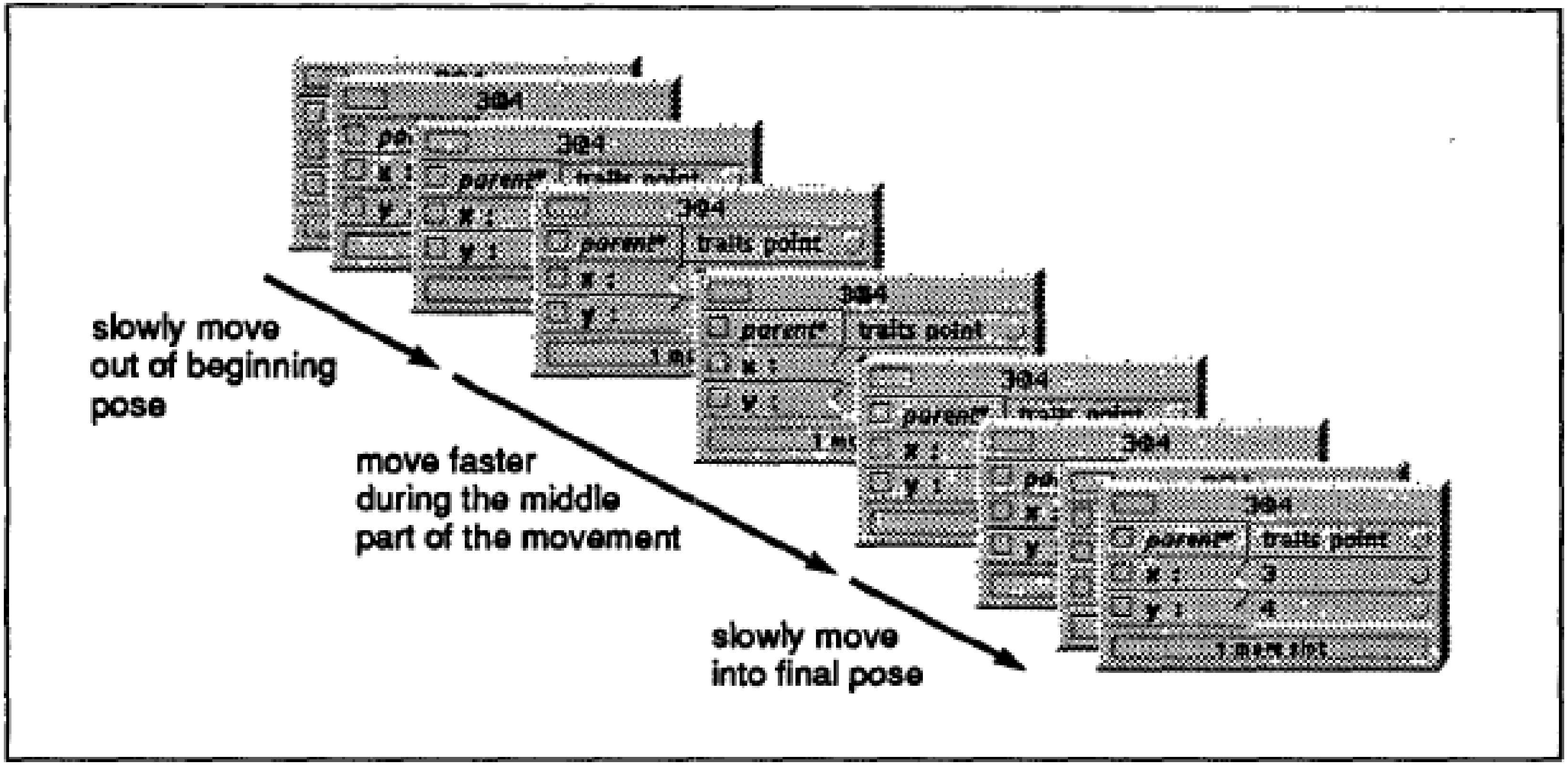


Figure 8. Objects ease out of their beginning poses and ease into their final poses. Although these motions are slower than that during the main portion of the movement, they are still quite fast.

Reinforcement: Arcs

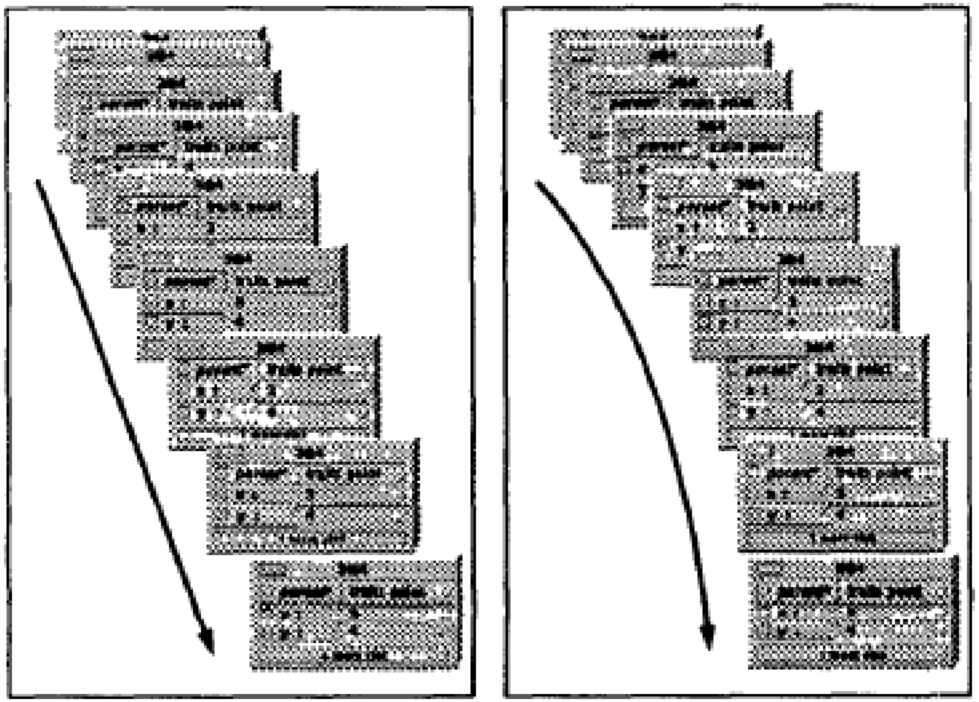


Figure 9. When objects travel under their own power (non-interactively), they move in arcs rather than straight lines.

Reinforcement: Follow Through

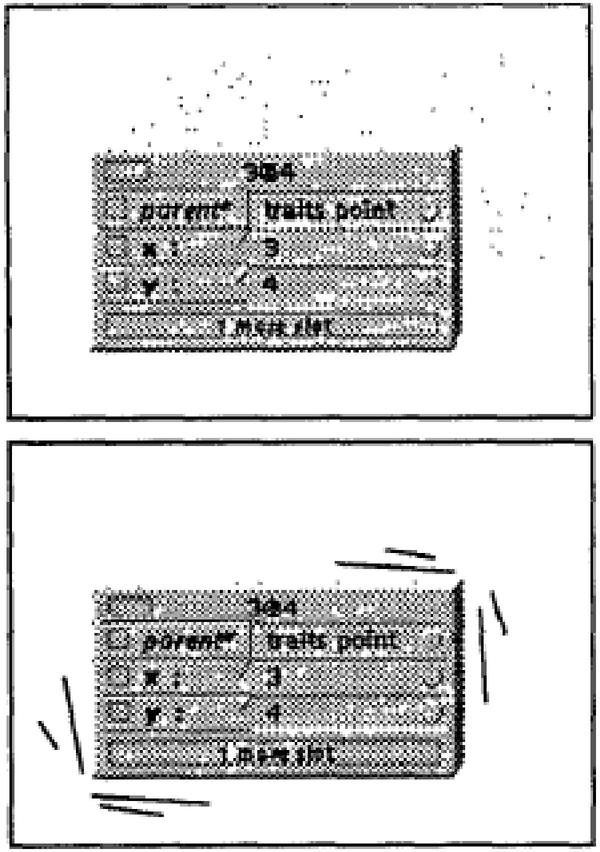


Figure 10. When objects come to a stop after moving on their own, they exhibit follow through in the form of wiggling back and forth quickly. This is just suggested by the "wiggle lines" in the figure—in actuality, the object moves back and forth, with motion blur.

Animation Case Study

Animation Support in a User Interface Toolkit: Flexible, Robust, and Reusable Abstractions

Hudson and Stasko, 1993

http://dx.doi.org/10.1145/168642.168648

Animation Support in a User Interface Toolkit: Flexible, Robust, and Reusable Abstractions

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ABSTRACT

Animation can be a very effective mechanism to convey information in visualization and user interface settings. However, integrating animated presentations into user interfaces has typically been a difficult task since, to date, there has been little or no explicit support for animation in window systems or user interface toolkits. This paper describes how the Artkit user interface toolkit has been extended with new animation support abstractions designed to overcome this problem. These abstractions provide a powerful but convenient base for building a range of animations, supporting techniques such as simple motion-blur, "squash and stretch", use of arcing trajectories, anticipation and follow through, and "slow-in / slow-out" transitions. Because these abstractions are provided by the toolkit they are reusable and may be freely mixed with more conventional user interface techniques. In addition, the Artkit implementation of these abstractions is robust in the face of systems (such as the X Window System and Unix) which can be ill-behaved with respect to timing considerations.

Keywords: object-oriented user interface toolkits, window systems, animation techniques, dynamic interfaces, motion blur, real-time scheduling.

This work was supported in part by the National Science Foundation under grants IRI-9015407, DCA-9214947, CCR-9121607 and CCR-9109399.

1 INTRODUCTION

Human perceptual capabilities provide a substantial ability to quickly form and understand models of the world from moving images. As a result, in a well designed display, information can often be much more easily comprehended in a moving scene than in a single static image or even a sequence of static images. For example, the "cone tree" display described in [Robe93] provides a clear illustration that the use of continuous motion can allow much more information to be presented and understood more easily.

However, even though the potential benefits of animation in user interfaces have been recognized for some time ([Baec90] for example, surveys a number of uses for animation in the interface and cites their benefits and [Stask93] reviews principles for using animation in interfaces and describes a number of systems that make extensive use of animation in an interface), explicit support for animation is rarely, if ever, found in user interface support environments. The work described in this paper is designed to overcome this problem by showing how flexible, robust, and reusable support for animation can be incorporated into a full scale object-oriented user interface toolkit. Specifically, this paper describes how the extension mechanisms of Artkit — the Advanced Reusable Toolkit (supporting interfaces in C++) [Henr90] — have been employed to smoothly integrate animation support with other user interface capabilities.

The animation abstractions provided by the Artkit system are designed to be powerful and flexible — providing basic support that can be used to build a range of sophisticated techniques such as: simple motion-blur, "squash and stretch", use of arcing

Events and Animation

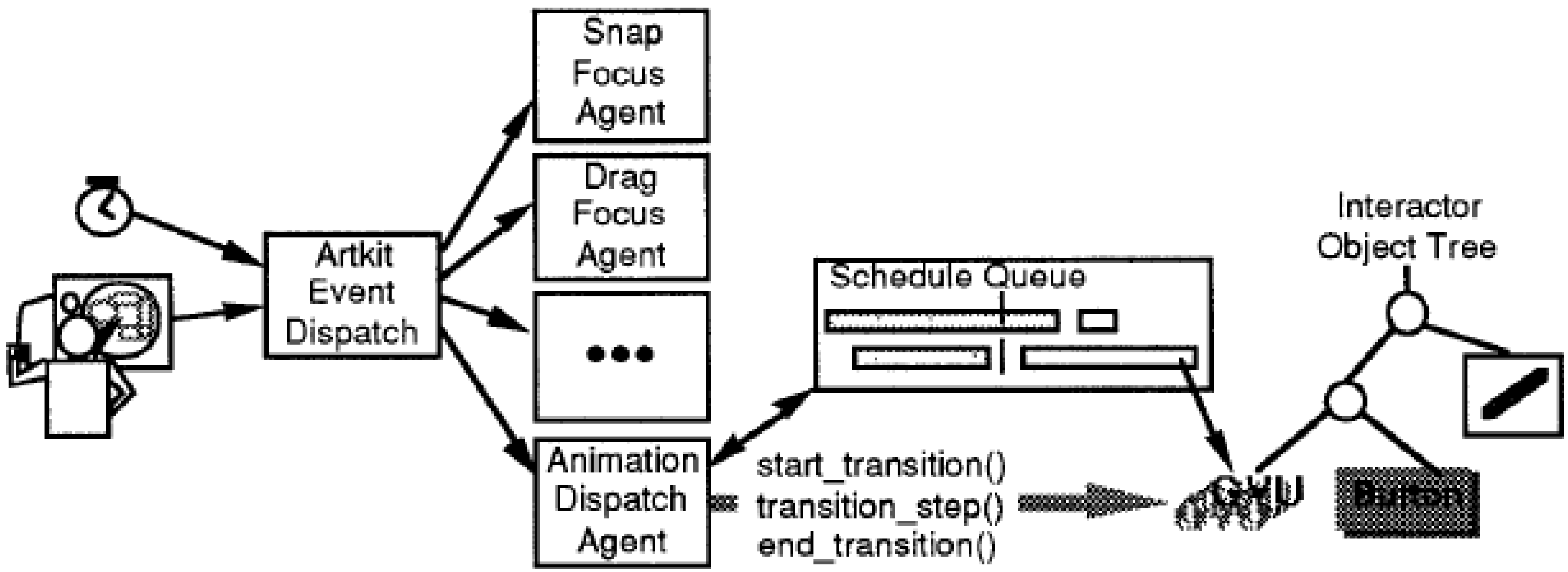


Figure 5. Animation Event Translation and Dispatch

Not Just an Implementation

Provides tool abstractions for implementing previously presented styles of animation

Overcomes a fundamental clash of approaches

- Event loop receives input, processes, repaints
- Animations expect careful control of frames, but the event loop has variable timing

Events and Animation

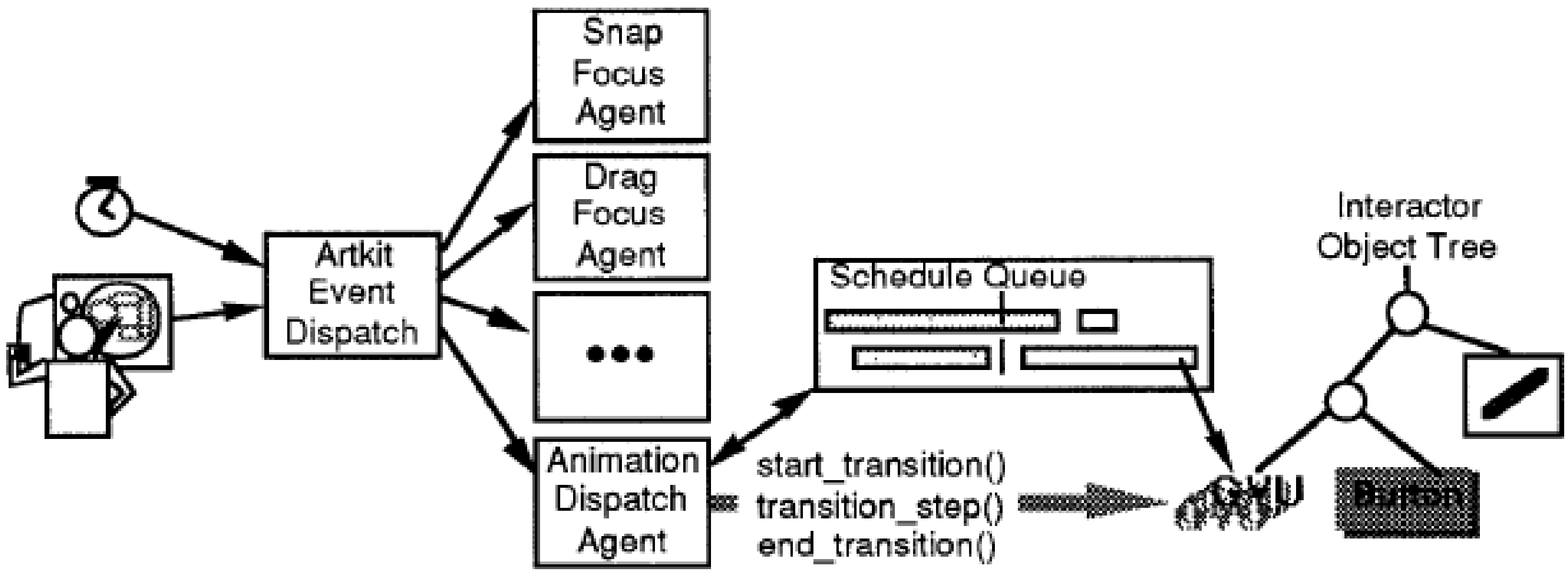


Figure 5. Animation Event Translation and Dispatch

Transition Object

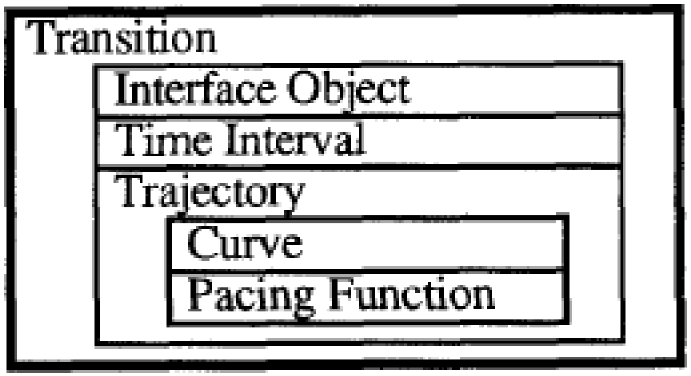


Figure 3. Parts of a Transition Object

Pacing Function

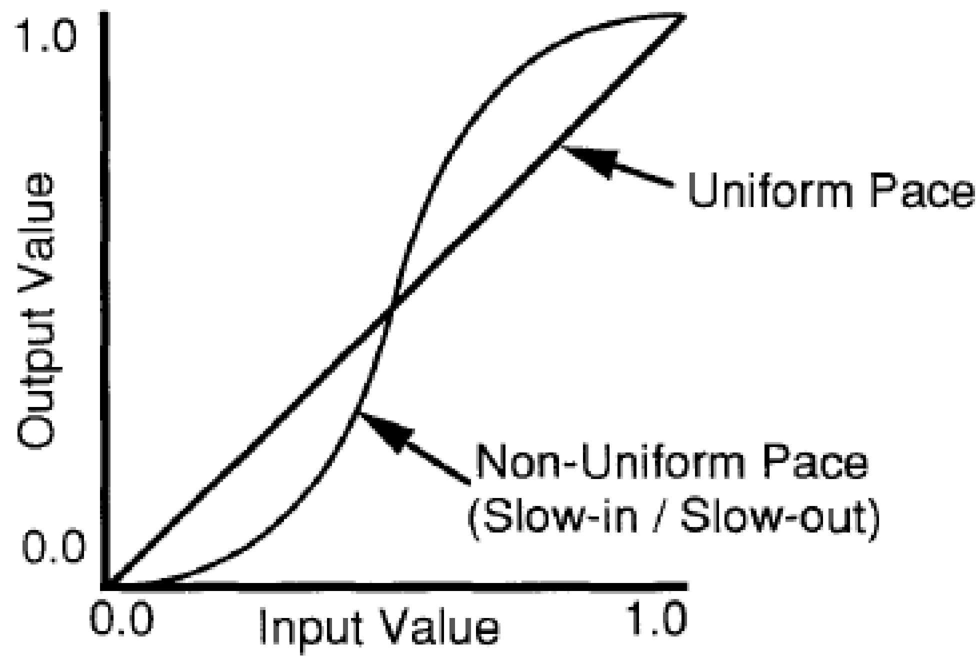


Figure 4. Two Example Pacing Functions

Computing a Frame

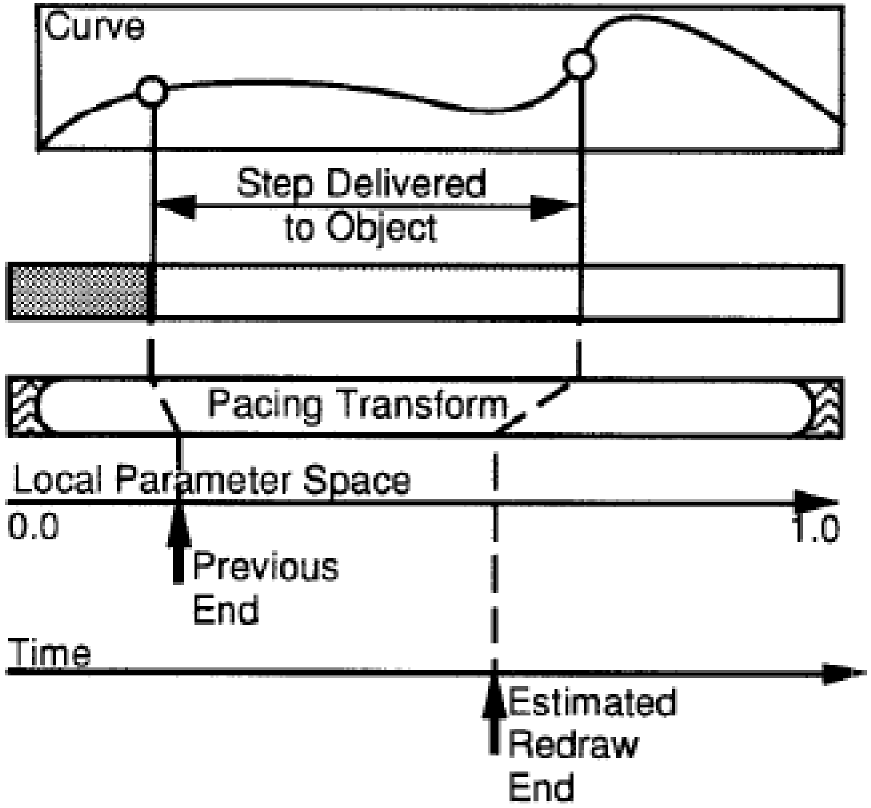


Figure 8. Translation from Time to Space

Animation Case Study

Based on increased understanding of how animation should be done in the interface, increasingly mature tools develop

Now built into major commercial toolkits (e.g., Microsoft's WPF, JavaFX, jQuery)

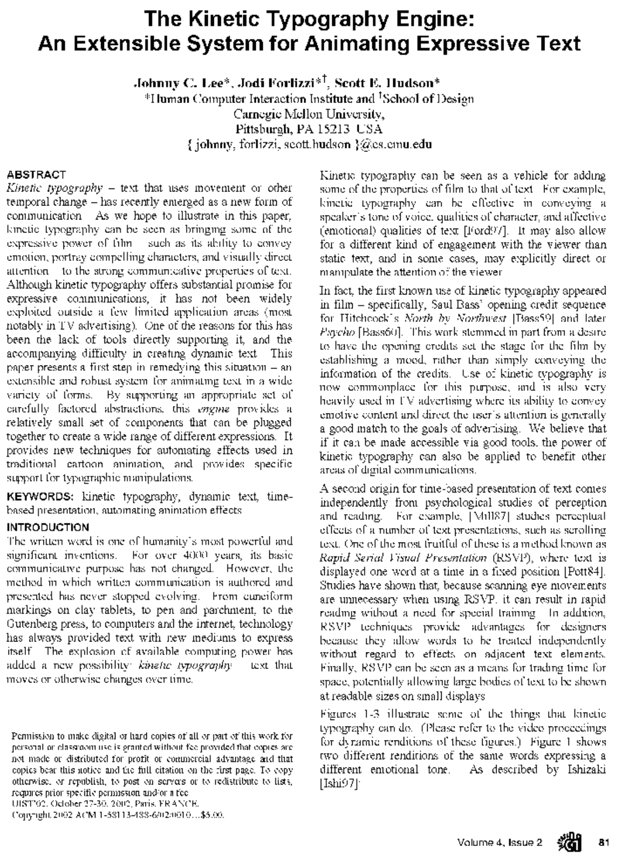
Once mature, begins to be used as a building block in even more complex behaviors

Animation Case Study

The Kinetic Typography Engine: An Extensible System for Animating Expressive Text

Lee et al, 2002

http://dx.doi.org/10.1145/571985.571997



The Kinetic Typography Engine: An Extensible System for Animating Expressive Text

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ABSTRACT
Kinetic typography – text that uses movement or other temporal change – has recently emerged as a new form of communication. As we hope to illustrate in this paper, kinetic typography can be seen as bringing some of the expressive power of film – such as its ability to convey emotion, portray compelling characters, and visually direct attention – to the strong communicative properties of text. Although kinetic typography offers substantial promise for expressive communications, it has not been widely exploited outside a few limited application areas (most notably in TV advertising). One of the reasons for this has been the lack of tools directly supporting it, and the accompanying difficulty in creating dynamic text. This paper presents a first step in remedying this situation – an extensible and robust system for animating text in a wide variety of forms. By supporting an appropriate set of carefully factored abstractions, this *engine* provides a relatively small set of components that can be plugged together to create a wide range of different expressions. It provides new techniques for automating effects used in traditional cartoon animation, and provides specific support for typographic manipulations.

KEYWORDS: kinetic typography, dynamic text, time-based presentation, automating animation effects

INTRODUCTION
The written word is one of humanity's most powerful and significant inventions. For over 4000 years, its basic communicative purpose has not changed. However, the method in which written communication is authored and presented has never stopped evolving. From cuneiform markings on clay tablets, to pen and parchment, to the Gutenberg press, to computers and the internet, technology has always provided text with new mediums to express itself. The explosion of available computing power has added a new possibility: *kinetic typography* – text that moves or otherwise changes over time.

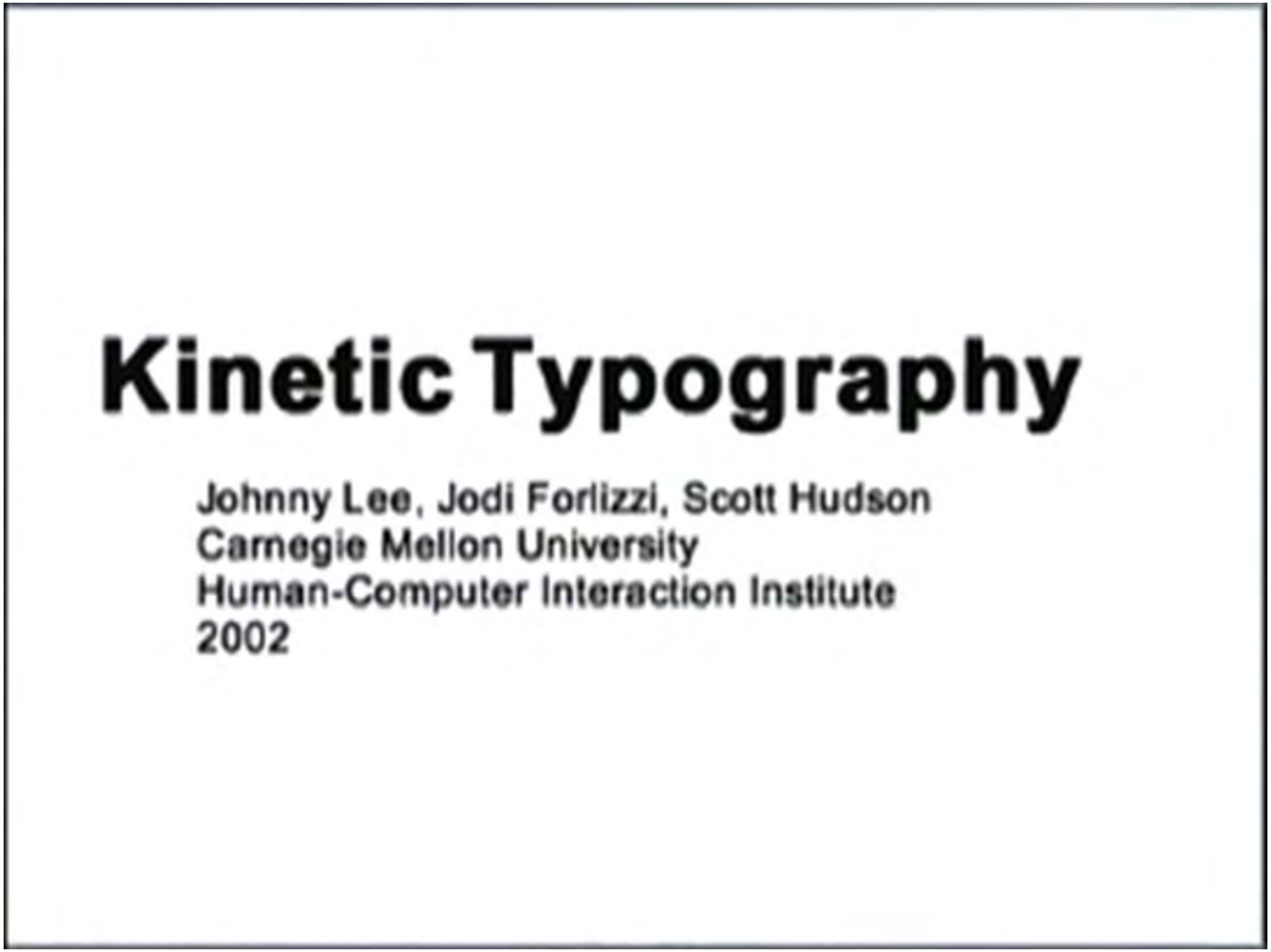
Kinetic typography can be seen as a vehicle for adding some of the properties of film to that of text. For example, kinetic typography can be effective in conveying a speaker's tone of voice, qualities of character, and affective (emotional) qualities of text [Ford97]. It may also allow for a different kind of engagement with the viewer than static text, and in some cases, may explicitly direct or manipulate the attention of the viewer.

In fact, the first known use of kinetic typography appeared in film – specifically, Saul Bass' opening credit sequence for Hitchcock's *North by Northwest* [Bass59] and later *Psycho* [Bass60]. This work stemmed in part from a desire to have the opening credits set the stage for the film by establishing a mood, rather than simply conveying the information of the credits. Use of kinetic typography is now commonplace for this purpose, and is also very heavily used in TV advertising where its ability to convey emotive content and direct the user's attention is generally a good match to the goals of advertising. We believe that if it can be made accessible via good tools, the power of kinetic typography can also be applied to benefit other areas of digital communications.

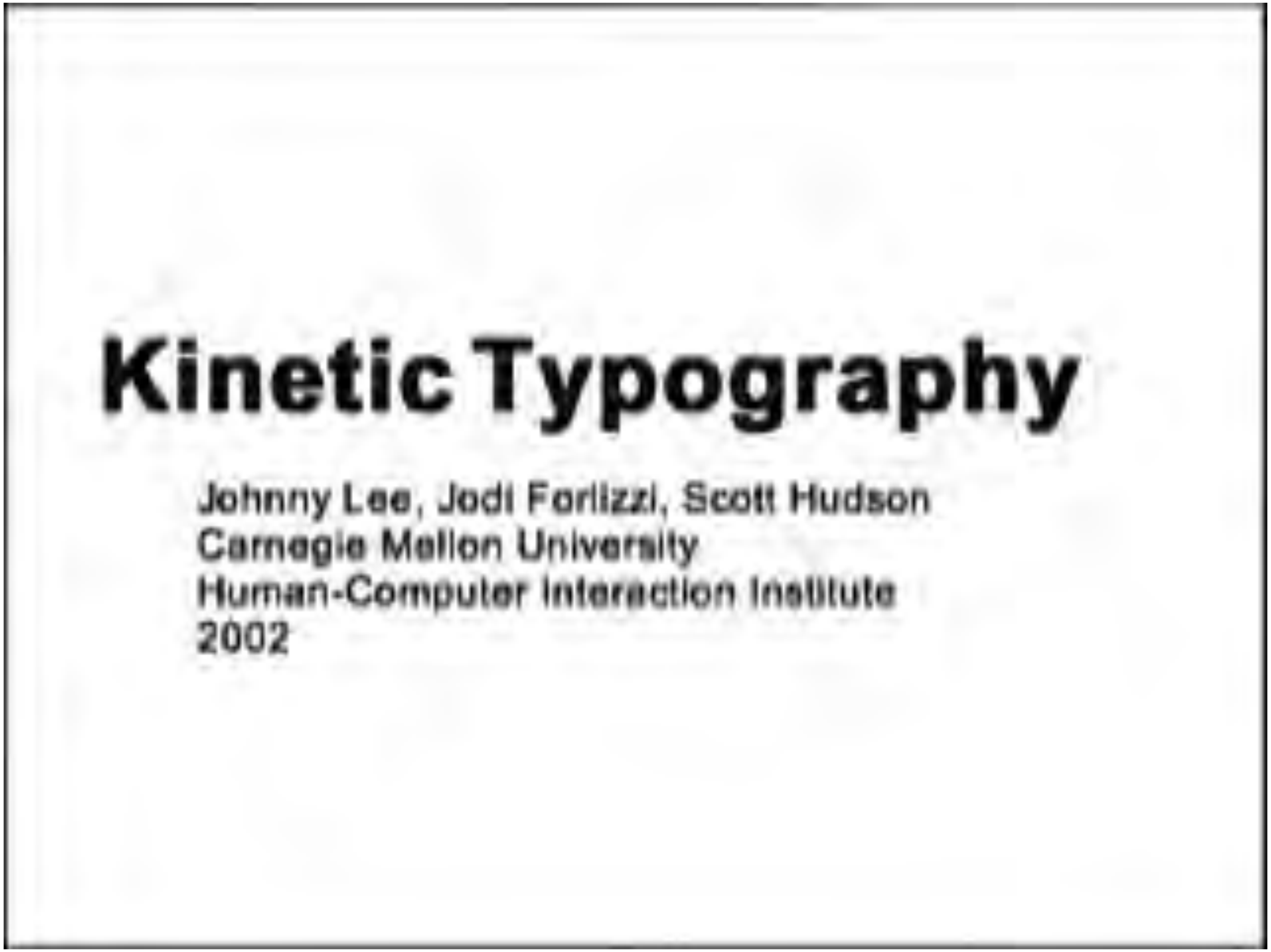
A second origin for time-based presentation of text comes independently from psychological studies of perception and reading. For example, [Mill87] studies perceptual effects of a number of text presentations, such as scrolling text. One of the most fruitful of these is a method known as *Rapid Serial Visual Presentation* (RSVP), where text is displayed one word at a time in a fixed position [Pott84]. Studies have shown that, because scanning eye movements are unnecessary when using RSVP, it can result in rapid reading without a need for special training. In addition, RSVP techniques provide advantages for designers because they allow words to be treated independently without regard to effects on adjacent text elements. Finally, RSVP can be seen as a means for trading time for space, potentially allowing large bodies of text to be shown at readable sizes on small displays.

Figures 1-3 illustrate some of the things that kinetic typography can do. (Please refer to the video proceedings for dynamic renditions of these figures.) Figure 1 shows two different renditions of the same words expressing a different emotional tone. As described by Ishizaki [Ishi97]

Kinetic Typography Engine



Kinetic Typography Engine



Kinetic Typography Engine

Goals of Kinetic Type

- Emotional content
- Creation of characters
- Direction of attention

Animation Composition

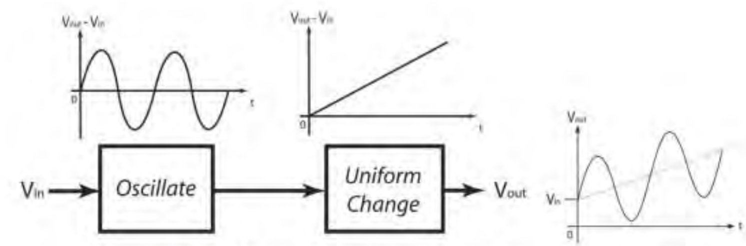


Figure 6. Waveform addition by chaining"

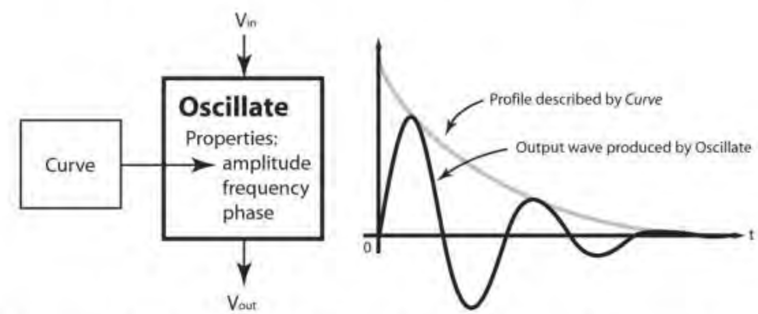


Figure 7. Waveform scaling by functional composition with amplitude

Tools and Interfaces

Why Interface Tools?

Case Study of Model-View-Controller

Case Study of Animation

Sapir-Whorf Hypothesis

Thoughtfulness in Tools

Case Study in Self-Tracking

Sapir-Whorf Hypothesis

Roughly, some thoughts in one language cannot be stated or understood in another language

- Language is not simply a way of voicing ideas, but is the very thing which shapes those ideas

Our tools define the language of interaction

- Beyond the simple matter of code
- Frame how we think about possibilities

You must be aware of this when choosing tools, designing applications, and creating new tools

Animation Case Study

Phosphor:
Explaining Transitions
in the User Interface
Using Afterglow Effects

Baudisch et al, 2006

http://dx.doi.org/10.1145/1166253.1166280

Phosphor: Explaining Transitions in the User Interface Using Afterglow Effects

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ABSTRACT
Sometimes users fail to notice a change that just took place on their display. For example, the user may have accidentally deleted an icon or a remote collaborator may have changed settings in a control panel. Animated transitions can help, but they force users to wait for the animation to complete. This can be cumbersome, especially in situations where users did not need an explanation. We propose a different approach. Phosphor objects show the outcome of their transition instantly; at the same time they explain their change in retrospect. Manipulating a phosphor slider, for example, leaves an afterglow that illustrates how the knob moved. The parallelism of instant outcome and explanation supports both types of users. Users who already understood the transition can continue interacting without delay, while those who are inexperienced or may have been distracted can take time to view the effects at their own pace. We present a framework of transition designs for widgets, icons, and objects in drawing programs. We evaluate phosphor objects in two user studies and report significant performance benefits for phosphor objects.

ACM Classification: H5.2 [Information interfaces and presentation] User Interfaces - Graphical user interfaces.

General terms: Design, Human Factors.

Keywords: Phosphor, comic animation, cartoon animation, user interfaces, information visualization, diagrams.

INTRODUCTION

Computer users sometimes make mistakes, such as accidentally deleting an icon or filing it into the wrong folder. Similarly, unexpected things may occur in collaboration scenarios. Users trying to replicate a process demonstrated by a collaborator may later realize that they missed some of the steps. This is particularly difficult for actions that leave no trace, such as shortcut commands.

The potential changes that users need to keep track of continues to rise with increasing user interface complexity, more concurrently running applications, large screens where the user may be attending to the wrong location, and the possibility of remote collaboration. Without knowing what changed and how it changed, users can find it hard to detect and correct unintended or unexpected actions.

Animated transitions have been proposed to help users understand changes in the user interface [9, 19] and have found their way into a range of products. *Windows Media Player 10*, for example, hides its play controls in fullscreen mode by slowly moving them off screen. While this can help users understand where the controls went and how to get them back, it also introduces "lag" into the interaction, i.e., it forces users to wait for the animation to complete. For experienced users who do not need an explanation, this forced pause can be cumbersome and may break their concentration.

Figure 1: These phosphor widgets use green afterglow effects to show how they have changed. The slider labeled "volume" was dragged all the way to the left. Two of the checkboxes in the next row were unchecked. The combo box was set from 1 to 2.

PHOSPHOR USER INTERFACE OBJECTS

We propose explaining user interface transitions without forcing users to wait. We define a *phosphor transition* as a transition that:

1. shows the outcome of the change *instantly* and
2. explains the change in retrospect using a diagrammatic depiction.

The space of retrospective diagrammatic descriptions encompasses a great number of possible designs. In this paper, we concentrate on a specific subset based on the notion of afterglow. Figure 1 shows an example. When a user op-

Phosphor

Animation can help people follow interface transitions

But the right speed is crucial

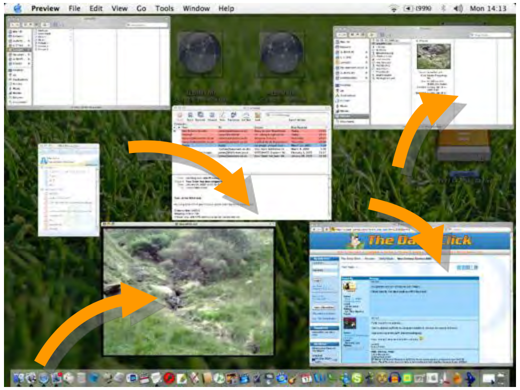
- Too fast increases error rate
- Too slow increases task time

The right speed depends on familiarity, distraction, etc.

- It cannot be determined

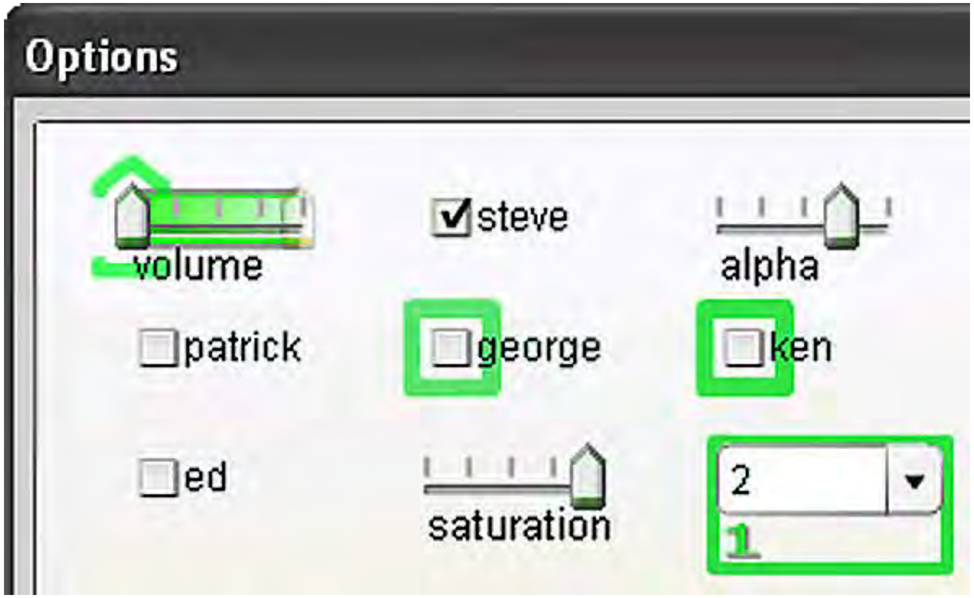
Windows Media Player

Apple Expose

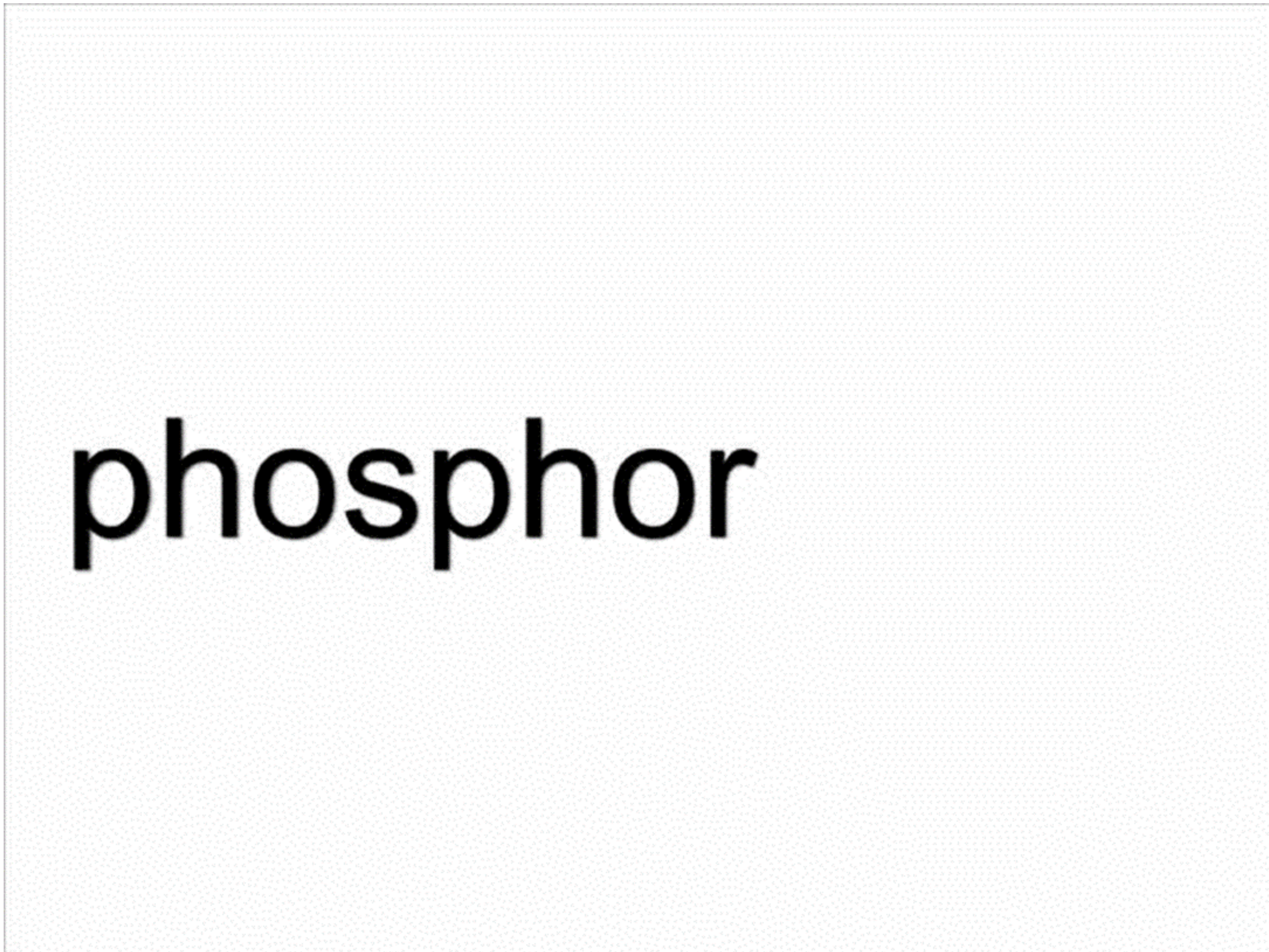


Phosphor

Phosphor shows the outcome immediately, then explains change in retrospect using a diagrammatic depiction



Phosphor

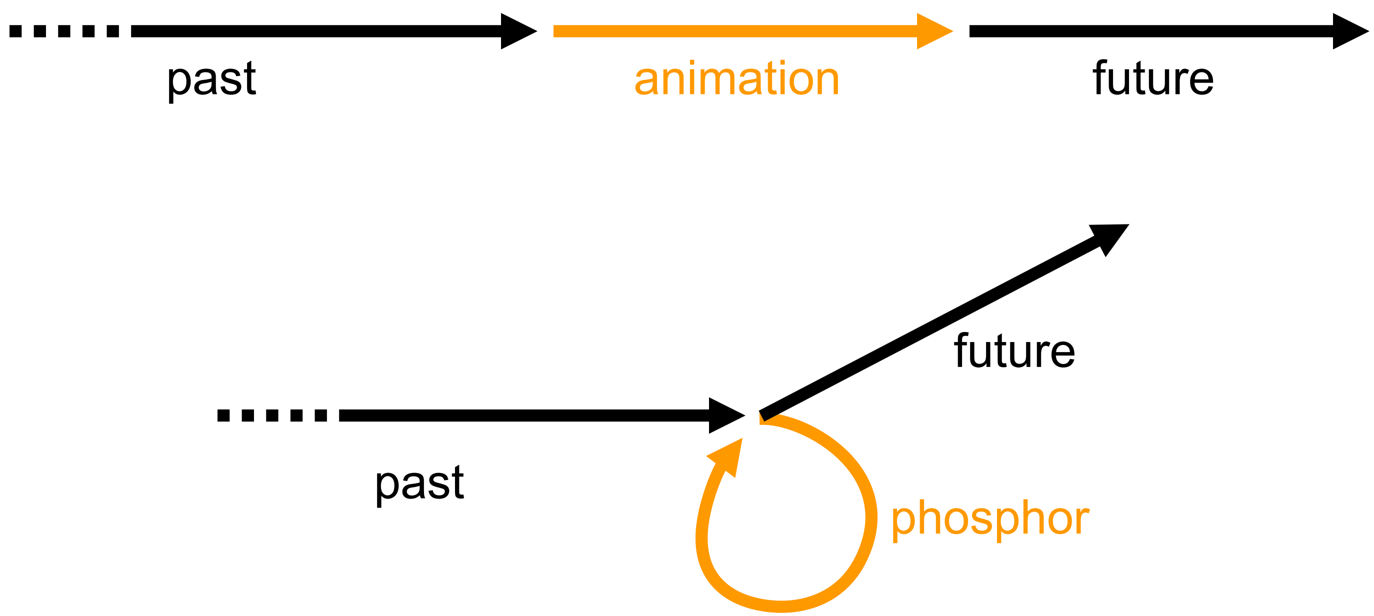


Phosphor

phosphor

Challenging Assumptions of Tools

Phosphor breaks from the assumptions that have evolved into current transition tools



Tools and Interfaces

Tools embody expertise and assumptions

Tools evolve based on emerging understanding of how to address categories of problems

Be conscious of your tool decisions

- Try to think about designs before tying to a tool
- Choose good and appropriate tools
- Understand what you are getting in a tool
- Push yourself to think outside the tool

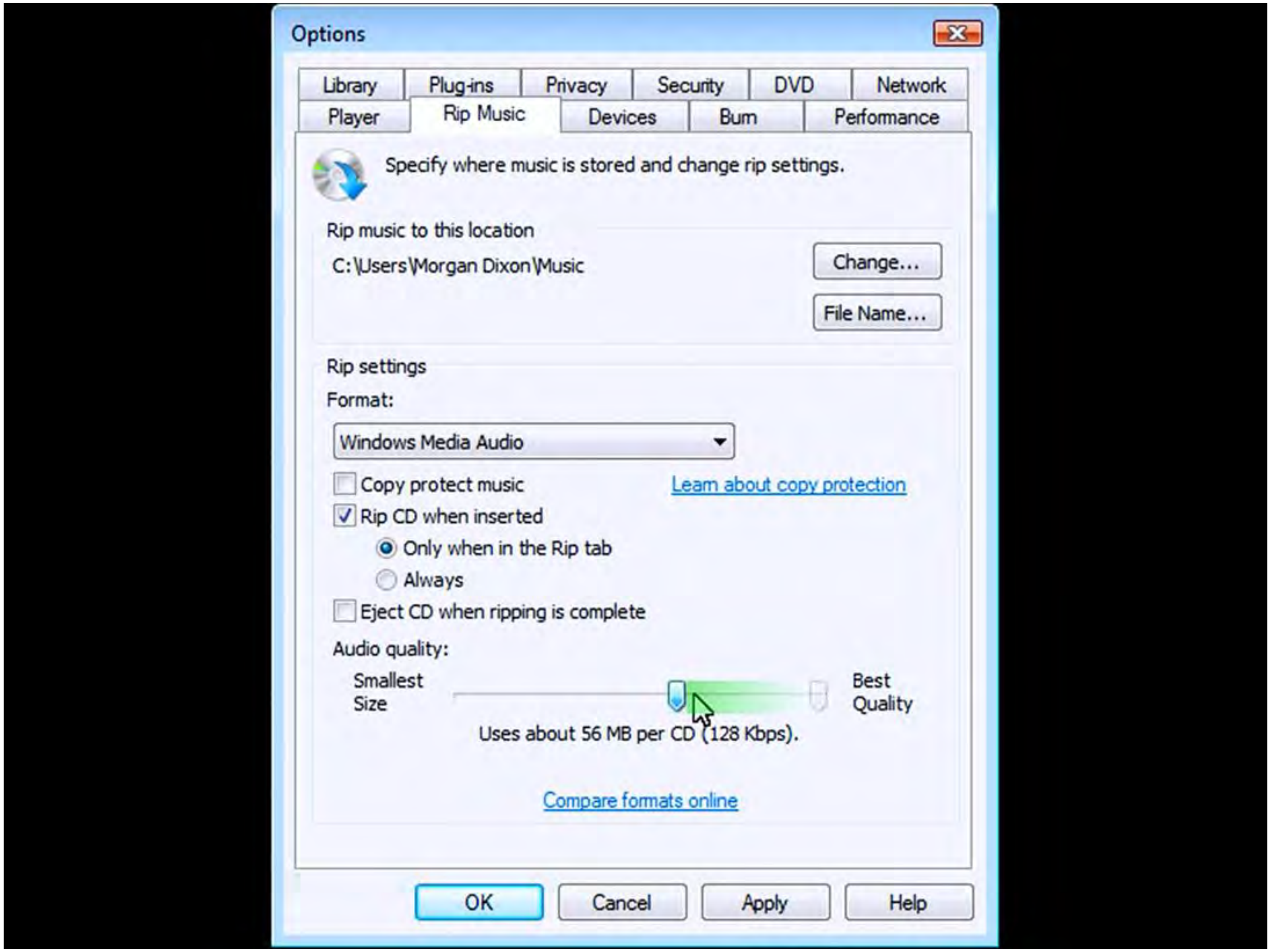
Prefab

Prefab uses pixel analysis to modify existing applications from the outside, using only pixels

Prefab is informed by how toolkits work, but not linked to any particular toolkit implementation

Allows trying and fielding new ideas that are not supported by existing applications or toolkits

Prefab

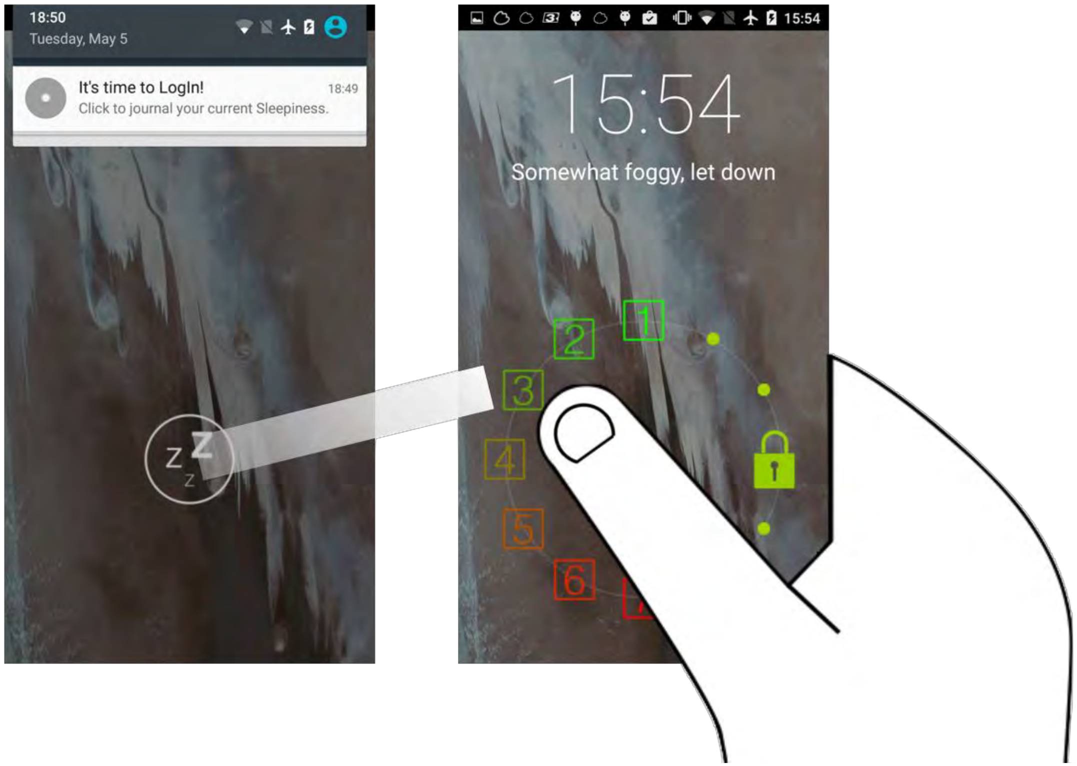

Options
Library
Plug-ins
Privacy
Security
DVD
Network
Player
Rip Music
Devices
Burn
Performance
Specify where music is stored and change rip settings.
Rip music to this location
C:\Users\Morgan Dixon\Music
Change...
File Name...
Rip settings
Format:
Windows Media Audio
Copy protect music
Learn about copy protection
Rip CD when inserted
Only when in the Rip tab
Always
Eject CD when ripping is complete
Audio quality:
Smallest Size
Best Quality
Uses about 56 MB per CD (128 Kbps).
Compare formats online
OK
Cancel
Apply
Help

Mobile Phones as Pagers

Our notion of technology design for journals / ESM / EMA has been anchored by papers journals and pager-based reminders

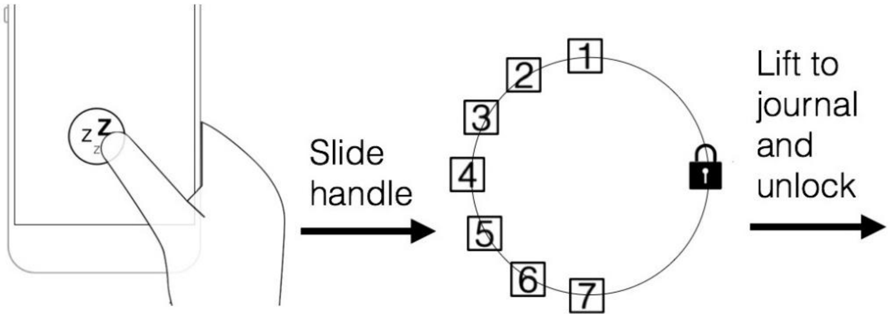
Csikszentmihalyi, Larson. Validity and Reliability of the Experience-Sampling Method. *J Nerv Ment Dis 1987*.
Feldman Barrett, Barrett. An Introduction to Computerized Experience Sampling in Psychology. *Soc Sci Comput Rev 2001*.
Froehlich, Chen, Consolvo, Harrison, Landay. MyExperience … *MobiSys 2007*.

Unlock Journaling for Self-Report



Truong, Shihipar, Wigdor. Slide to X: Unlocking the Potential of Smartphone Unlocking. *CHI 2014*.
Zhang, Pina, Fogarty. Examining Unlock Journaling with Diaries and Reminders ... *CHI 2016.*

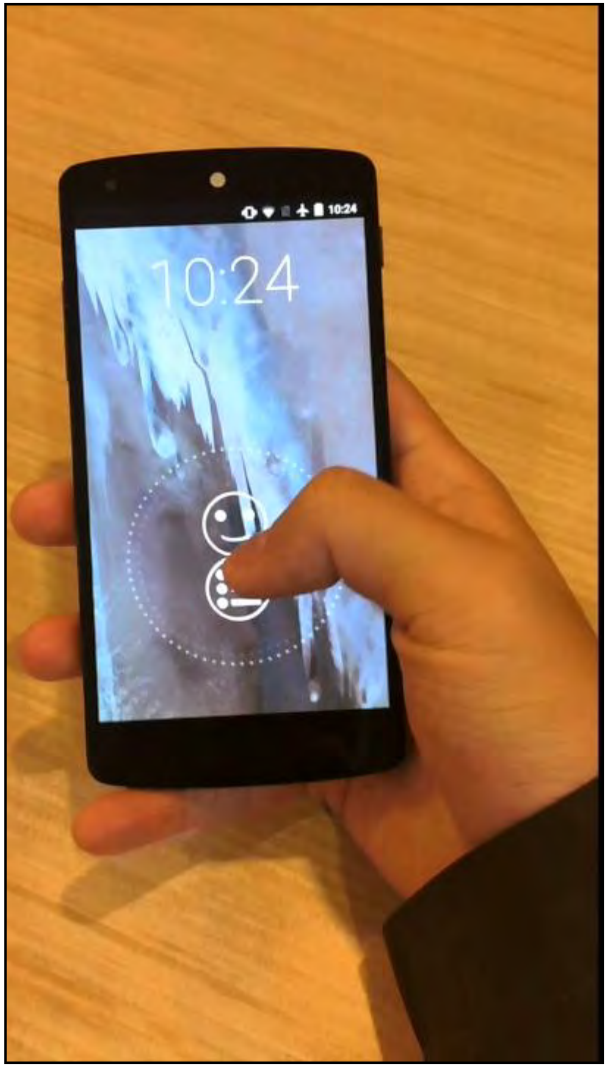
Unlock Journaling for Self-Report

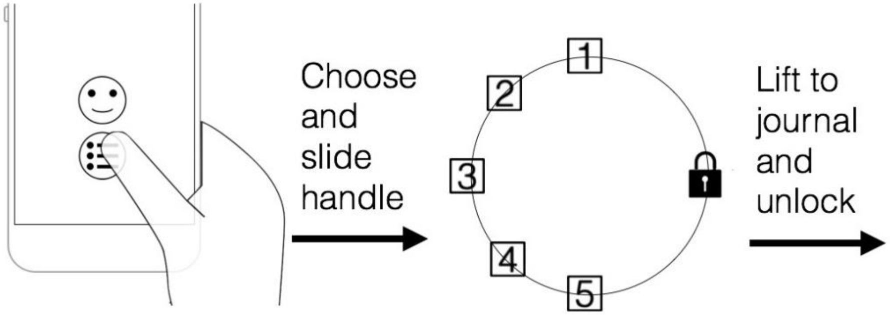


Stanford Sleepiness Scale

Hoddes, Zarcone, Dement. Development and Use of Stanford Sleepiness Scale. *Pyschophysiology 1972*.

Unlock Journaling for Self-Report

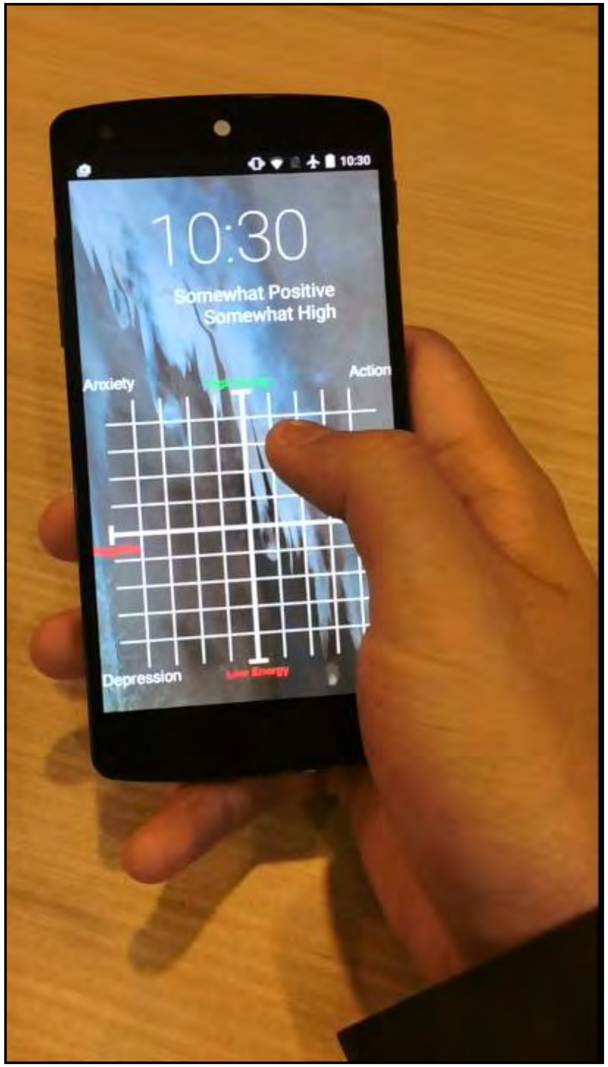


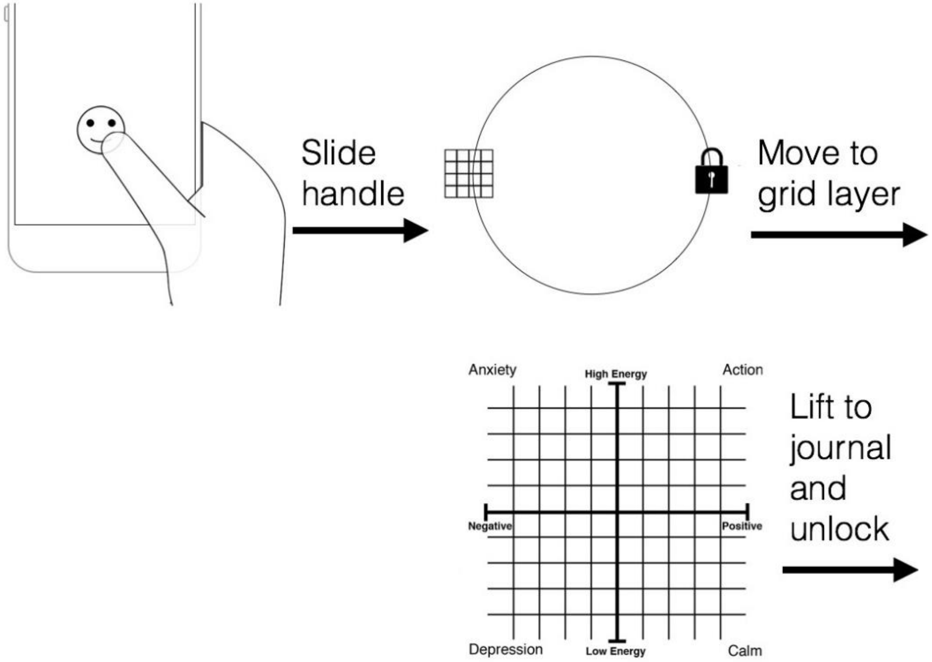


Pleasure and Accomplishment
(e.g., self-monitoring depressive symptoms)

Lejuez, Hopko, Acierno, Daughters, Pagoto. ... Behavioral Activation Treatment for Depression … *Behav Modif 2011*.

Unlock Journaling for Self-Report



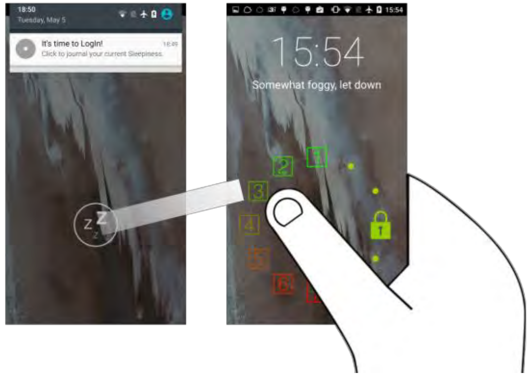


Russell's Affect Grid

Russell, Weiss, Mendelsohn. Affect Grid: A Single-Item Scale of Pleasure and Arousal. *J Pers Soc Psychol 1989*.

Unlock Journaling vs. Notifications

Unlock journaling is:



rated less intrusive
(1.77 vs. 2.22 on a 5-point scale)

yields greater frequency
(15.0 vs. 9.8 per 12-hour day)

comparable timeliness
(8.6 vs. 9.3 minutes)

Instead of reminders to journal, unlock journaling makes the opportunity visible, easy, and optional

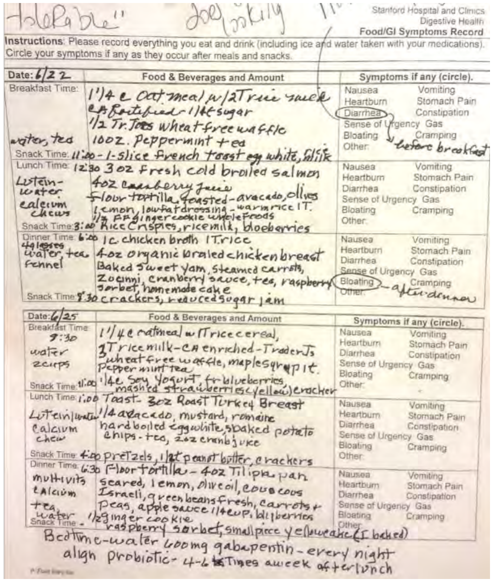
It should not have taken 10 years to get here

Mobile Food Journals

Origins in daily recall

Self-monitoring of food can support many goals

- Weight Loss
- Diabetes Management
- Trigger Identification



High burdens detract from potential benefit, data is often wrong

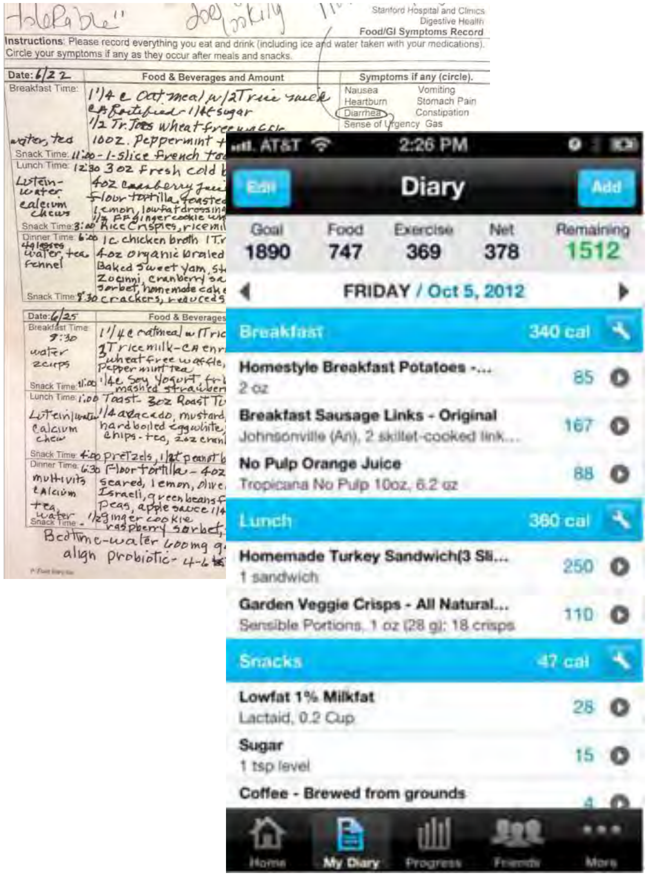
Burke. The Dietary History as a Tool in Research. *J Am Diet Assoc 1947*.
Craig, Kristal, Cheney, Shattuck. The Prevalence and Impact of 'Atypical' Days in 4-Day Food Records. *J Am Diet Assoc 2000*.

Mobile Food Journals

Mobile devices provide real-time feedback

- Search for each food in a large database, often breaking into components
- Typically provide calorie-based feedback

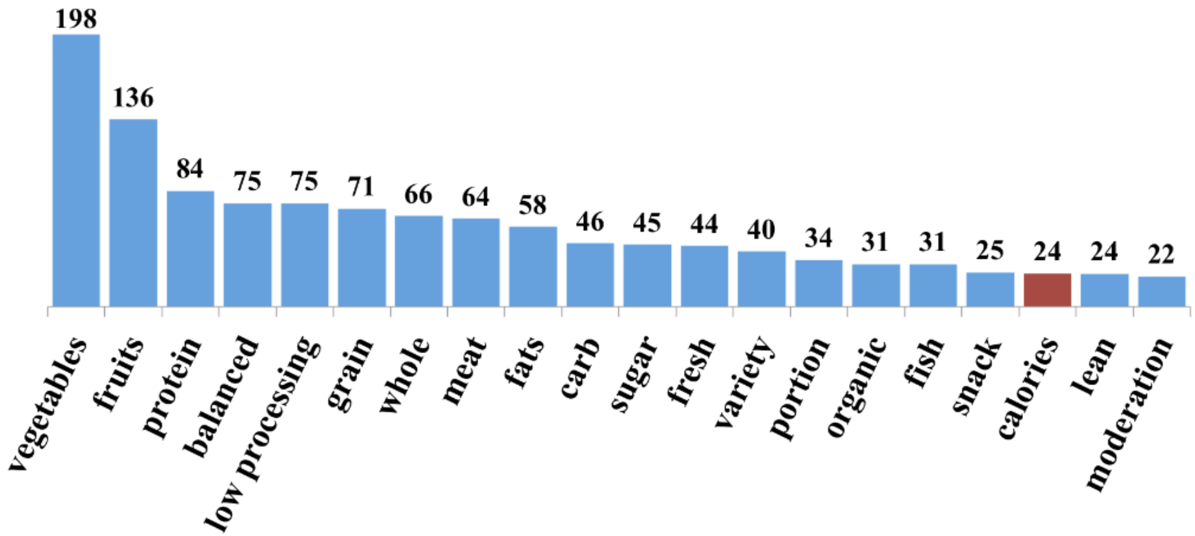
High burdens detract from potential benefit, data is often wrong



Tsai, Lee, Raab, Norman, Sohn, Griswold, Patrick, K. Usability and Feasibility of PmEB … *Mobile Netw Appl 2007*.

Perceptions of Healthy Eating

“What does healthy eating look like to you?”



Food types:	Food qualities:	Diet qualities:
“vegetables”	“low processed”	“balanced”
“fruits”	“organic”	“variety”
“protein”	“fresh”	“portion”

Cordeiro, Bales, Cherry, Fogarty. Rethinking the Mobile Food Journal … *CHI 2015*.

Difficulty as a Negative Nudge

“I just avoided eating things that were hard to log” – SP132

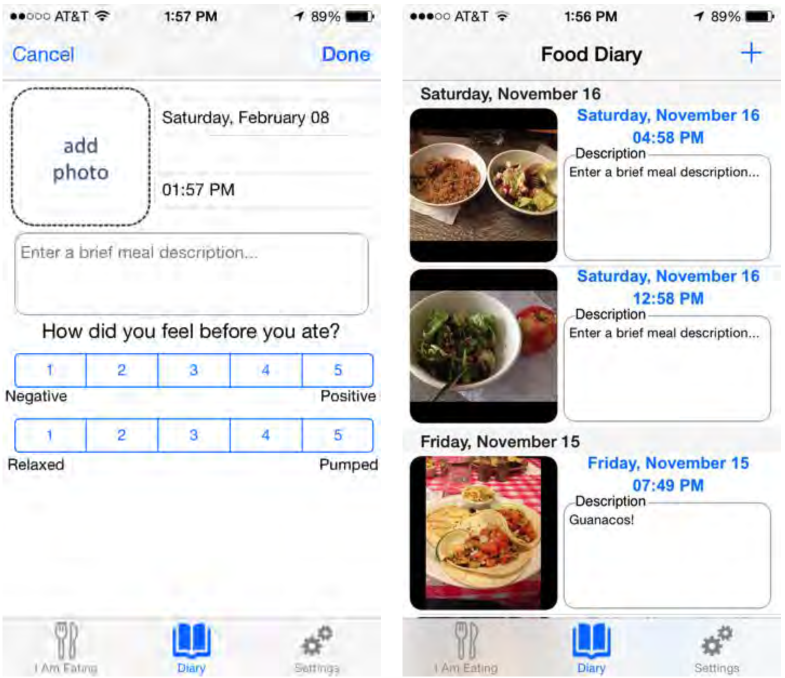
“Prepackaged meals were the easiest because of bar codes but those aren’t healthy” – SP123

“I could make life easier by eating the same things regularly” – SP97

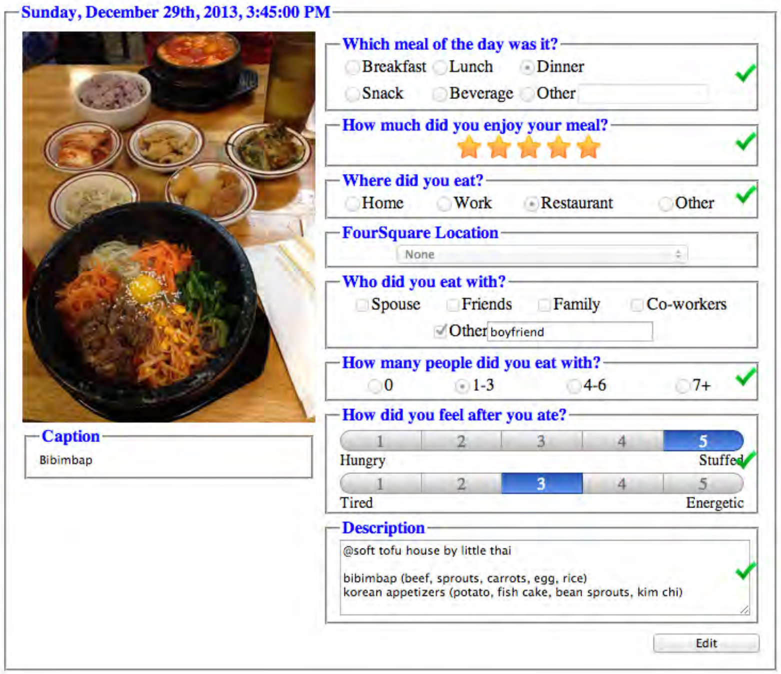
“It discourages you from eating out or at a friend’s, even if it is healthy” – SP42

Cordeiro, Epstein, Thomaz, Bales, Jagannathan, Abowd, Fogarty. Barriers and Negative Nudges ... *CHI 2015*.
Cordeiro, Bales, Cherry, Fogarty. Rethinking the Mobile Food Journal … *CHI 2015*.

Deploying a Photo-Based Journal



Mobile capture and review



Web review and annotation

Cordeiro, Bales, Cherry, Fogarty. Rethinking the Mobile Food Journal … *CHI 2015*.

Leveling the Difficulty of Journaling

With prior techniques:

60% report not journaling because it was too difficult

65% report not journaling because they did not know

With photo-based capture:

22% report not journaling because it was too difficult

None report not journaling due to food knowledge

"For some meals, it's just really easy to take a picture … than sit there and type in every ingredient" – FP20

Journaling without Judgment

With prior journals, participants report choosing not to journal because they would exceed a calorie budget or because a food was unhealthy

- 13% of survey participants
- 45% of field participants

Photos enable mindfulness while avoiding judgment

- "[it was] easier because there were no calorie counts, no judgments, but still makes you aware" – FP14
- "Do I really want to eat this? I'm capturing this" – FP17

Triggers and Trends

“I eat too much pizza” – FP10

“I’m surprised at how many times I’m seeing things that I consider an exception to my diet!” – FP4

“I don’t branch out as much as I thought I did, even when I go somewhere new, I kind of get what I always get somewhere else” – FP10

Food Journals as Daily Recall

"it should be noted that much of the use of food journaling is in a more clinical setting with the purpose being sharing and evaluating the journal with nutritionists and care providers …

it's not relevant if photos are more or less easily understood by the user if a nutritionist is the eventual consumer of the data"

– Actual Anonymous Grumpy R3

CSE 440: Introduction to HCI

User Interface Design, Prototyping, and Evaluation

Lecture 10:
Interface
Implementation

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50

CSE 440: Introduction to HCI

User Interface Design, Prototyping, and Evaluation

Lecture 11:
Tasks in Testing

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50

In-Class Design, Prototype, Test

Design and prototype a touchscreen alarm clock to be deployed in a very high-end hotel brand. Your alarm clock should be immediately usable for tired, busy, or just-don't-want-to-be-bothered travelers who will spend zero time learning your interface.

In addition to displaying the current time,
your design should include basic functionality for:

- turning the alarm on/off
- setting the wake-up time
- anything else you think is appropriate

Guests will interact with the alarm via a touch panel.

Task Design is Important

The goal of a test is to figure out how a person interacts with an interface in the wild...

There are two possible explanations for why a test does not find significant problems:

- The interface does not have significant problems
- The test itself has significant problems

Task Design is Important

Testing is not entirely in the wild

As a part of focusing the test, you often need to give a person a somewhat artificial task

The artificiality of the task may influence how people interact with an interface...

...and thus may influence the outcomes and insights gained through user testing

Bad: Artificial Subgoals

People using the design “in the wild”
may not necessarily form these same subgoals

The task should give one top-level goal, a people should form their subgoals while pursuing this

Now you want to choose the type of paper you want to print your document on. Lets imagine that Bin “B” has the paper you want to print your paper on, please complete this task.

Now set the darkness of your copies to about 50% dark.
After setting the darkness, you decide you want to print 2 sides of copies on two sides of paper. Please complete this task.

Bad: Artificial Ordering

Without an artificial ordering of information or subgoals, people might not proceed in this order

The ordering might also be biased towards the layout of the interface, which would conceal any problems with finding the appropriate control

- Enter in 10 copies, with lightness set to 10%.
- Choose 1 sided to 2 sided, use paper source bin A.
- Cover sheet needed, using paper bin B for cover sheet.
- Set stapling feature on and collating on.
- Start printing.

Bad: Changing the Task

The task is to make copies, and this happens to involve entering information in the copier interface

But this task description is an data entry task, “Here is some information. Put it in the interface.”

- Make 23 copies
- With collate
- Cover sheets
- Default darkness
- 1 Sided-> 1 Sided

Bad: Giving the Answers

Tells the person what terminology the interface uses, which they might not otherwise know

lighten = contrast, sorted = collated?

> You are a teacher and are trying to make 40 copies of a one-sided magazine article that is 10 pages long for your class tomorrow. Due to the large number of copies, you print the article double-sided, in other words 10 page article would be printed on 5 sheets of paper. Due to the high contrast of the article, you must lighten the copy, in other words change the contrast. You then want the copies to be collated and stapled.

Good: Giving Context

Giving realistic context through scenarios can reduce the artificiality of the task

It’s your first day in the office, starting a new job. You would like to make some copies of several documents that your boss gave you to browse through. Your colleague in the next cubicle tells you that you need an access code to make copies. The code is 5150. You walk over to the copy machine at the end of the hall and realize that it is not the Xerox copier that you are accustomed too... Make 2 copies of the “Company Annual Report”.

Consider: Under-Specified Tasks

Many realistic goals are under-specified, as people have only a general idea what they want

By under-specifying the task, you can elicit realistic confusion and decision-making

> You just finished fixing up the old hot rod in the garage and now its time to sell her. Make a couple copies of the pictures you took to send into the used car sales magazines. It’s ok that they’re in black and white but maybe you should lighten them up a bit. Your account billing code is 5150.

Task Design Summary

Task design is difficult and important

Poorly designed tasks mask interface failures

Have others help you “debug” them before testing

CSE 440: Introduction to HCI

User Interface Design, Prototyping, and Evaluation

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Tuesday / Thursday
10:30 to 11:50

CSE 440: Introduction to HCI

User Interface Design, Prototyping, and Evaluation

Lecture 13:
Inspection-Based Methods

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50

Today

Project Status

Exam Discussion

Inspection-Based Methods

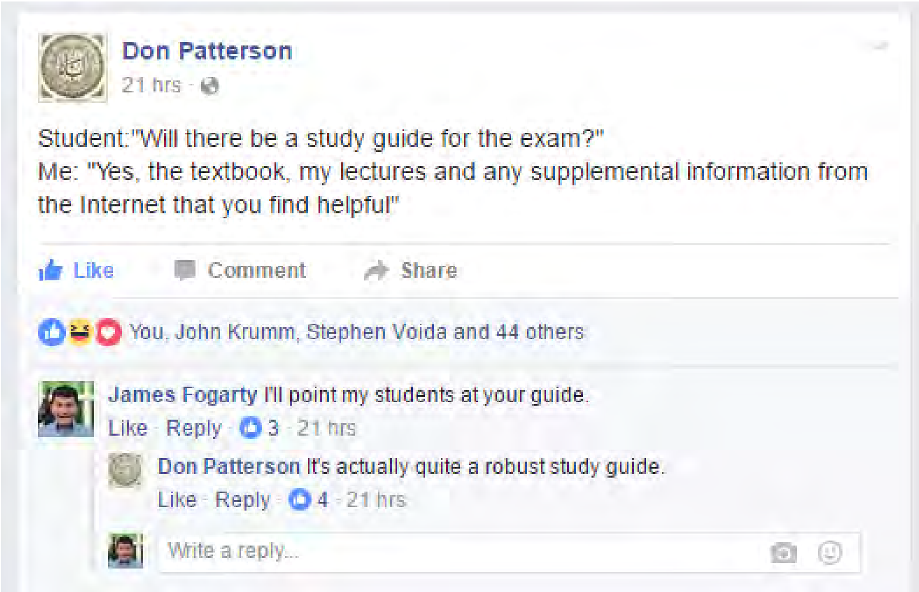
Time for Heuristic Evaluation of Paper Prototypes

Exam

In-Class
Next Tuesday 2/21

Mostly short answer, some long answer

Content drawn from lecture and readings



Will post a compilation of the lecture slides

Schedule a time for Q&A?

Inspection-Based Methods

We have cut prototyping to its minimum

- Sketches, storyboards, paper prototypes
- Rapid exploration of potential ideas

But we need evaluation to guide improvement

- Can become relatively slow and expensive
- Study participants can be scarce
- Can waste participants on obvious problems

Inspection-Based Methods

Simulate study participants

- Instead of actual participants, use inspection to quickly and cheaply identify likely problems

Inspection methods are rational, not empirical

Today we cover two complementary methods

- Heuristic Evaluation
- Cognitive Walkthrough

Heuristic Evaluation

Developed by Jakob Nielsen

- Helps find usability problems in a design
- Not a method for “coming up with” a design

Small set of evaluators examine interface

- Three to five evaluators
- Independently check compliance with principles
- Different evaluators will find different problems
- Evaluators only communicate afterwards

Can perform on working interfaces or sketches

Nielsen's 10 Heuristics

Too few unhelpful, too many overwhelming

- "Be Good" versus thousands of detailed rules

Nielsen seeks to create a small set

- Collects 249 usability problems
- Collects 101 usability heuristics
- Rates how well heuristics explain problems
- Factor analysis to identify key heuristics

Nielsen, 1994

Nielsen’s 10 Heuristics

Visibility of system status
Match between system and the real world
User control and freedom
Consistency and standards
Error prevention
Recognition rather than recall
Flexibility and efficiency of use
Aesthetic and minimalist design
Help recognize, diagnose, and recover from errors
Help and documentation

Nielsen, 1994

1. Visibility

Visibility of system status

The system should always keep people informed about what is going on, through appropriate feedback within reasonable time.

1. Visibility

Visibility of system status

The system should always keep people informed about what is going on, through appropriate feedback within reasonable time.

Refers to both visibility of system status and providing appropriate feedback

Anytime a person is wondering what state the system is in, or the result of some action, this is a visibility violation.

2. Real World Match

Match between system and the real world

The system should speak a person’s language, with words, phrases and concepts familiar to the person, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.

2. Real World Match

Match between system and the real world

- The system should speak a person's language, with words, phrases and concepts familiar to the person, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.

Refers to word and language choice, mental model, metaphor, mapping, and sequencing

3. Control and Freedom

User control and freedom

People often choose system functions by mistake and will need a clearly marked “emergency exit” to leave the unwanted state without having to go through an extended dialogue.

Support undo and redo.

3. User in Control

User control and freedom

People often choose system functions by mistake and will need a clearly marked “emergency exit” to leave the unwanted state without having to go through an extended dialogue.

Support undo and redo.

Not just for navigation exits,
but for getting out of any situation or state.

4. Consistency

Consistency and standards

People should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.

4. Consistency

Consistency and standards

People should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.

Internal consistency is consistency throughout the same product. External consistency is consistency with other products in its class.

5. Error Prevention

Error prevention

Even better than good error messages is a careful design which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present people with a confirmation option before they commit to the action.

5. Error Prevention

Error prevention

Even better than good error messages is a careful design which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present people with a confirmation option before they commit to the action.

Try to commit errors and see how they are handled. Could they have been prevented?

6. Recognition not Recall

Recognition rather than recall

Minimize a person's memory load by making objects, actions, and options visible. A person should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.

6. Recognition not Recall

Recognition rather than recall

Minimize a person’s memory load by making objects, actions, and options visible. A person should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.

People should never carry a memory load

6. Recognition not Recall

Addresses visibility of features and information

- where to find things

Visibility addresses system status and feedback

- what is going on

Problems with affordances may go here

- hidden affordance: remember where to act
- false affordance: remember it is a fake

7. Flexibility and Efficiency

Flexibility and efficiency of use

Accelerators, while unseen by novices, may often speed up the interaction for experts such that the system can cater to both inexperienced and experienced use.

Allow people to tailor frequent actions.

7. Flexibility and Efficiency

Flexibility and efficiency of use

Accelerators, while unseen by novices, may often speed up the interaction for experts such that the system can cater to both inexperienced and experienced use. Allow people to tailor frequent actions.

Concerns anywhere users have repetitive actions that must be done manually. Also concerns allowing multiple ways to do things.

8. Aesthetic Design

Aesthetic and minimalist design

Dialogues should not contain information which is irrelevant or rarely needed.
Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.

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Aesthetic and minimalist design

Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.

Not just about “ugliness”.
About clutter, overload of visual field, visual noise, distracting animations.

9. Error Recovery

Help users recognize, diagnose,
and recover from errors

Error messages should be expressed in
plain language (no codes),
precisely indicate the problem,
and constructively suggest a solution.

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Error prevention is about preventing errors before they occur. This is about after they occur.

10. Help

Help and documentation

Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on a person’s task, list concrete steps to be carried out, and not be too large.

10. Help

Help and documentation

Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on a person's task, list concrete steps to be carried out, and not be too large.

This does not mean that a person must be able to ask for help on every single item.

Heuristic Evaluation Process

Evaluators go through interface several times

- Inspect various dialogue elements
- Compare with list of usability principles

Usability principles

- Nielsen's "heuristics"
- Supplementary list of category-specific heuristics (competitive analysis or testing existing products)

Use violations to redesign/fix problems

Examples

Can’t copy info from one window to another

- violates “Minimize memory load” (H6)
- fix: allow copying

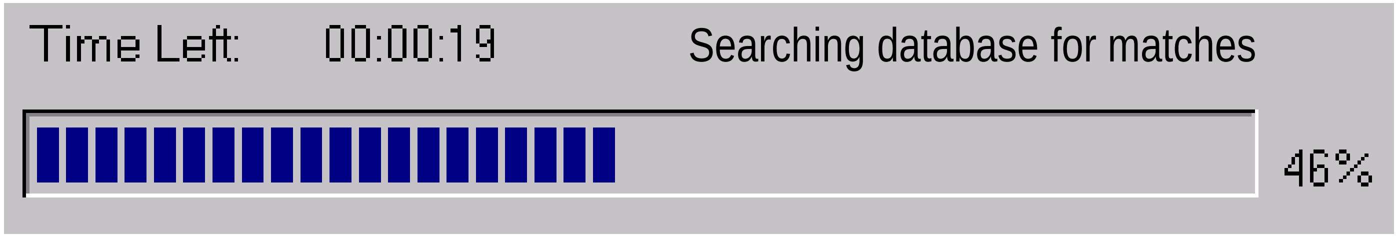
Typography uses different fonts in 3 dialog boxes

- violates “Consistency and standards” (H4)
  - slows users down
  - probably wouldn’t be found by usability testing
- fix: pick a single format for entire interface

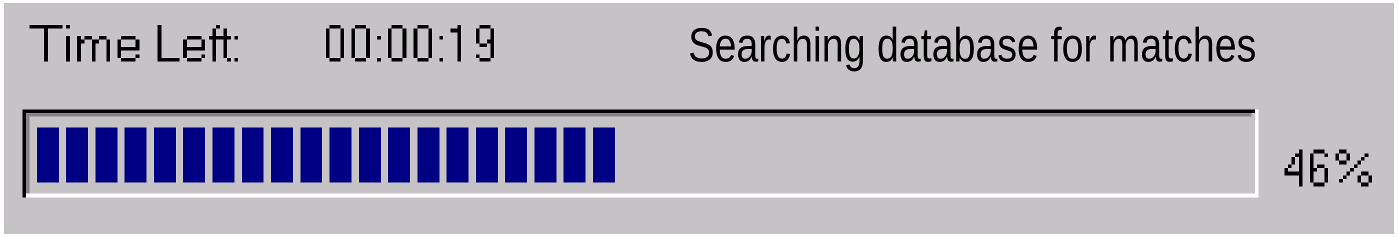
Heuristics

Heuristics

Heuristics



Heuristics



Visibility of system status

pay attention to response time

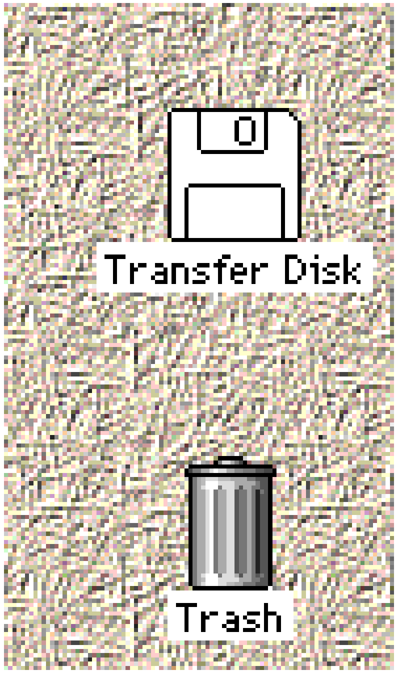
0.1 sec: no special indicators needed (why?)

1.0 sec: user tends to lose track of data

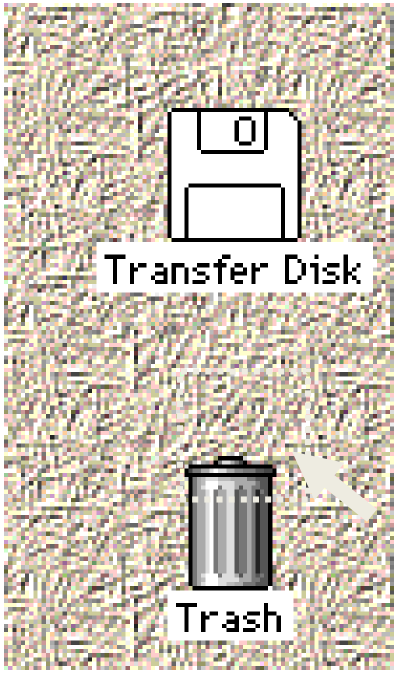
10 sec: maximum duration if user to stay focused on action

longer delays require percent-done progress bars

Heuristics



Heuristics



Mac desktop

Dragging disk to trash should delete, not eject it

Match system to real world

Speak the person's language

Follow conventions

Heuristics

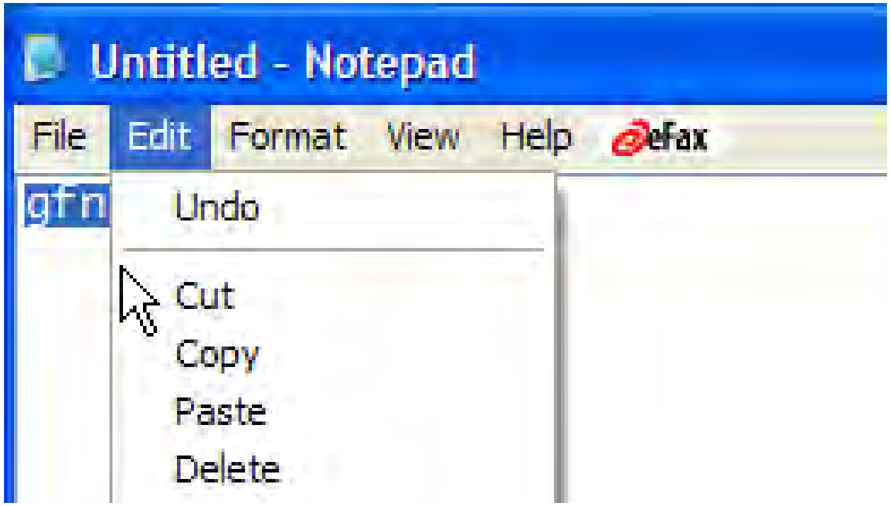
Heuristics

"Mailto", "protocol"?

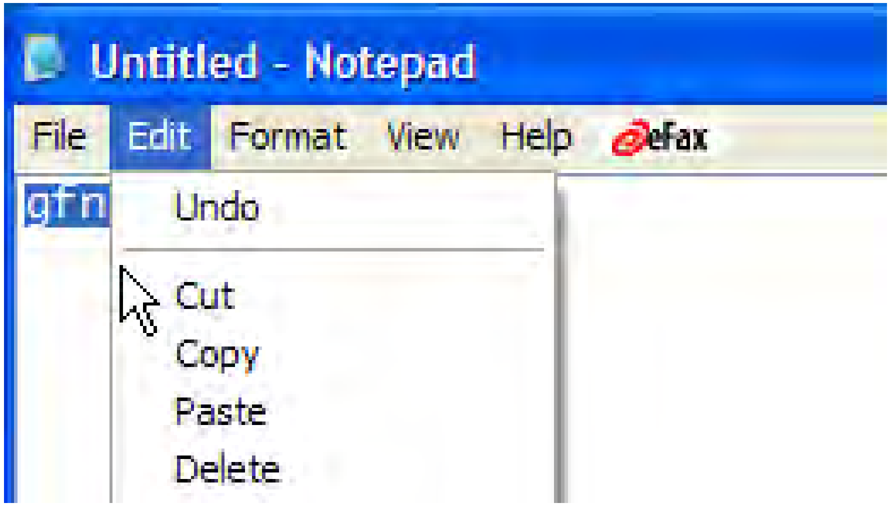
Match system to real world

Speak the person's language

Heuristics


Untitled - Notepad
File
Edit
Format
View
Help
efax
gfn
Undo
Cut
Copy
Paste
Delete

Heuristics

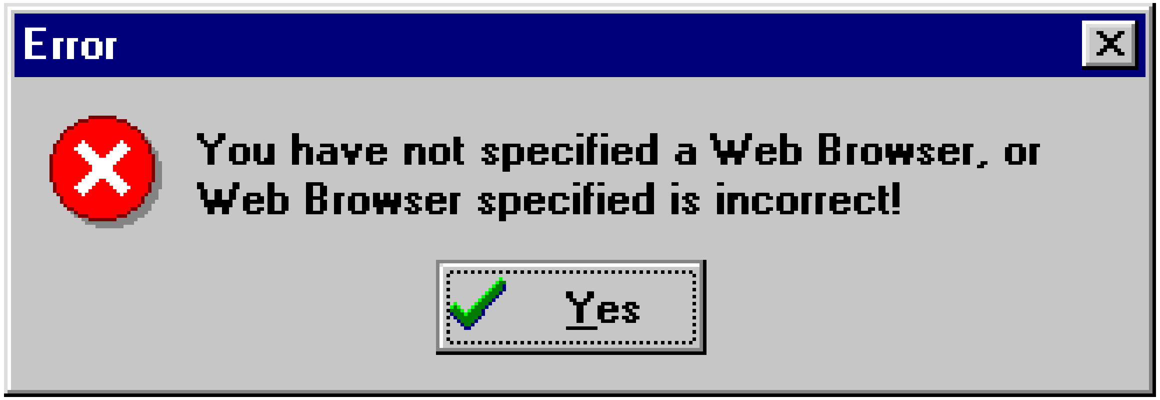


Flexibility and Efficiency of Use

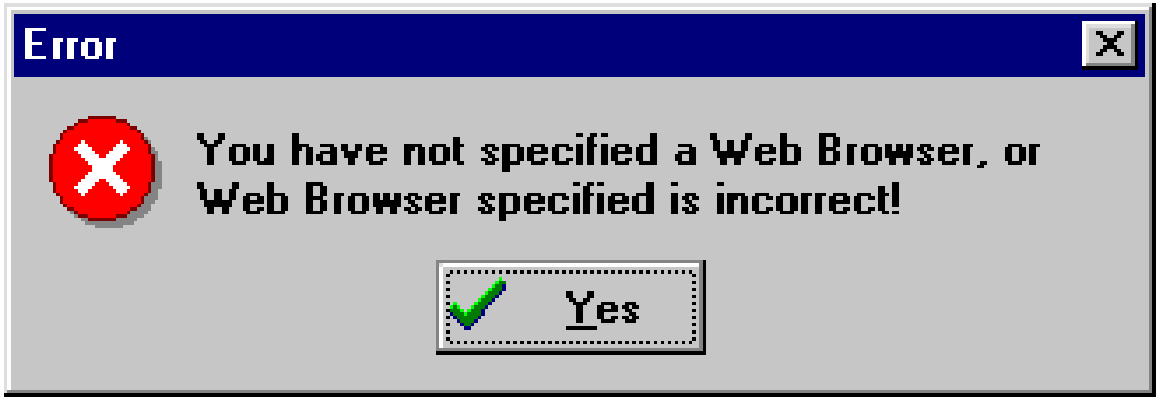
accelerators for experts (e.g., keyboard shortcuts)

allow tailoring of frequent actions (e.g., macros)

Heuristics


Error
You have not specified a Web Browser, or
Web Browser specified is incorrect!
Yes

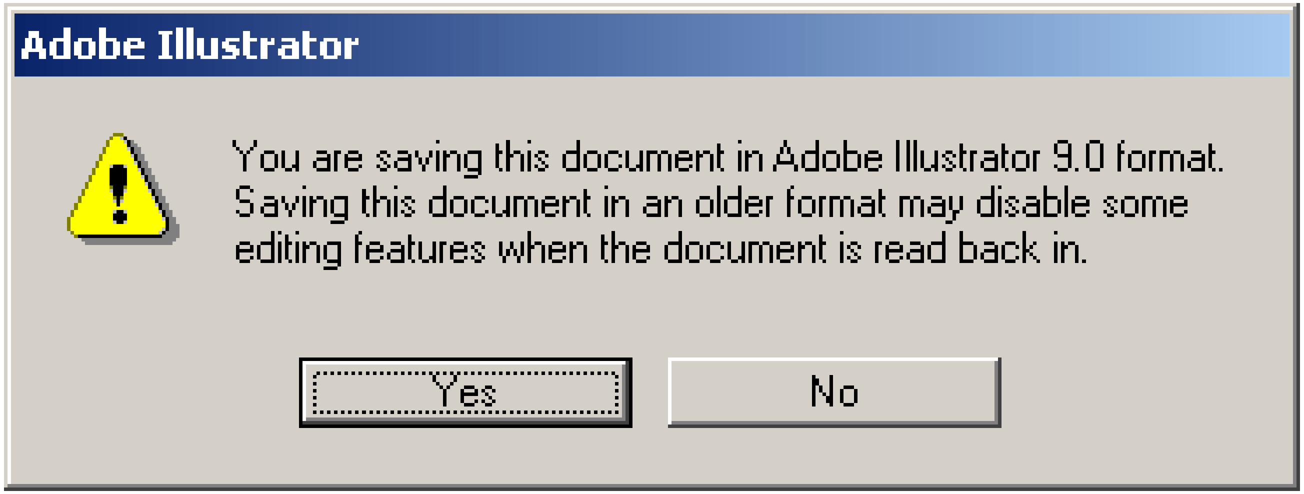
Heuristics



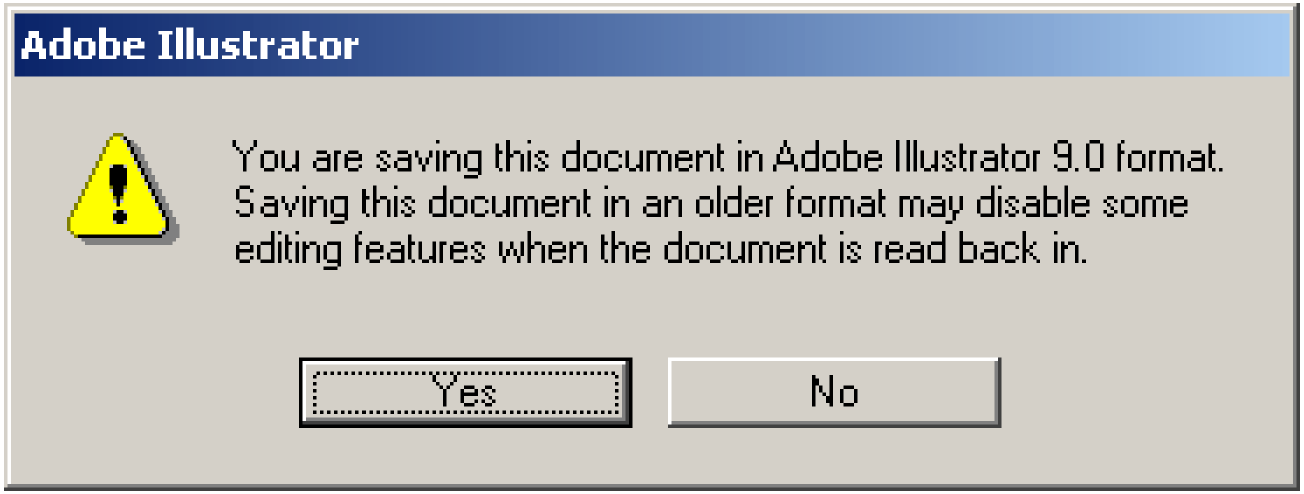
Help recognize, diagnose, & recover from errors

- error messages in plain language
- precisely indicate the problem
- constructively suggest a solution

Heuristics


Adobe Illustrator
You are saving this document in Adobe Illustrator 9.0 format. Saving this document in an older format may disable some editing features when the document is read back in.
Yes
No

Heuristics



User Control and Freedom

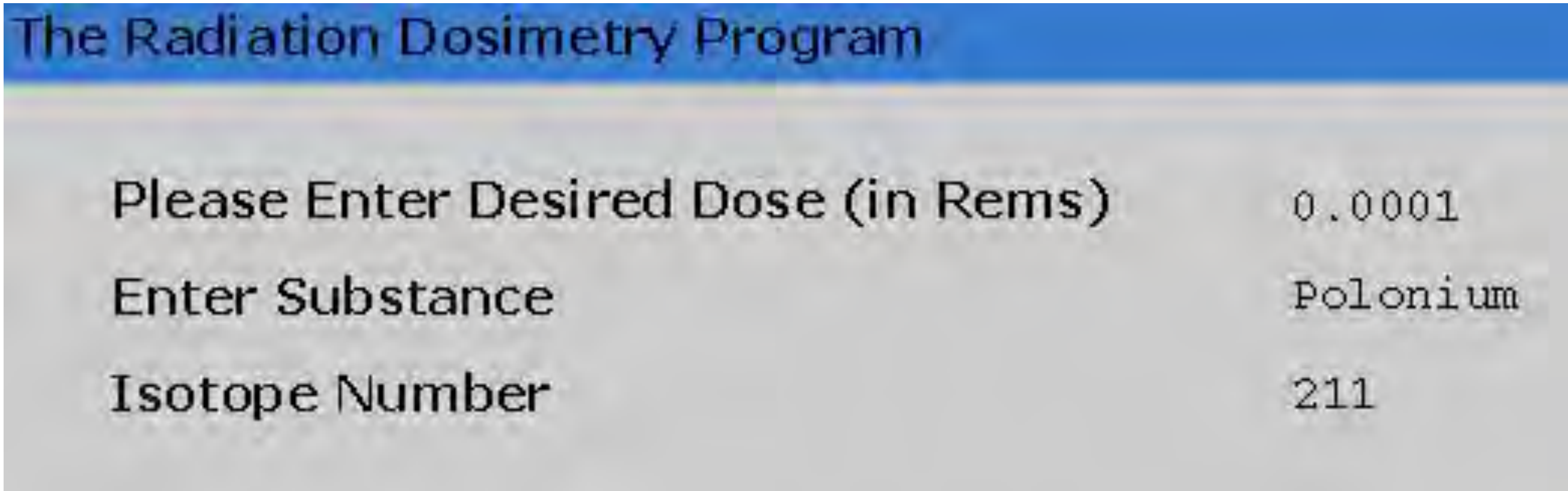
Prevent Errors

Heuristics

The Radiation Dosimetry Program

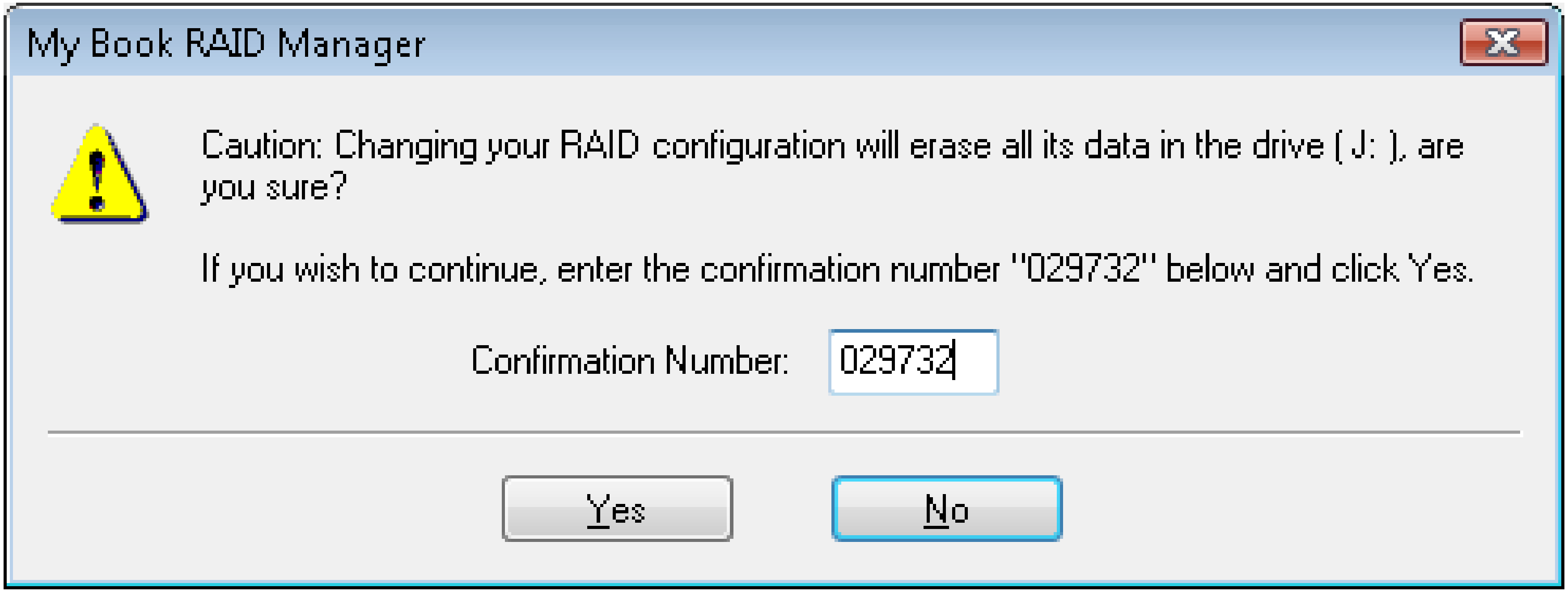
Please Enter Desired Dose (in Rems)	0.0001
Enter Substance	Polonium
Isotope Number	211

Heuristics

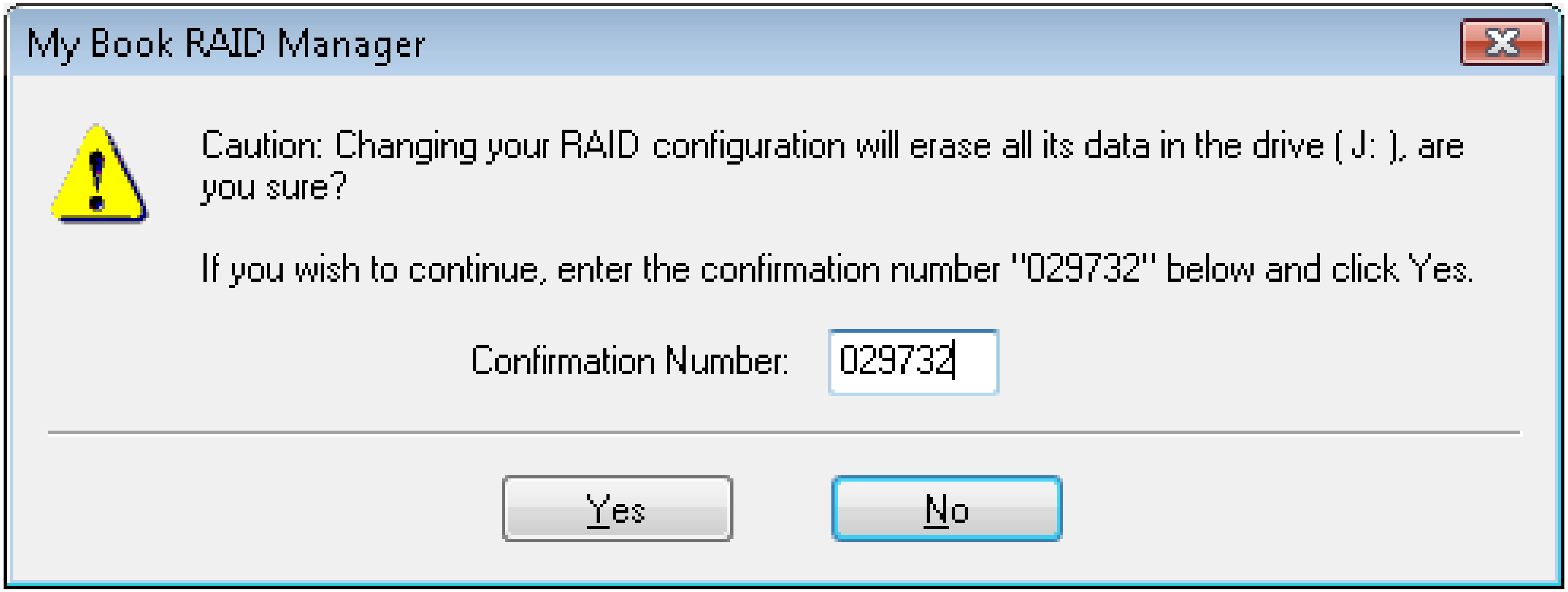


Prevent Errors

Heuristics

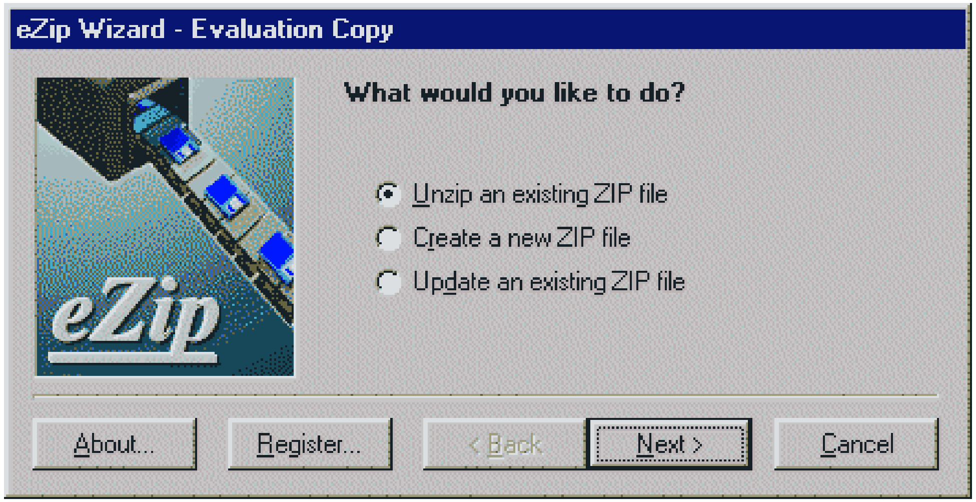

My Book RAID Manager
Caution: Changing your RAID configuration will erase all its data in the drive (J:), are you sure?
If you wish to continue, enter the confirmation number "029732" below and click Yes.
Confirmation Number:
029732
Yes
No

Heuristics

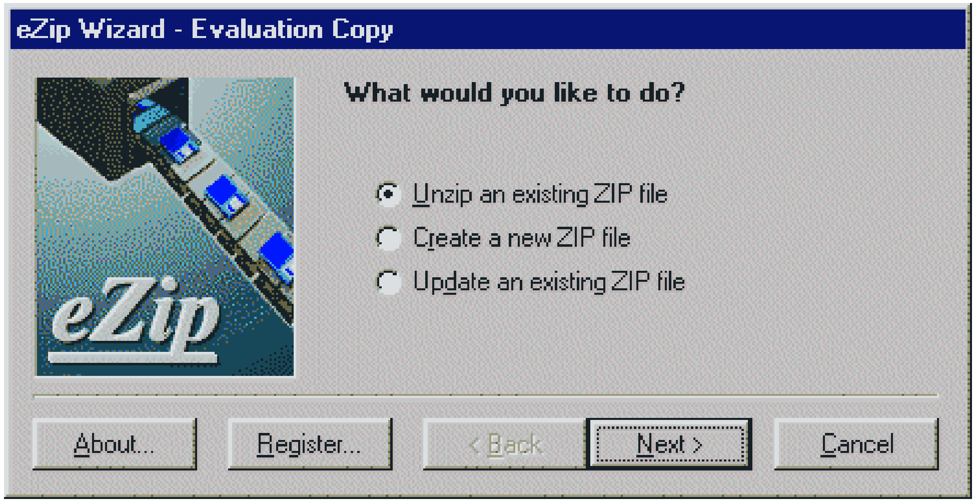


Prevent Errors

Heuristics


eZip Wizard - Evaluation Copy
eZip
What would you like to do?
Unzip an existing ZIP file
Create a new ZIP file
Update an existing ZIP file
About...
Register...
< Back
Next >
Cancel

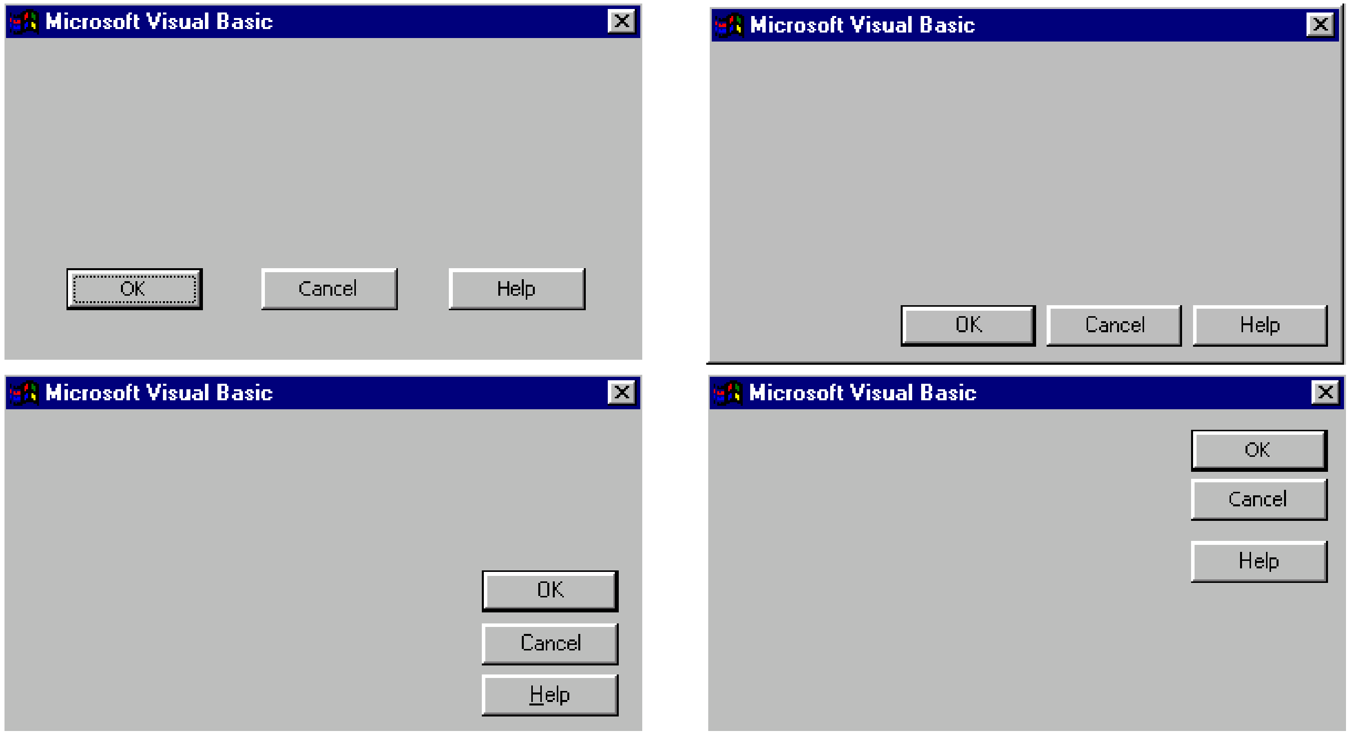
Heuristics



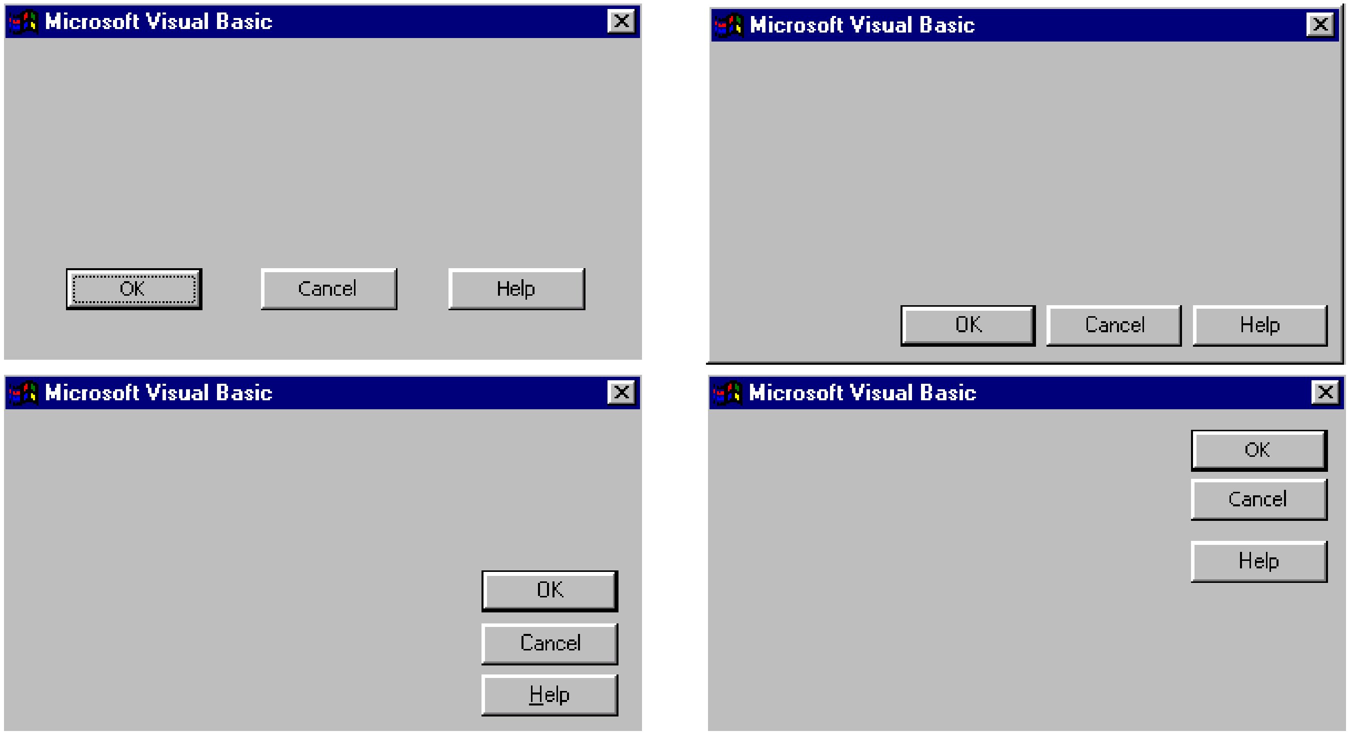
User control & freedom
- provide “exits” for mistaken choices, undo, redo
- don’t force down fixed paths

Wizards
- must respond to question before going to next
- good for beginners, infrequent tasks
- not for common tasks
- consider having 2 versions (WinZip)

Heuristics


Microsoft Visual Basic
OK
Cancel
Help
Microsoft Visual Basic
OK
Cancel
Help
Microsoft Visual Basic
OK
Cancel
Help
Microsoft Visual Basic
OK
Cancel
Help

Heuristics

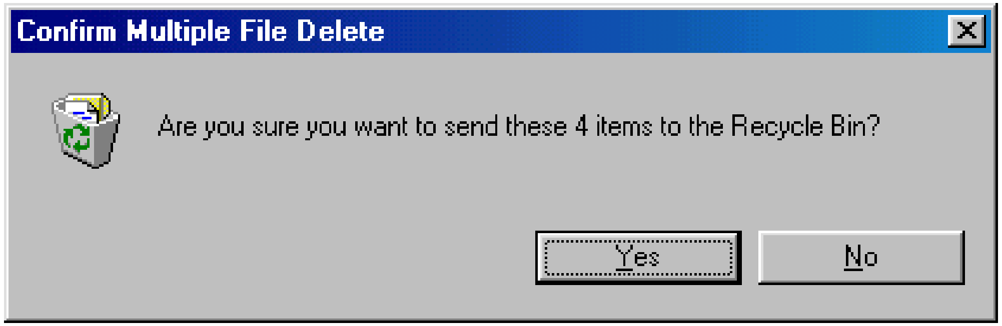


Consistency & Standards

Heuristics

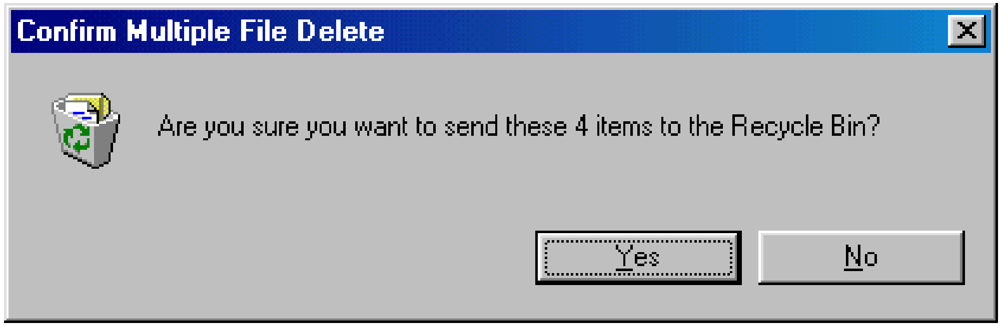
% rm cse440*

%



Heuristics

```
% rm cse440*
%
```

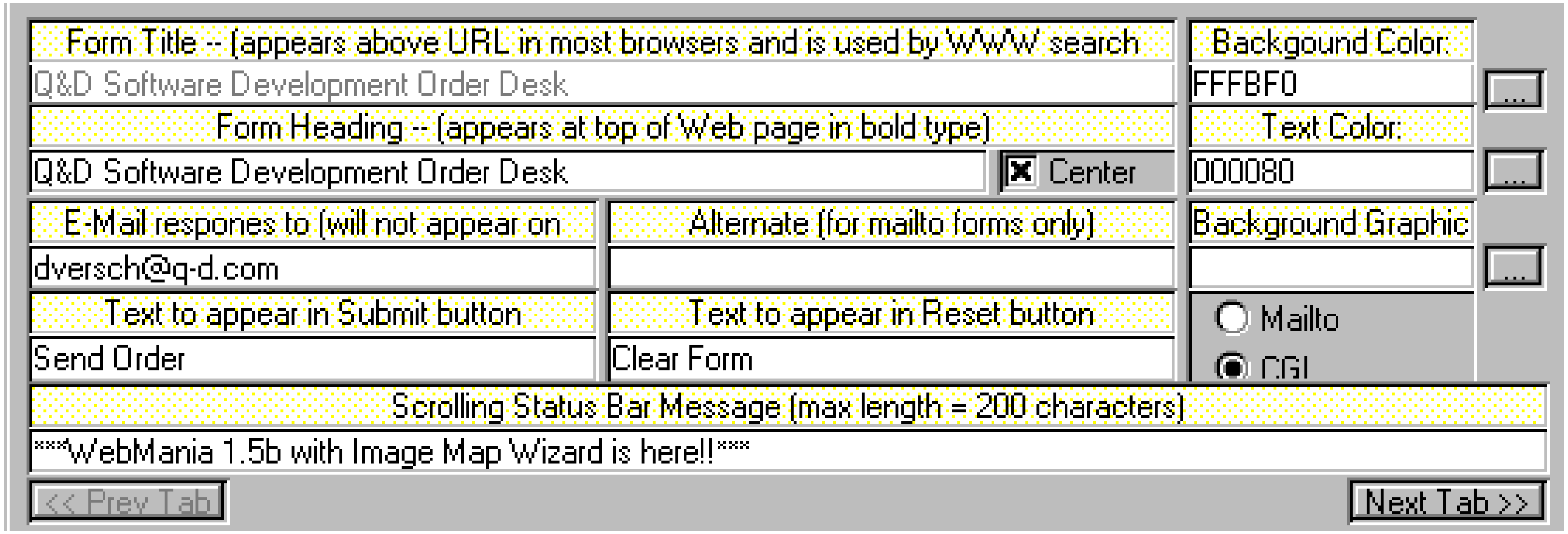


Error prevention

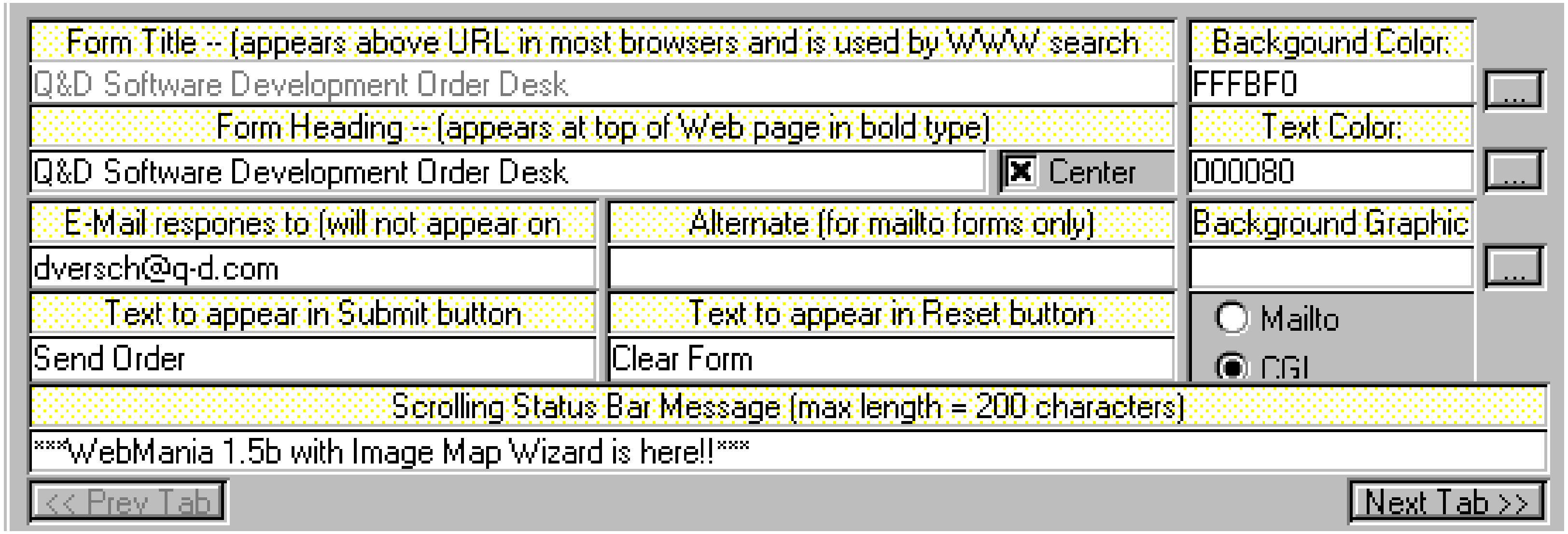
Recognition rather than recall

Visibility

Heuristics


Form Title -- (appears above URL in most browsers and is used by WWW search
Q&D Software Development Order Desk
Backgound Color:
FFFBF0
...
Form Heading -- (appears at top of Web page in bold type)
Q&D Software Development Order Desk
Center
Text Color:
000080
...
E-Mail respones to (will not appear on
dversch@q-d.com
Alternate (for mailto forms only)
Background Graphic
...
Text to appear in Submit button
Send Order
Text to appear in Reset button
Clear Form
Mailto
CGI
Scrolling Status Bar Message (max length = 200 characters)
WebMania 1.5b with Image Map Wizard is here!!
<< Prev Tab
Next Tab >>

Heuristics



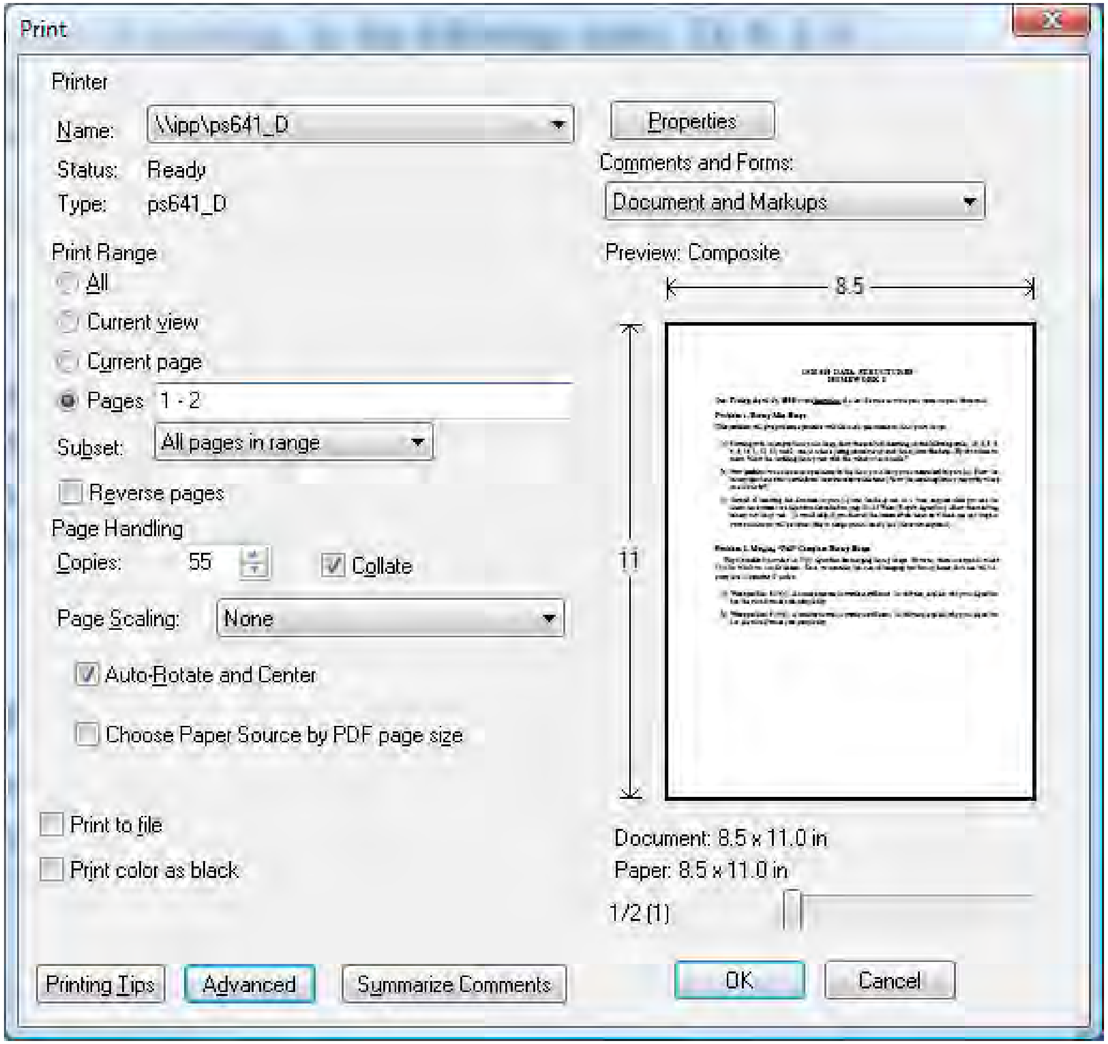
Aesthetic & Minimalist design

no irrelevant information in dialogues

Heuristics


Select an award style...
Select an award style using the scroll bar. When you've found a style that suits you, press OKAY to create that award and open the editor.
Certificate of
ACHIEVEMENT
CERTIFICATE OF ACHIEVEMENT
Cancel
OK

Heuristics


Print
Printer
Name: \\ipp\ps641_D
Properties
Status: Ready
Type: ps641_D
Comments and Forms:
Document and Markups
Print Range
All
Current view
Current page
Pages 1 - 2
Subset: All pages in range
Reverse pages
Preview: Composite
8.5
11
Page Handling
Copies: 55
Collate
Page Scaling: None
Auto-Rotate and Center
Choose Paper Source by PDF page size
Print to file
Print color as black
Document: 8.5 x 11.0 in
Paper: 8.5 x 11.0 in
1/2 (1)
Printing Tips
Advanced
Summarize Comments
OK
Cancel

Heuristics

UR Rewarding Experiences - Mozilla Firefox
File Edit View History Bookmarks Tools Help
https://ultimaterewardslt.chase.com/edealinv/servlet/ExecMacro?ctl_nbr=10630&nurl=control%2FS
Most Visited Getting Started Latest Headlines
UR Rewarding Experiences
My Chase Accounts Manage Ultimate Rewards Help Log Off
CHASE
ultimate rewards
Rewards Home Travel Experiences Merchandise Gift Cards Cash Back Earn Faster Spotlight
Your rewards balance is 25,601 Points
All Rewards Search GO
Rewarding Experiences
Your Chase card with Ultimate Rewards gives you access to great entertainment including concerts, sporting events, chef dinners and more.
Use your points or your Chase card to redeem for most items, or just your points to bid on the auctions.
Featured Experiences & Auctions
Five-Night Vacation to Rome for Two
Auction
Rome, Italy
Opening Bid: 128,575 points
View Details | View More Like This
Quick Search
City All Cities
Category: All Categories
From To
Search
Culinary & Wine
Culinary Experiences (29)
Wine Experiences (2)
Restaurants (1)
See All Culinary & Wine
Sports & Leisure
Car Racing (38)
Adventure (27)
Outdoor Activities (24)
See All Sports & Leisure
Art & Entertainment
More Art & Entertainment (4)
Museums (1)
Music (1)
See All Art & Entertainment
Gift Ideas
Cook up Sweet Chocolate Creations
43,400 points or $434 on your Chase Card
Private Photography Lesson
Current Bid: 12,519 points
DJ Delights
14,400 points or
Featured Experiences
These new Experiences offer excitement on land, on sea and in the air!
Ride shotgun in a dragster at Brainerd International Raceway. $184 or 18400 points.
Dance and dine on a Washington, D.C. dinner cruise for two. $249 or 24900 points.
How It Works
There are two types of rewards:
Auctions
For auctions, you can bid on rewards using your points. If you are the top bidder when the auction expires, you win.
Redeem Now
For everything else, you can redeem now using your points or your Chase card with Ultimate Rewards.
» FAQs
Transferring data from ultimaterewardslt.chase.com...

Phases of Heuristic Evaluation

1) Pre-evaluation training

   give expert evaluators needed
   domain knowledge & information on the scenario

2) Evaluation

   individuals evaluate interface
   and make lists of problems

3) Severity rating

   determine how severe each problem is

4) Aggregation

   group meets and aggregates problems (w/ ratings)

5) Debriefing

   discuss the outcome with design team

How to Perform Evaluation

At least two passes for each evaluator

- first to get feel for flow and scope of system
- second to focus on specific elements

If system is walk-up-and-use or evaluators are domain experts, no assistance needed

- otherwise might supply evaluators with scenarios

Each evaluator produces list of problems

- explain why with reference to heuristic
- be specific & list each problem separately

Example Heuristic Violation

1. [H4 Consistency]

The interface used the string "Save" on the first screen for saving the person's file, but used the string "Write file" on the second screen.
People may be confused by this different terminology for the same function.

How to Perform Heuristic Evaluation

Why separate listings for each violation?

- risk of repeating problematic aspect
- may not be possible to fix all problems

Where problems may be found

- single location in interface
- two or more locations that need to be compared
- problem with overall structure of interface
- something that is missing
  - common problem with paper prototypes
  - (sometimes features are implied by design documents and just haven’t been “implemented” – relax on those)

Severity Rating

Used to allocate resources to fix problems

Estimates of need for more usability efforts

Combination of

- frequency
- impact
- persistence (one time or repeating)

Should be calculated after all evaluations are in

Should be done independently by all judges

Severity Rating

0 - Do not agree this is a problem.

1 - Usability blemish.
Mild annoyance or cosmetic problem. Easily avoidable.

2 - Minor usability problem.
Annoying, misleading, unclear, confusing.
Can be avoided or easily learned. May occur only once.

3 - Major usability problem.
Prevents people from completing tasks. Highly confusing or unclear. Difficult to avoid. Likely to occur more than once.

4 - Critical usability problem.
People will not be able to accomplish their goals.
People may quit using system all together.

Example Heuristic Violation

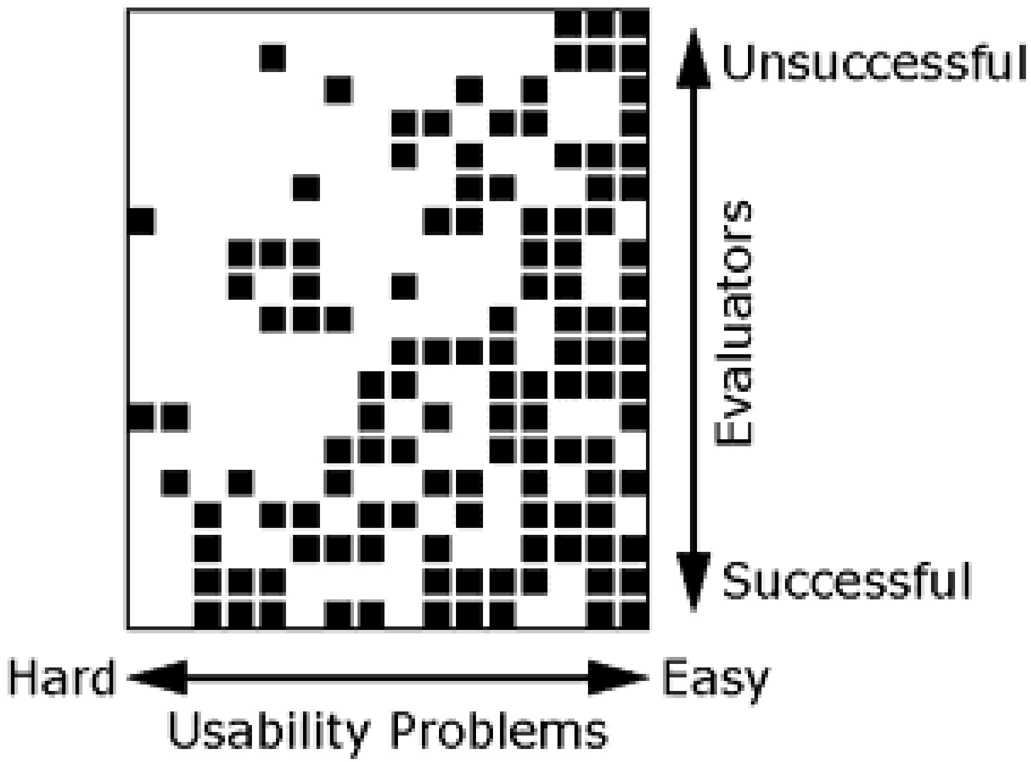
1. [H4 Consistency] [Severity 3]

The interface used the string "Save" on the first screen for saving the person’s file, but used the string "Write file" on the second screen. People may be confused by this different terminology for the same function.

Why Multiple Evaluators?

Every evaluator does not find every problem

Good evaluators find both easy & hard ones



Debriefing

Conduct with evaluators, observers,
and development team members

Discuss general characteristics of interface

Suggest potential improvements to address
major usability problems

Development team rates how hard to fix

Make it a brainstorming session

Fixability Scores

1 - Nearly impossible to fix. Requires massive re-engineering or use of new technology. Solution not known or understood at all.

2 - Difficult to fix. Redesign and re-engineering required. Significant code changes. Solution identifiable but details not fully understood.

3 - Easy to fix. Minimal redesign and straightforward code changes. Solution known and understood.

4 - Trivial to fix. Textual changes and cosmetic changes. Minor code tweaking.

Example Heuristic Violation

1. [H4 Consistency] [Severity 3] [Fix 4]

The interface used the string "Save" on the first screen for saving the person's file, but used the string "Write file" on the second screen. People may be confused by this different terminology for the same function.

Fix: Change second screen to "Save".

Results of Using HE

Discount: benefit-cost ratio of 48

- cost was $10,500 for benefit of $500,000
- how might we calculate this value?
- in-house → productivity; open market → sales

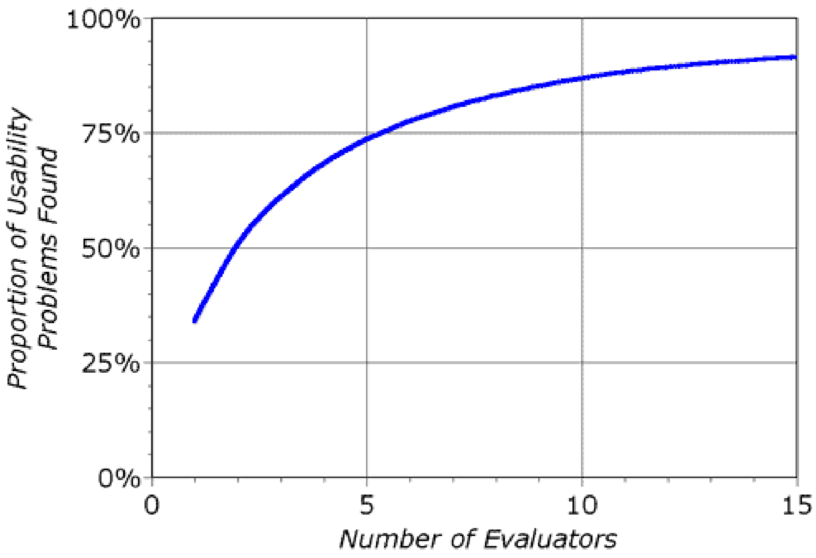
Single evaluator achieves poor results

- only finds 35% of usability problems
- 5 evaluators find ~ 75% of usability problems
- why not more evaluators?

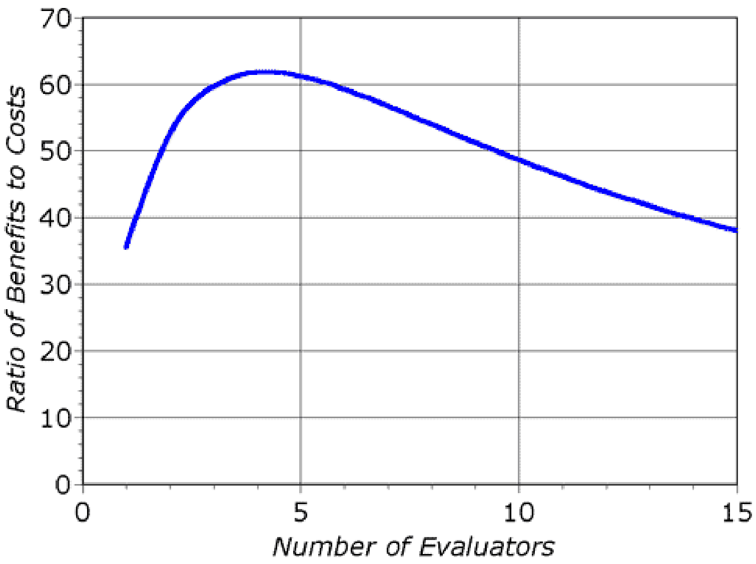
Nielsen, 1994

Decreasing Returns

problems found



benefits / cost



Nielsen, 1994

Alternative Inspection-Based Methods

Cognitive Walkthrough

- Surfaces different types of usability problems
- Consider as a complement to heuristic evaluation

Action Analysis

- Low-level modeling of expert performance
- Be aware of GOMS, but may never encounter it

Cognitive Walkthrough

Evaluation method based on:

- A person works through an interface in an exploratory manner
- A person has goals
- The person is applying means-ends reasoning to work out how to accomplish these goals

Evaluation by an expert, who goes through a task while simulating this cognitive process

Preparation: Need Four Things

1) Person description, including level of experience and any assumptions made by the designer
2) System description (e.g., paper prototype)
3) Task description, specifying the task the expert has to carry out, from a person's point of view
4) Action sequence describing the system display and the actions needed to complete the task. One system display and one action together are one step.

Cognitive Walkthrough Process

Designer/Developer prepares the required documents described on previous slide

Gives these documents to the usability expert

Expert reads the descriptions, and carries out the task by following the action list

At each step in action list, asks four questions

Record problems similar to heuristic evaluation

Believability

1) Will the person be trying to produce whatever effect the action has?
2) Will the person be able to notice that the correct action is available?
3) Once the person finds the correct action at the interface, will they know that it is the right one for the effect they are trying to produce?
4) After the action is taken, will the person understand the feedback given?

Action Analysis / Cognitive Modeling

GOMS: Goals, Operators, Methods, Selection

Developed by Card, Moran and Newell

Walk through sequence of steps

Assign each an approximate time duration

Sum to estimate overall performance time

1. Select sentence		
Reach for mouse	H	0.40
Point to first word	P	1.10
Click button down	K	0.60
Drag to last word	P	1.20
Release	K	0.60
		3.90 secs

Inspection vs. Usability Testing

Inspection is

- Is much faster
- Does not require interpreting participant actions
- May miss problems or find false positives

Usability testing is

- More accurate, by definition
- Account for actual people and tasks

One approach is to alternate between them

- Find different problems, conserve participants

CSE 440: Introduction to HCI

User Interface Design, Prototyping, and Evaluation

Lecture 13:
Inspection-Based Methods

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50