

# CSE 440: Introduction to HCI

User Interface Design, Prototyping, and Evaluation

Lecture 07:  
Storyboarding and  
Video Prototyping

Tuesday / Thursday  
12:00 to 1:20

James Fogarty  
Kailey Chan  
Dhruv Jain  
Nigini Oliveira  
Chris Seeds  
Jihoon Suh

# Project Status

## Looking Forward

2e: Task Review due Tonight

2f: Design Check-In (3x4) Due Monday 10/23

2g: Design Review (1x2) Due Thursday 10/26

“Getting the Right Design” Report Due Monday 10/30

“Getting the Right Design” Report Due Wednesday 11/1

## Beware the Pitfall of “Splitting” Design Ideation

It hurts, it hurts so much

## Other Assignments

Reading 2 Due this Saturday 10/21

Reading 5 Can Be Done Anytime, Sooner is Better

# Denny 303 on Tuesday 10/24



# James Away on Tuesday 10/24

The screenshot shows a web browser displaying the event page for the Computing Research: Addressing National Priorities and Societal Needs 2017 symposium. The page features a red header with the CCC logo and the text "Catalyzing the computing research community and enabling the pursuit of innovative, high-impact research". Below the header is a navigation bar with links for ABOUT, VISIONING, LEADERSHIP DEVELOPMENT, TASK FORCES, RESOURCES, EVENTS, and BLOG. A search bar is also present. The main title "COMPUTING RESEARCH" is prominently displayed in large red letters, with the subtitle "ADDRESSING NATIONAL PRIORITIES AND SOCIETAL NEEDS" underneath. To the right of the title is a graphic depicting a network of people connected by lines and icons representing technology and society. The main content area includes a section for "October 23-24, 2017" at "The InterContinental Washington D.C. at the Wharf, 801 Wharf Street, SW, Washington, D.C. 20024", a map of the Washington, D.C. area, and sections for "Event Contact" (Ann Drobis, adrobis@cra.org), "Event Type" (2017 Events, Special Event), "Event Category" (CCC), and "Tags" (grand challenges, research, symposium). The right side of the page contains detailed descriptions of the four main themes: Intelligent Infrastructure for our Cities and Communities, Security and Privacy for Democracy, AI and Amplifying Human Abilities, and Data, Algorithms, and Fairness. Each theme has a corresponding bulleted list of topics or descriptions.

Computing Research: Addressing National Priorities and Societal Needs 2017

October 23-24, 2017

The InterContinental Washington D.C. at the Wharf  
801 Wharf Street, SW, Washington, D.C. 20024

Map

Event Contact

Ann Drobis  
adrobis@cra.org

Event Type

2017 Events, Special Event

Event Category

CCC

Tags

grand challenges, research, symposium

Overview Agenda

Over the past several decades, computing and information technologies have shaped our lives, our society, and our physical world in ways we never would have imagined. An increasing number of jobs depend on IT, IT shrinks time and distance in our social lives, agriculture and transportation are rapidly becoming IT-based, and IT holds the promise of revolutionizing education and healthcare. Although many of the IT-powered innovations that are reshaping our society can be traced to fundamental computing-related research, their impact has been magnified through powerful applications in areas of broad societal need and opportunity.

Over the past 11 years, the Computing Community Consortium has hosted dozens of research visioning workshops to imagine, discuss, and debate the future of computing and its role in addressing societal needs. The second CCC Computing Research symposium draws these topics into a program designed to illuminate current and future trends in computing and the potential for computing to address national challenges.

The two days are organized around four main themes:

Intelligent Infrastructure for our Cities and Communities

- Intelligent infrastructure is already transforming our nation's cities and communities, but the technological revolution is just now beginning. The potential for major improvements in public health and safety, efficient use of our resources, and a higher quality of life for all citizens are enormous. At the same time, new risks arise as we attempt to integrate large scale data collection, advanced cyberphysical systems, and autonomous vehicles into our daily lives. This session will highlight some of the major advances now taking place, while at the same time emphasizing the substantial body of research, much of it crossing disciplinary boundaries, that still needs to be done.

Security and Privacy for Democracy

- Computing research enables new technology to help society cope with information security and privacy risks. Learn about how differential privacy will enable new understanding of the population while protecting privacy and about technologies used to help journalists and human rights workers to communicate safely in oppressive regimes.

AI and Amplifying Human Abilities

- This panel will examine the emerging role of AI in augmenting human abilities in new and powerful ways. In particular, this session will examine the spectrum of human and machine capabilities and how we develop systems that provide a seamless interface between the two. Speakers will also ground their remarks in application areas ranging from health, transportation, universal access, data analysis, and education.

Data, Algorithms, and Fairness

- Data-driven and algorithmic decision making increasingly determine how businesses target advertisements to consumers, how police departments monitor individuals or groups, how banks decide who gets a loan and who does not, how employers hire, how colleges and universities make admissions and financial aid decisions, and much more. As data-driven decisions increasingly affect every corner of our lives, there is an urgent need to ensure they do not become instruments of discrimination, barriers to equality, and threats to social justice.

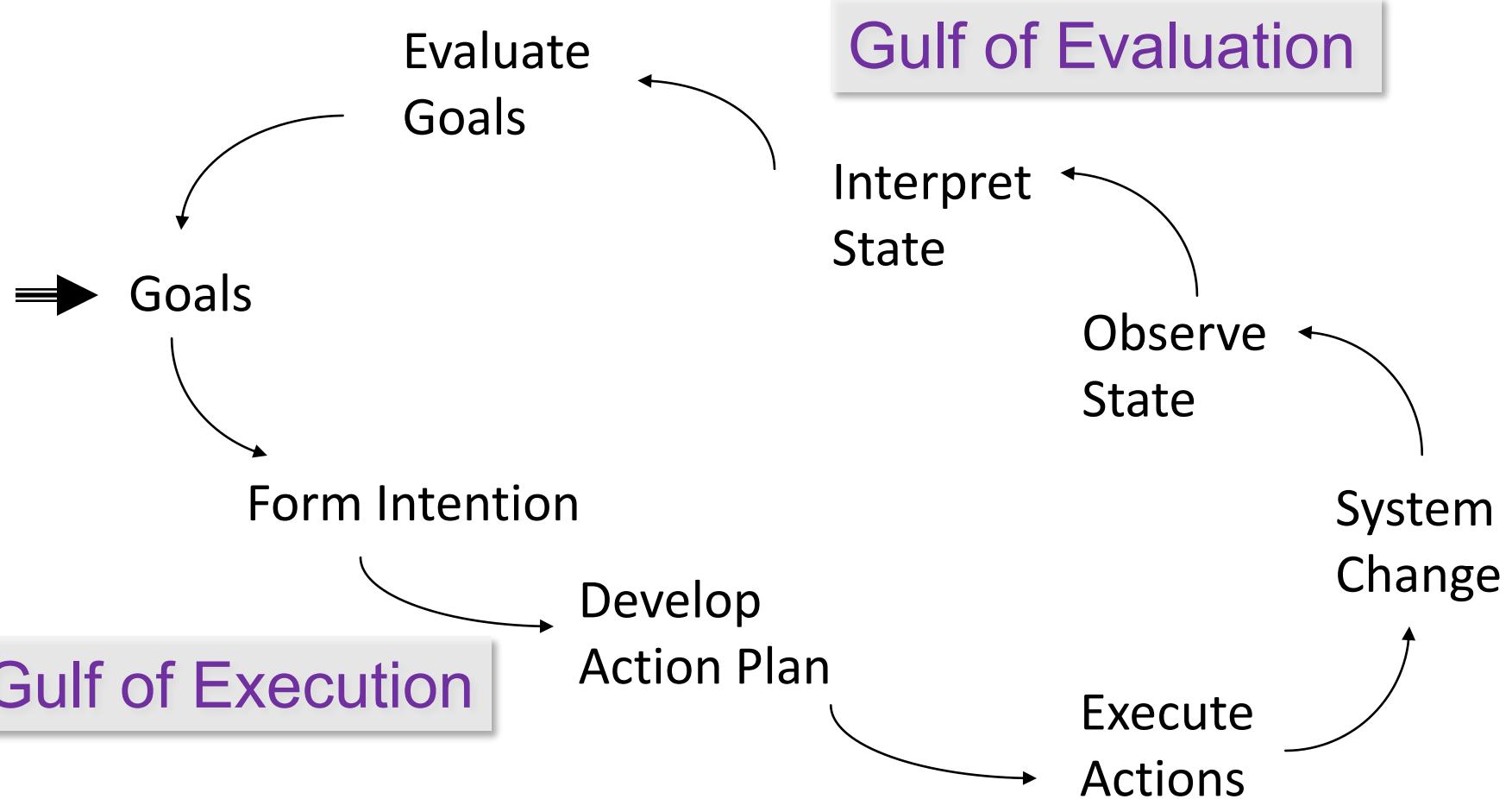
Livestream

# Today

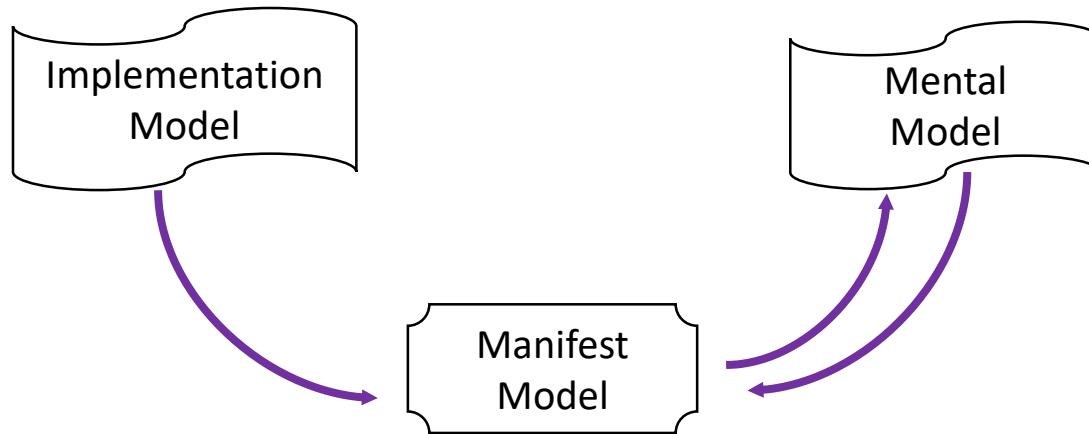
## Finishing Design of Everything Things

### Storyboarding and Video Prototyping

# Norman's Execution-Evaluation Cycle



# Manifest and Mental Models



Designer projects their model into an artifact

Person forms their model based on interaction

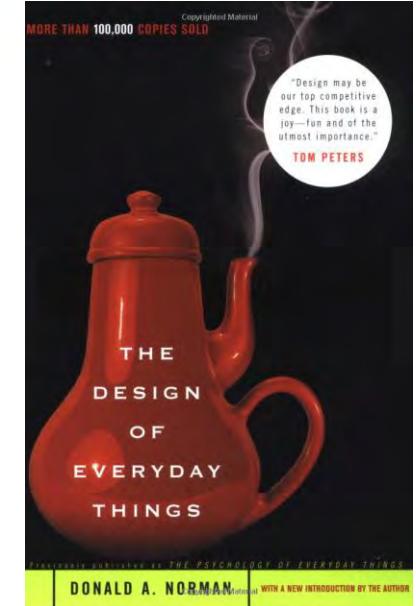
People struggle until model matches manifest model

Update mental model in response to breakdowns

Matching the implementation model is not necessary

# 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

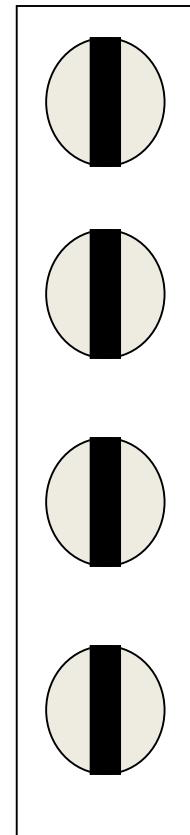
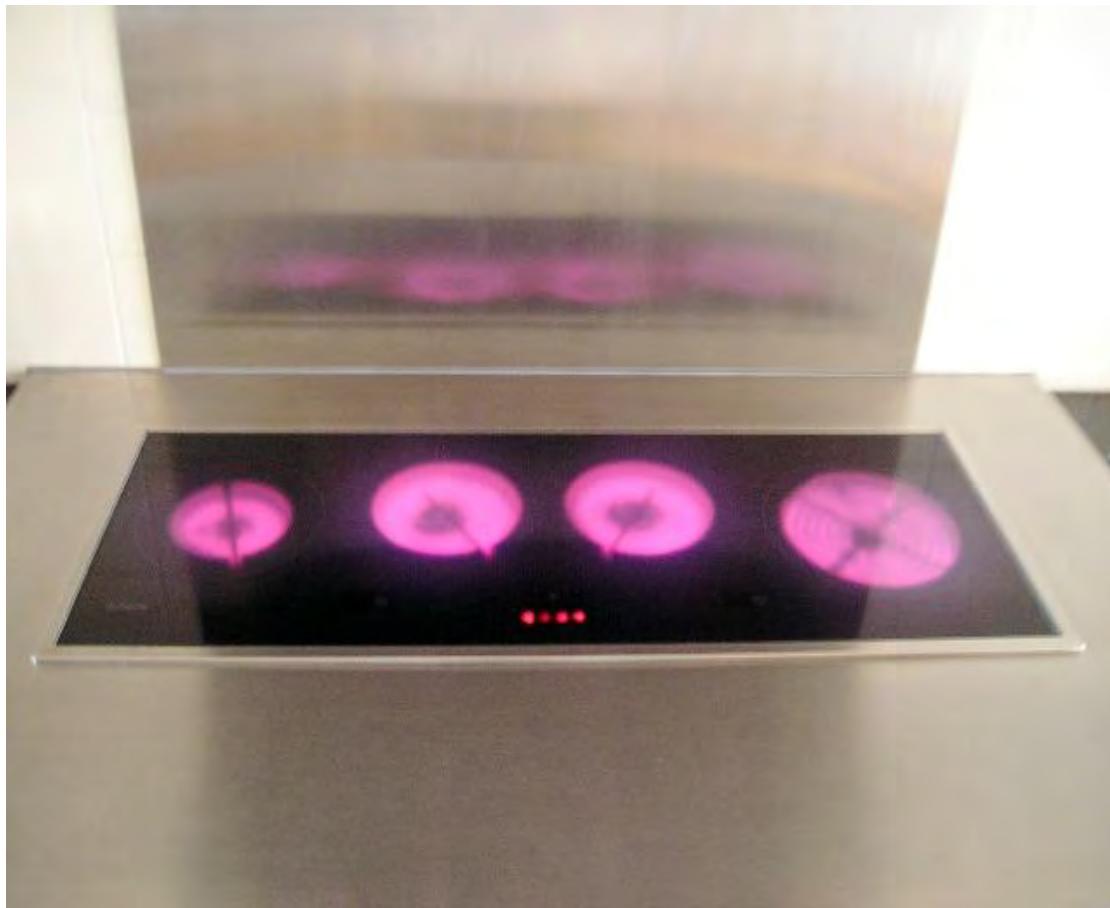
# Mapping

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

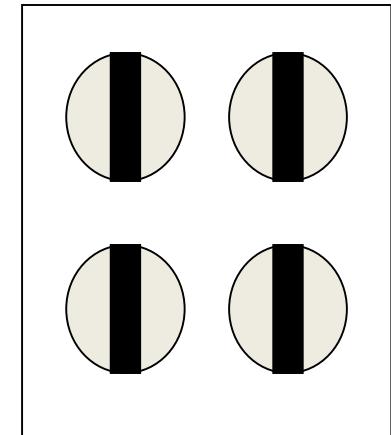
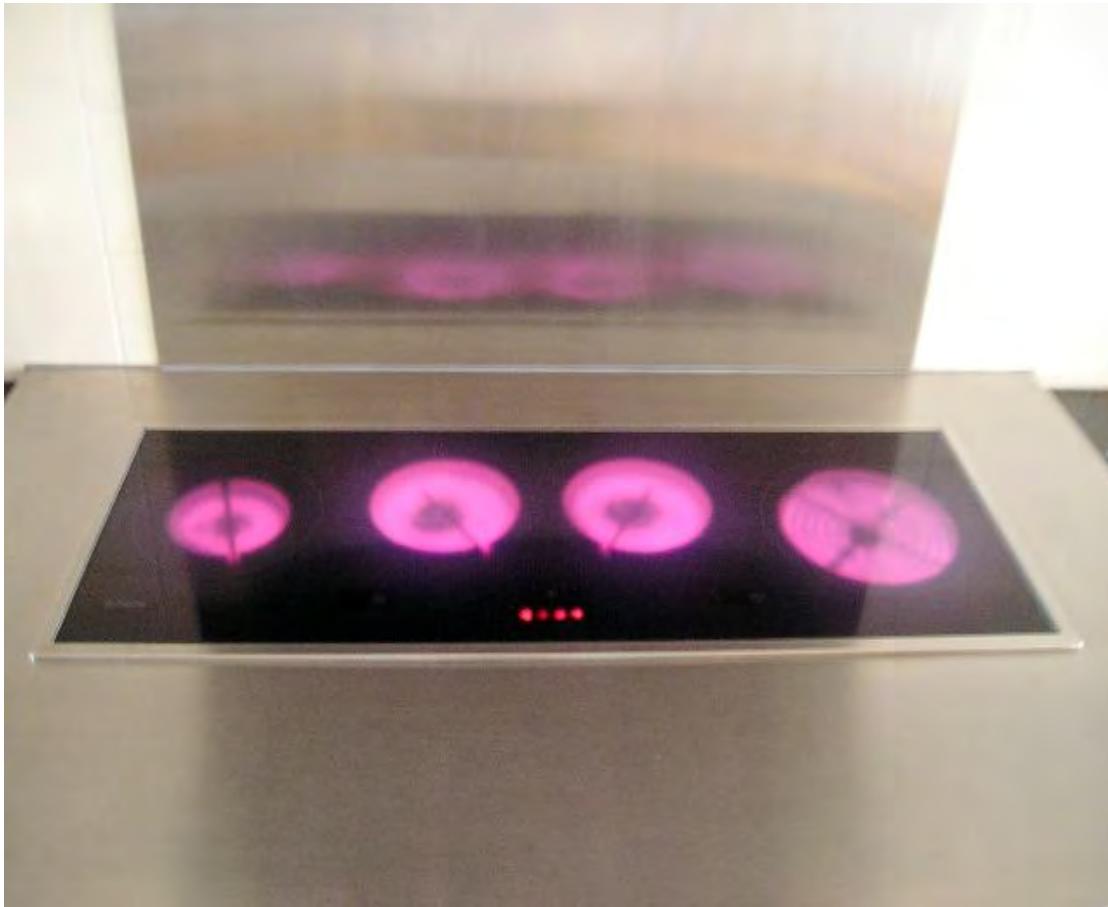
Minimize cognitive steps to transform action into effect, or perception into comprehension (i.e., execution and evaluation)



# Very Bad Mapping



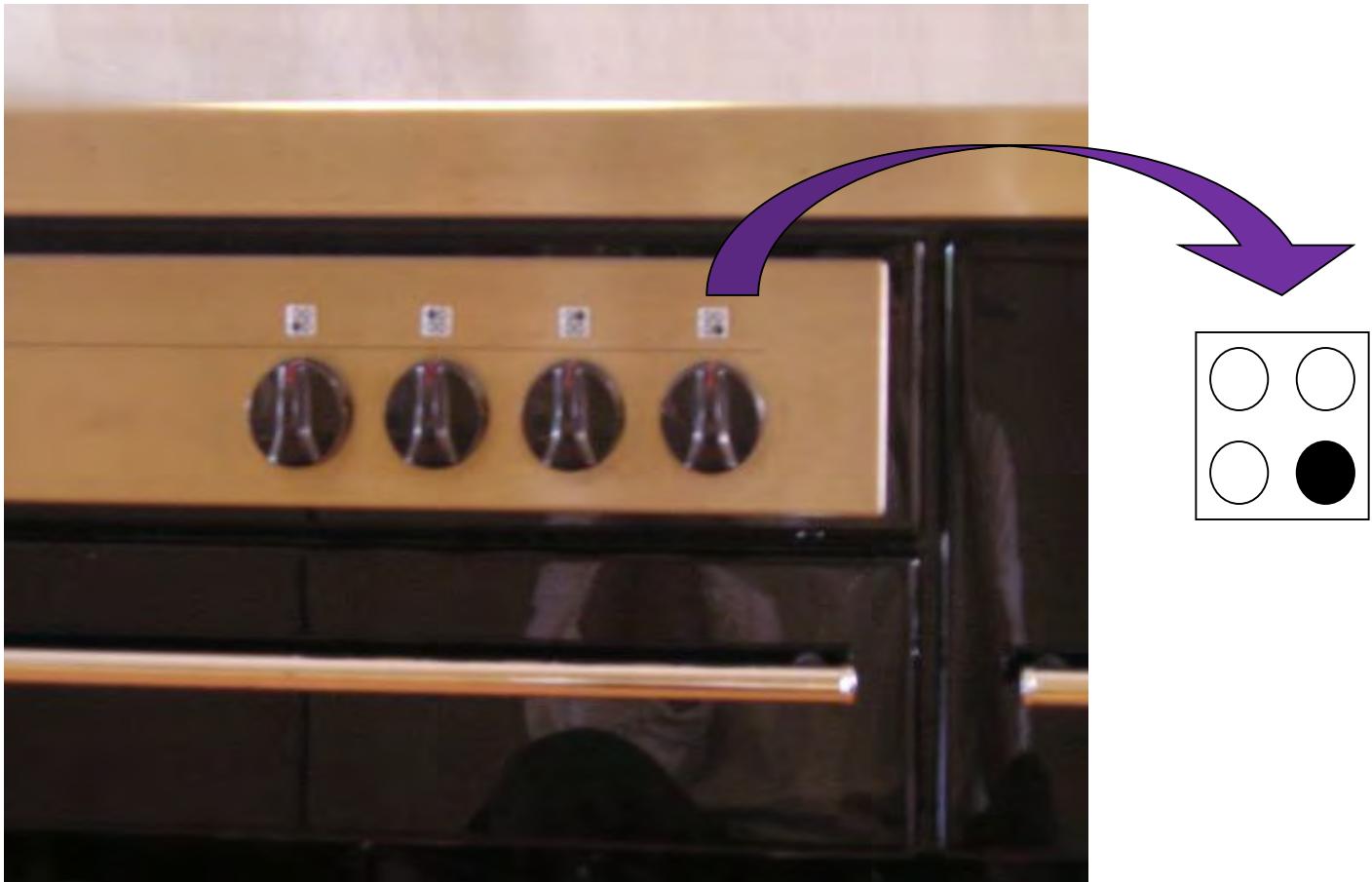
# Slightly Better Mapping



# Good Mapping



# Not this Stove



# Great Mapping



# Mapping



Removing the cover plate, then removing and swapping the switches.

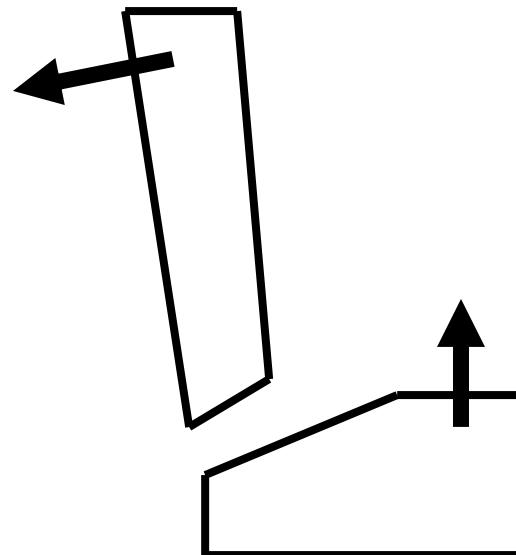
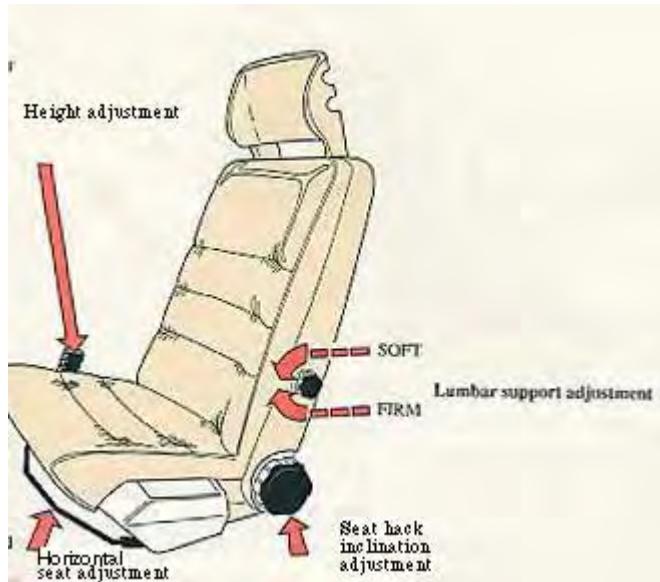


*From <http://fivesketches.com/2009/11/natural-mapping-of-switches/>*

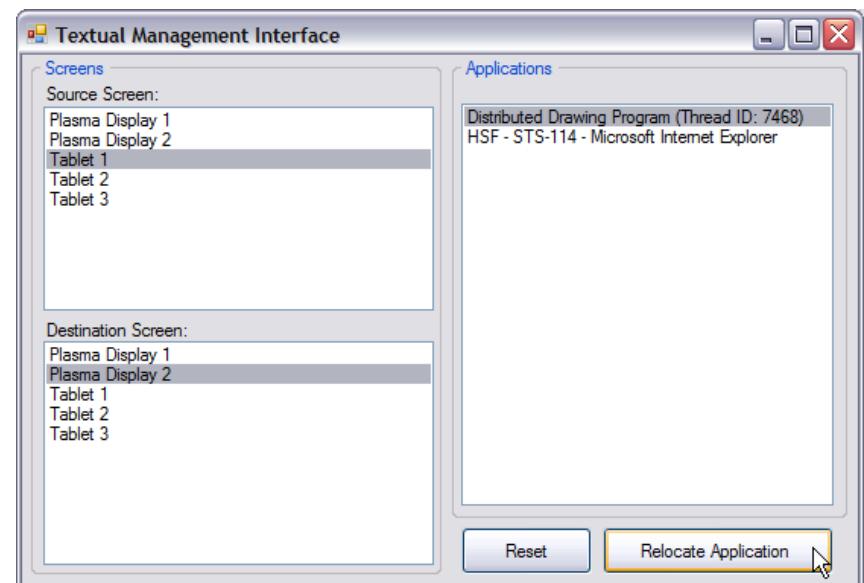
# Mapping



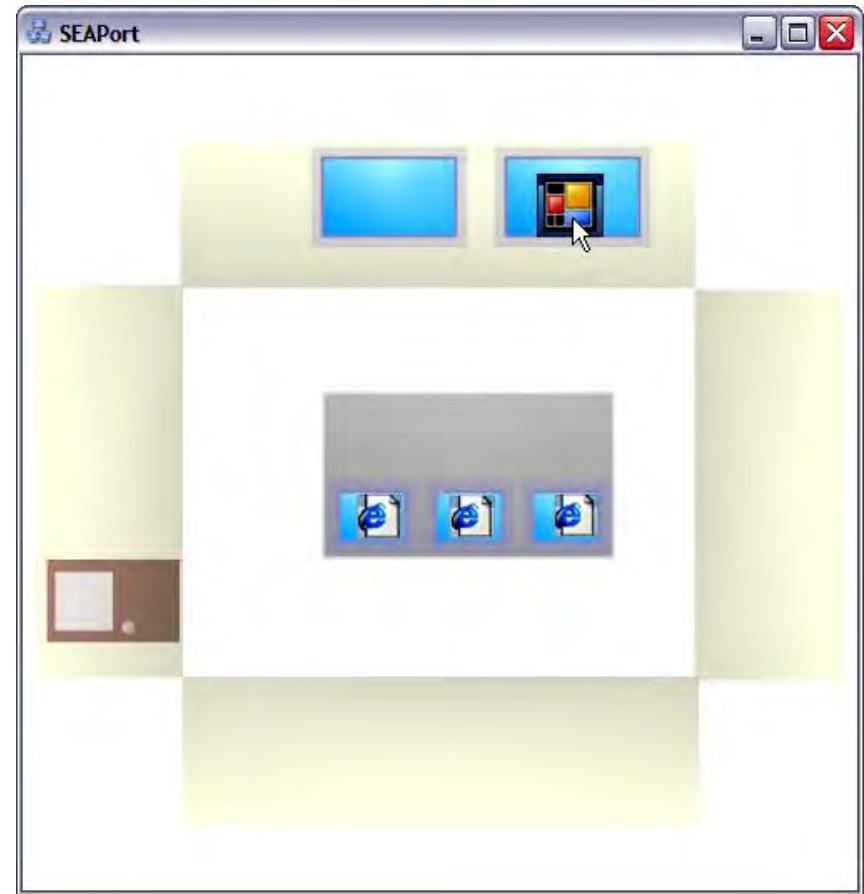
# Mapping



# Mapping



# Mapping



# Consistency

Interfaces should be meaningfully consistent

Ubiquitous use of same keys for cut/copy/paste

Helps in developing / applying a mental model

Types of consistency

Internal (i.e., within itself)

e.g., same terminology and layout throughout

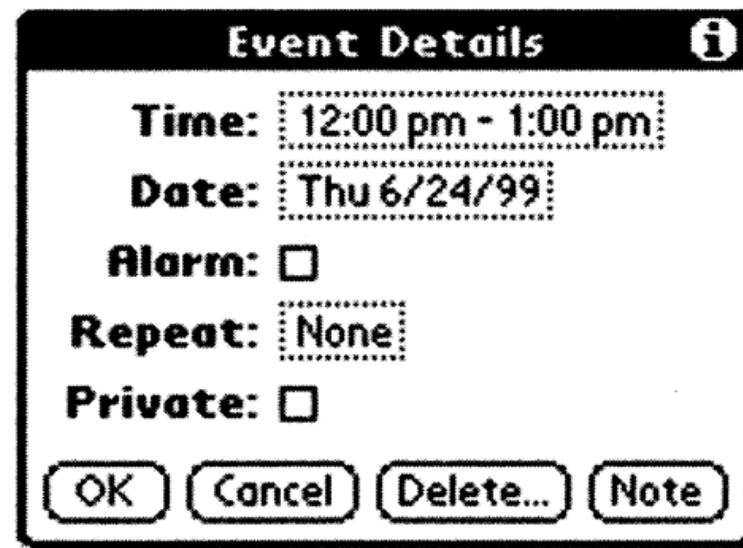
External (i.e., with other applications)

e.g., common widget appearance

e.g., design patterns common across applications

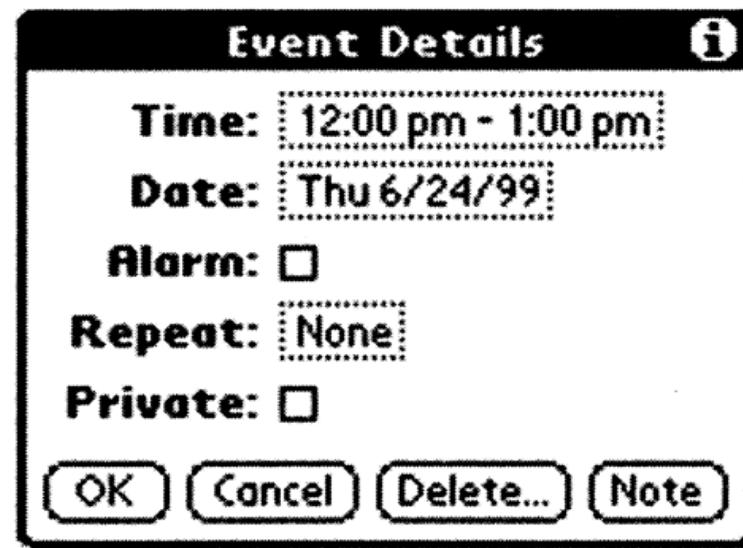
# Is Consistent Always Better?

Should “new” & “delete” be in the same place?



# Is Consistent Always Better?

Should “new” & “delete” be in the same place?



New is common, delete is not

# Is Consistent Always Better?

**Event Details** i

**Time:** 12:00 pm - 1:00 pm

**Date:** Thu 6/24/99

**Alarm:**

**Repeat:**

None  Day  Week  Month  Year

Every: ...1 week(s)

End on: ▼ No End Date

Repeat on:  S  M  T  W  T  F  S

**Private:**

**OK** **Cancel** **Delete...** **Note**

**Event Details** i

**Time:** 12:00 pm - 1:00 pm

**Date:** Thu 6/24/99

**Alarm:**

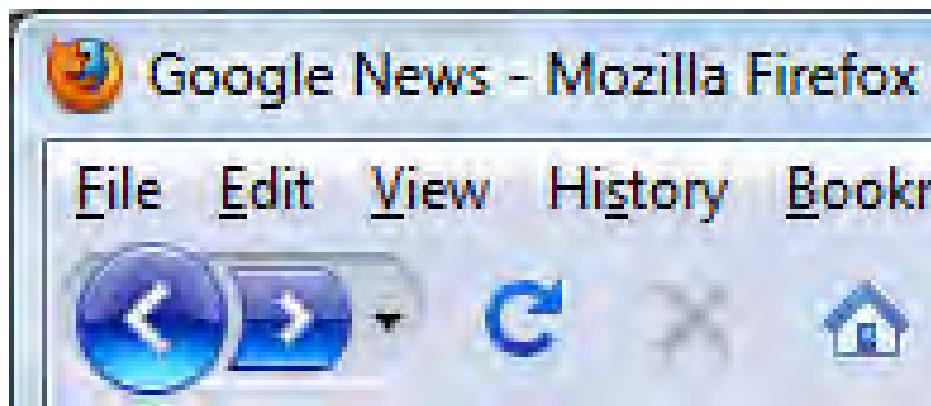
**Repeat:**  None

**Private:**

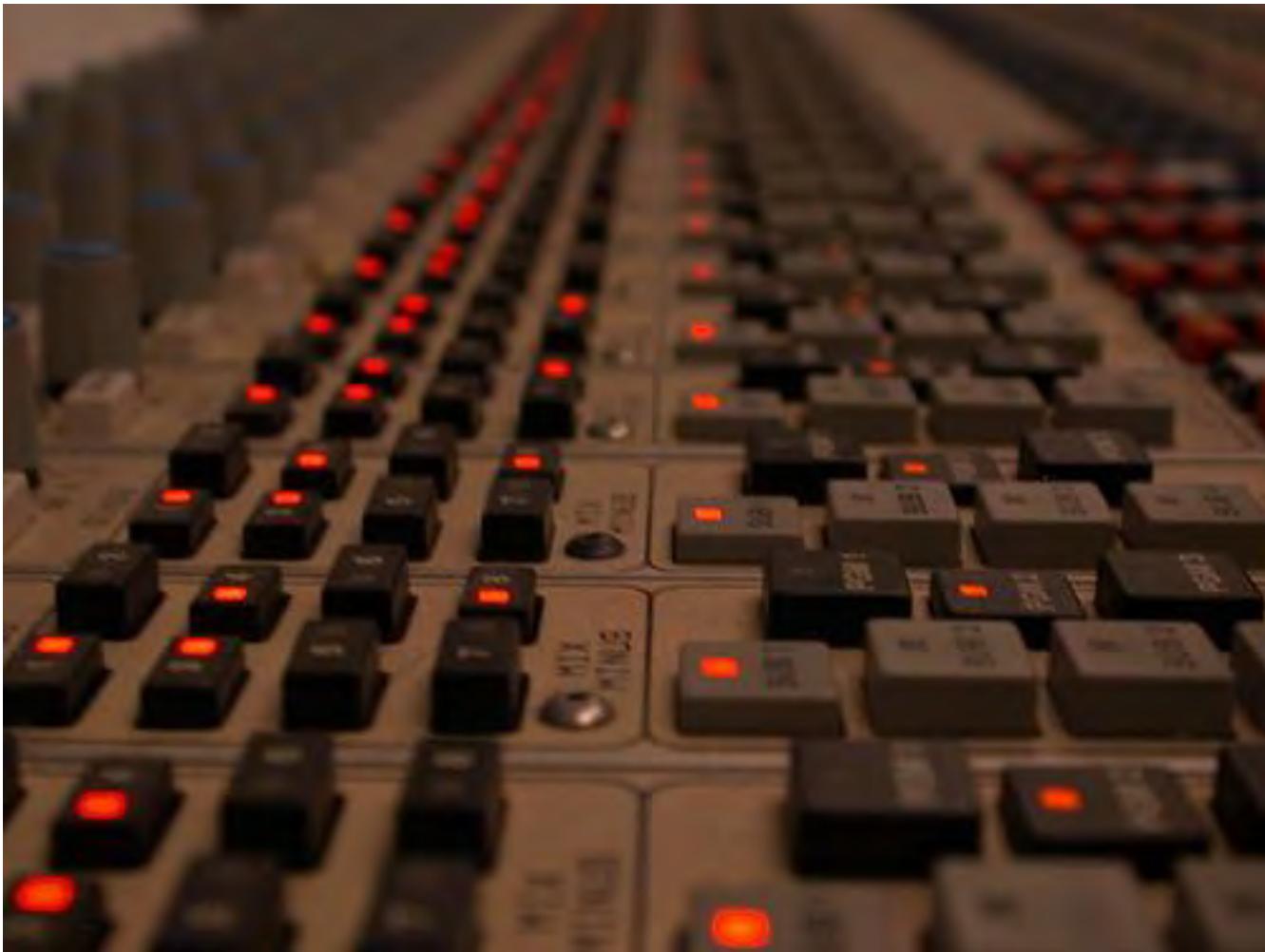
**OK** **Cancel** **Delete...** **Note**

Original focus on consistency,  
later design for mobile form

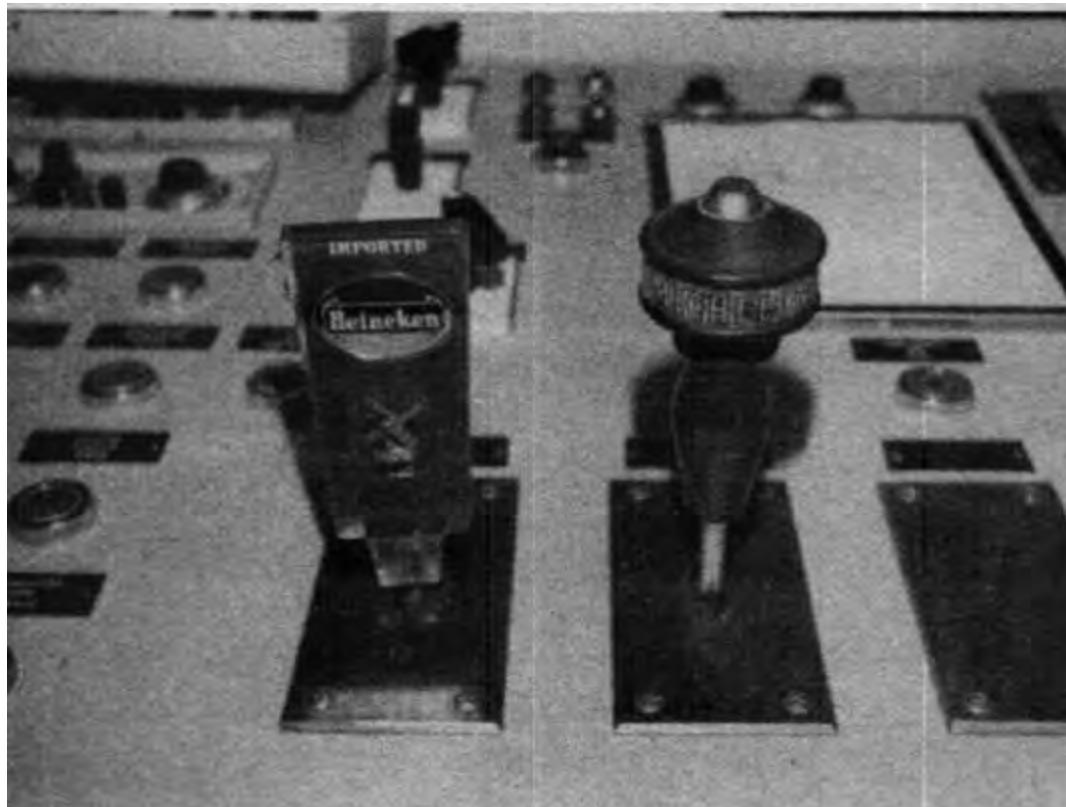
# Is Consistency Always Better?



# Is Consistency Always Better?

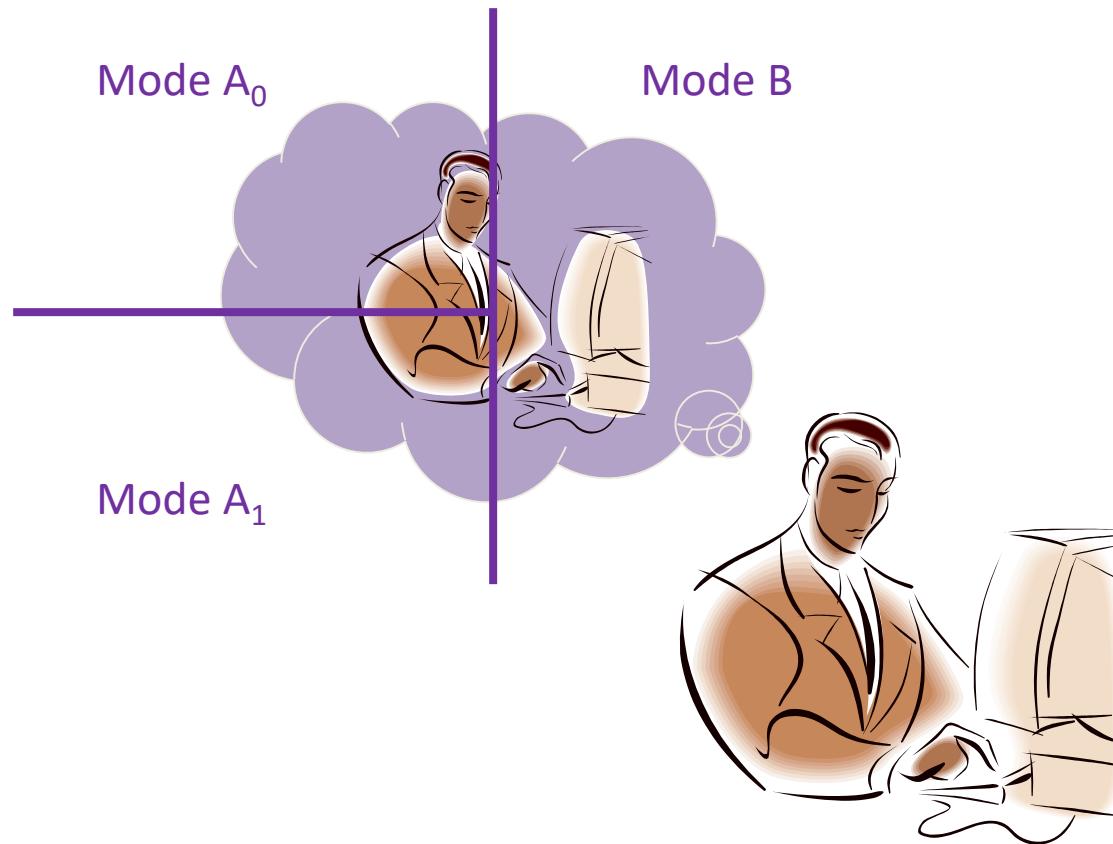


# Is Consistency Always Better?



# 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

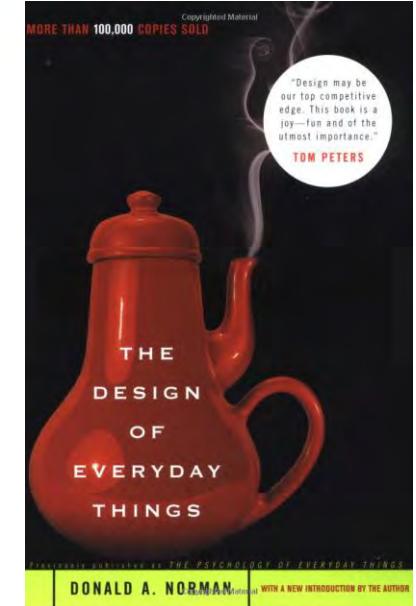
Exploit the power of constraints

Design for error

When all else fails, standardize

# 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

# Today

## Finishing Design of Everything Things

### Storyboarding and Video Prototyping

# Objectives

Be able to:

Describe purposes of storyboards,  
as differentiated from sketches and prototypes

Describe varying purposes of video prototypes  
(e.g., and why this name is a poor fit)

# 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



## STORE FOR THE STYLE-CHALLENGED

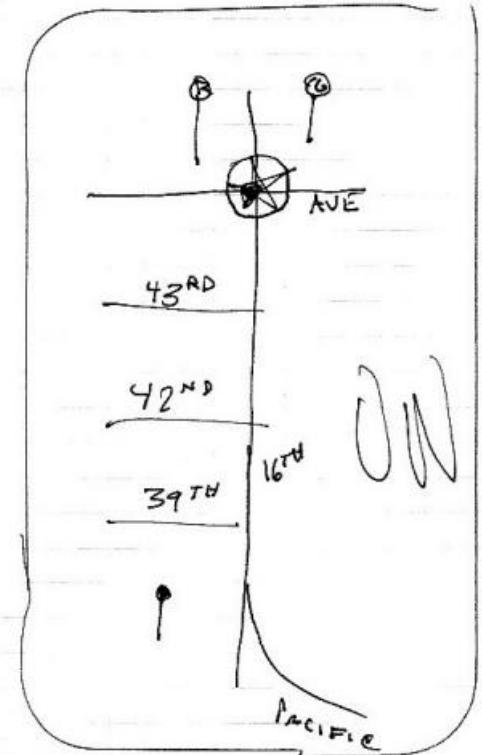


### As it should be...

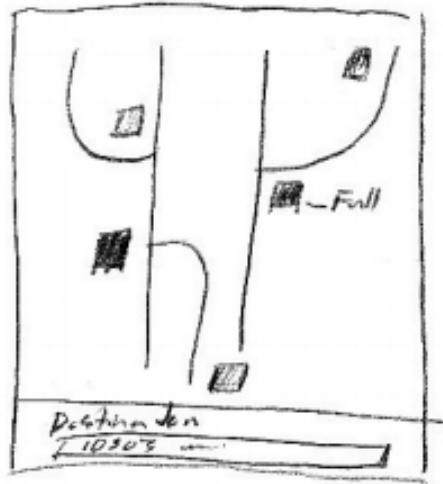


(pre-selected to match so you don't  
have to choose.)

# Sketching



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



- different colors
- highlights availability
-

# Sketching and Tasks

Attendance List

Sent By: Last Name Show Enrollment

Last Name	All
Lee, Benjamin	Enrollment
Santos, Allen	Waitlist
Schwartz, Jonah	Audit
Vernette, Joshua	Present
	Absent
	Section

12345678 Junior  
23456789 Senior  
34567890 Semi

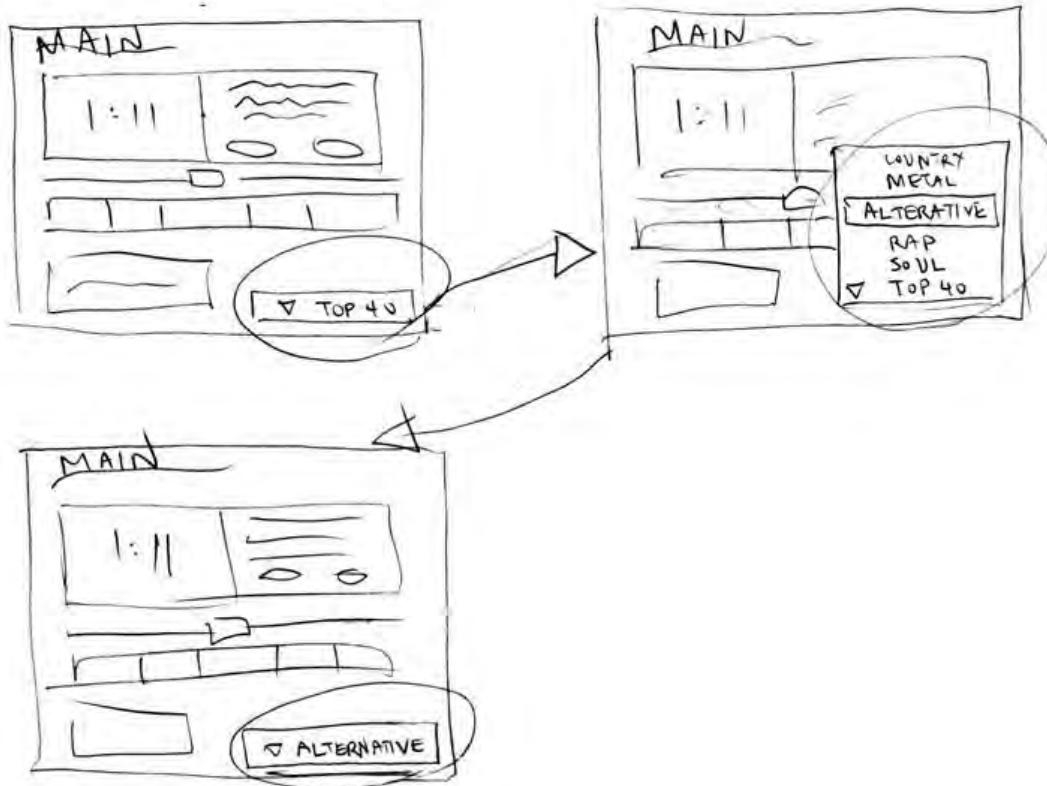
Go to Attendance View

Back to main menu refresh w/ new info  
38 Present, 2 Absent Take Attendance  
from students' PDF  
Done Look Up: Sc highlights student

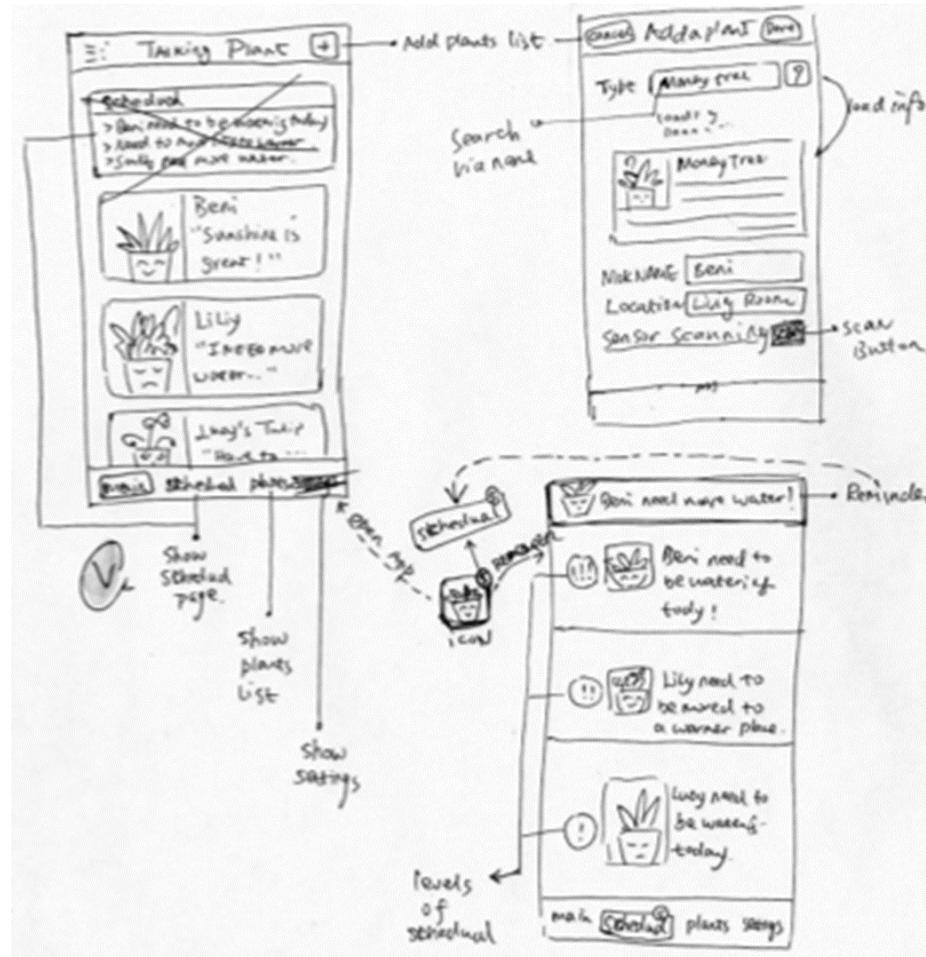
# Sketching and Tasks

SCENARIO 1

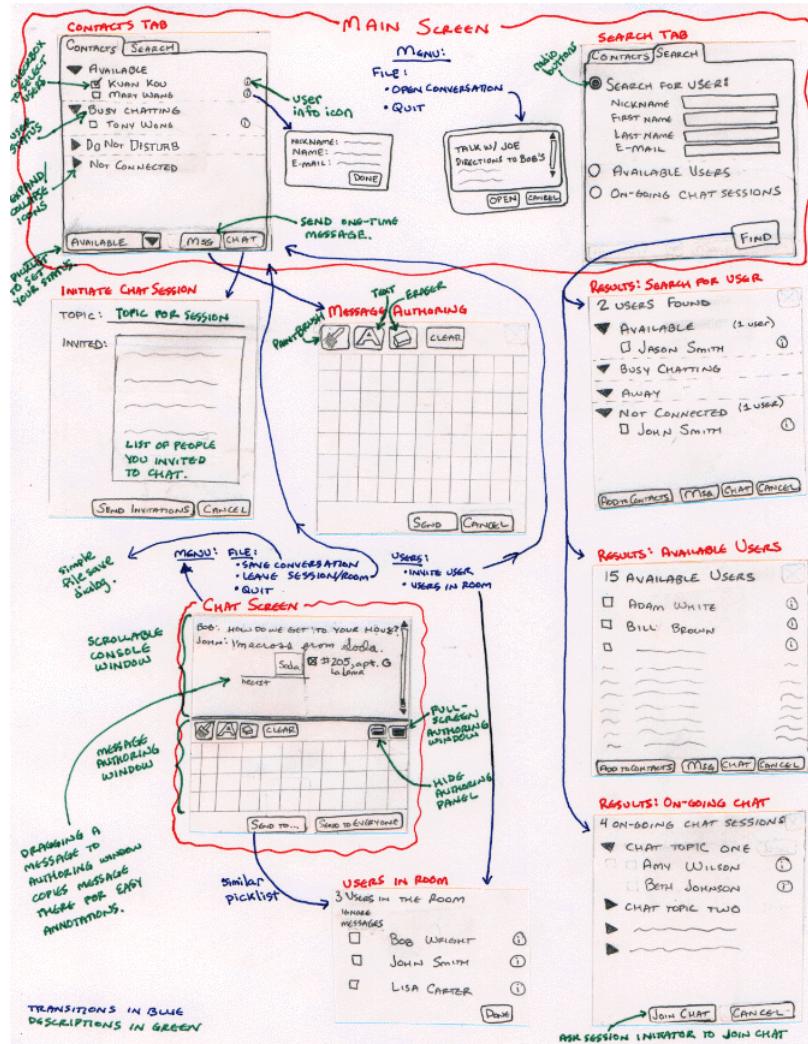
"I want to listen to alternative music"



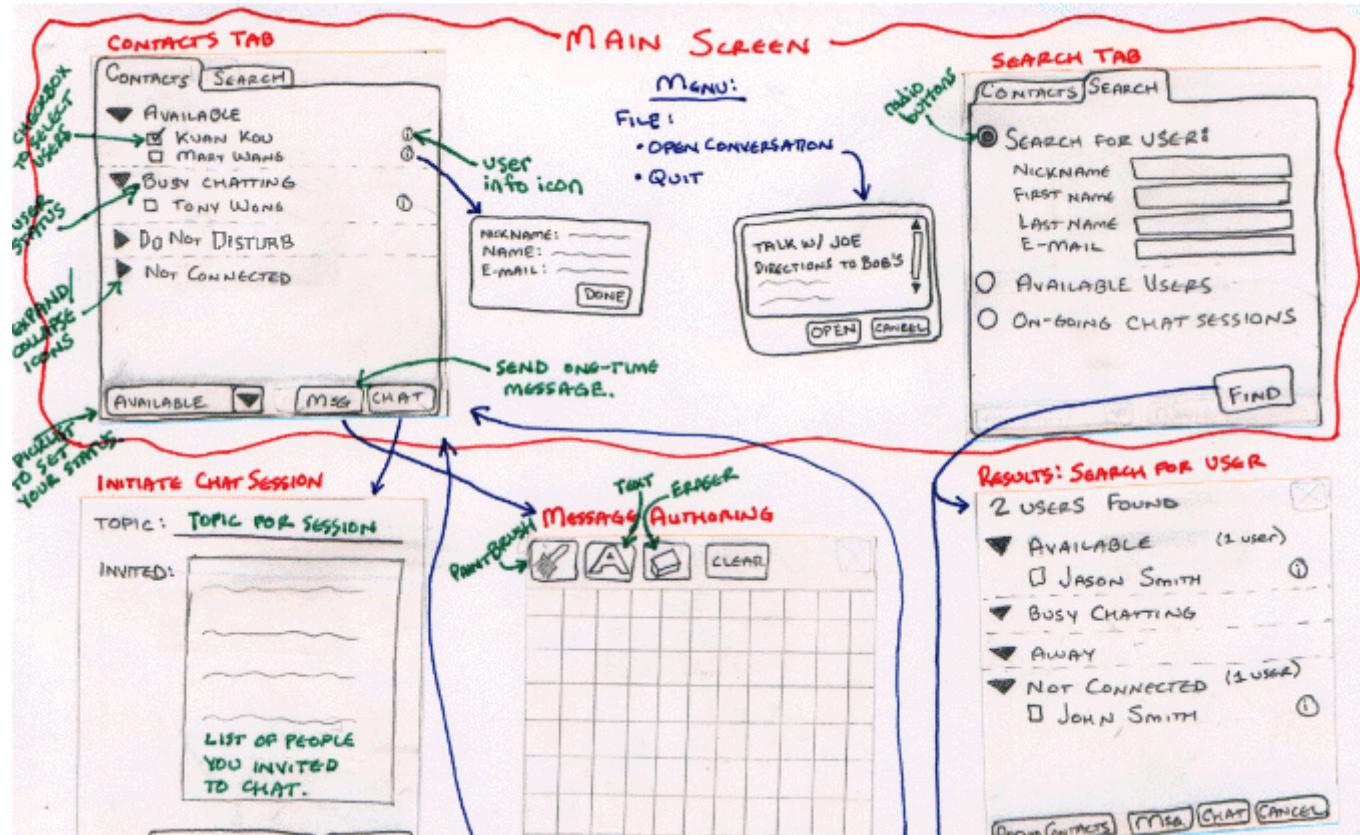
# Sketching and Tasks



# 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

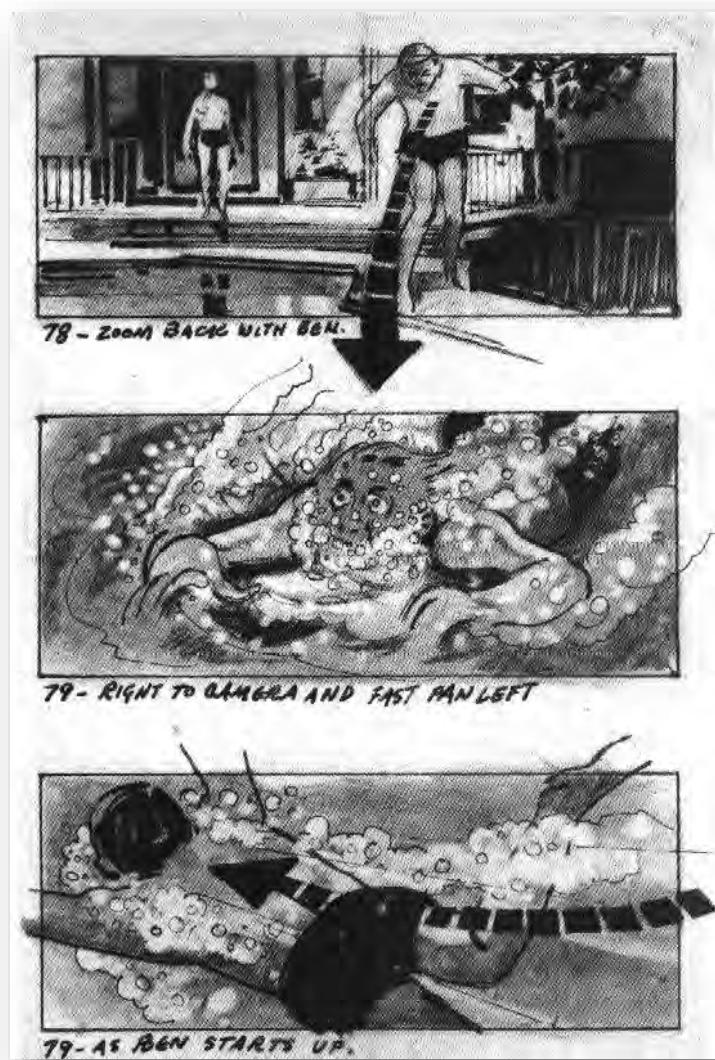
Can be used to explore

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

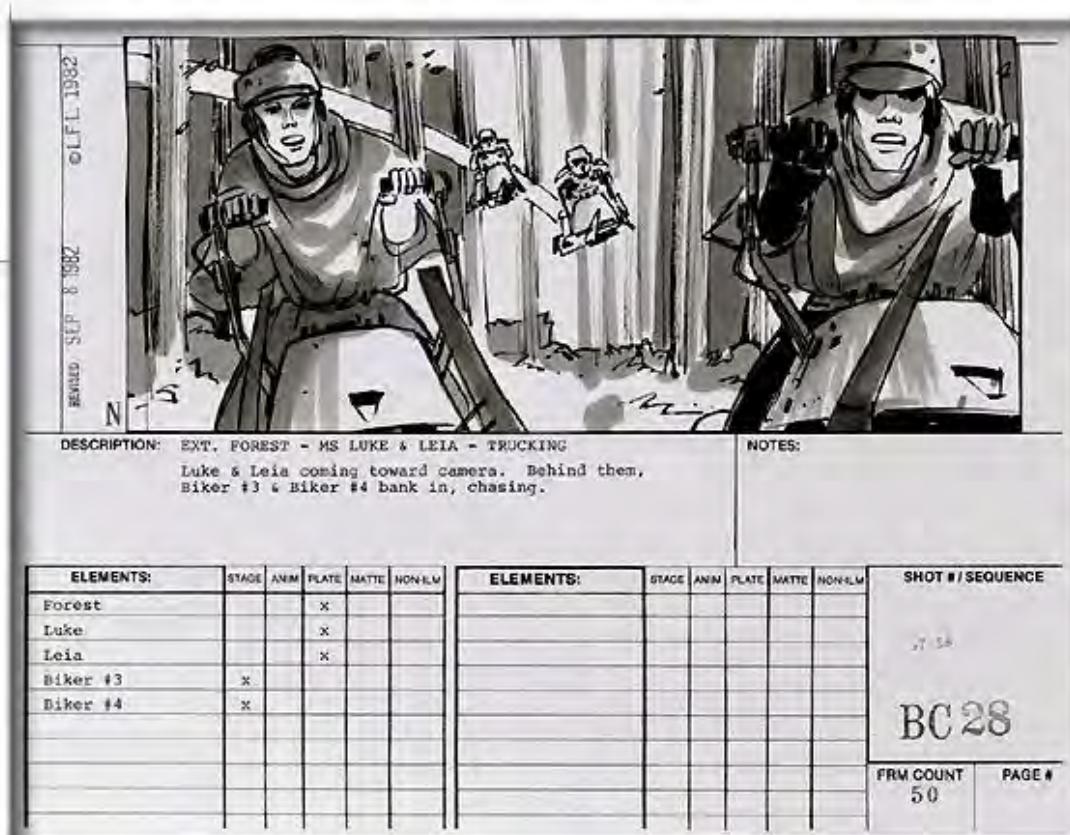
Effective storyboards can quickly convey information that would be difficult to understand in text

Imagine explaining this in text, for various audiences

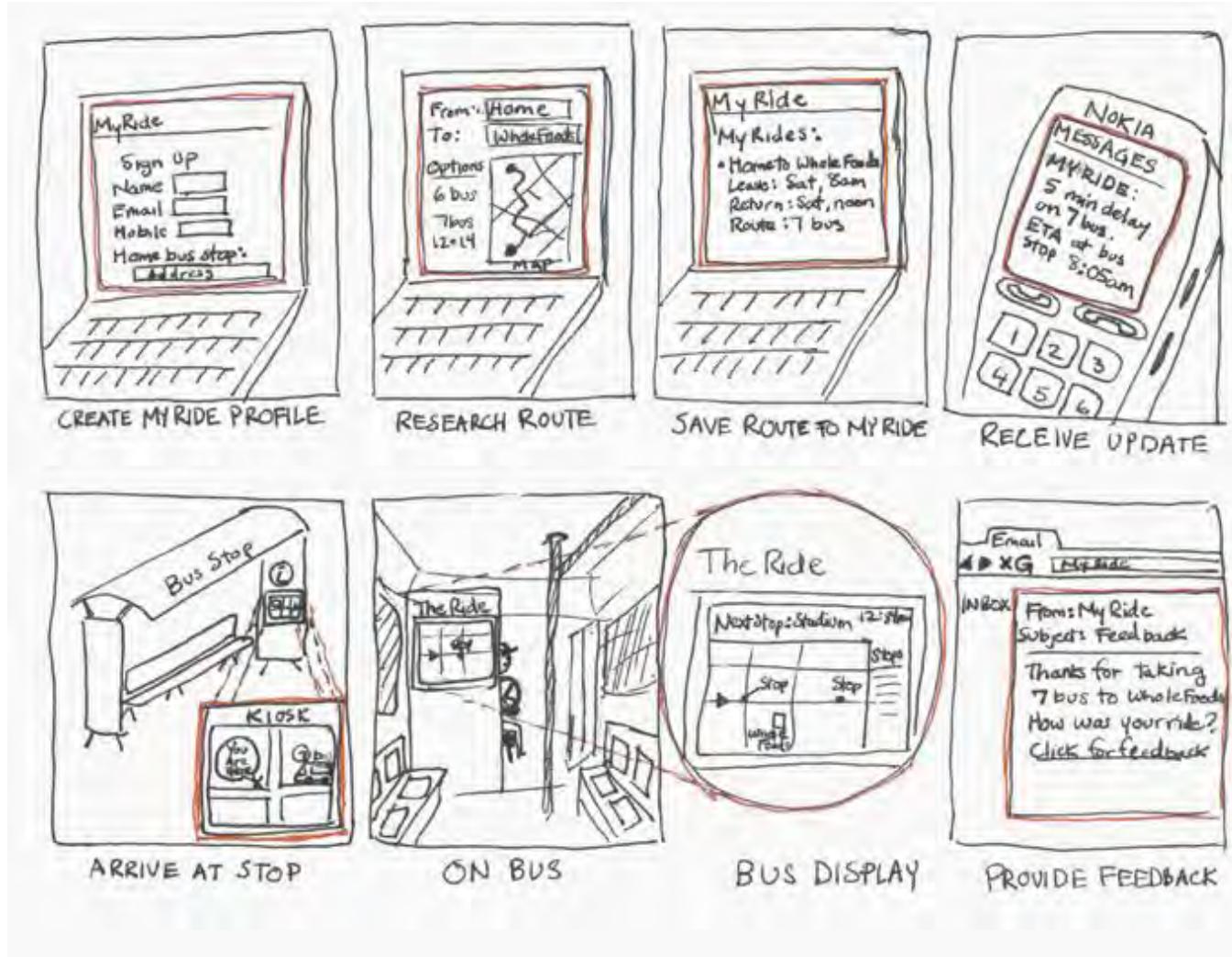


# Storyboards

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



# Basic Storyboard

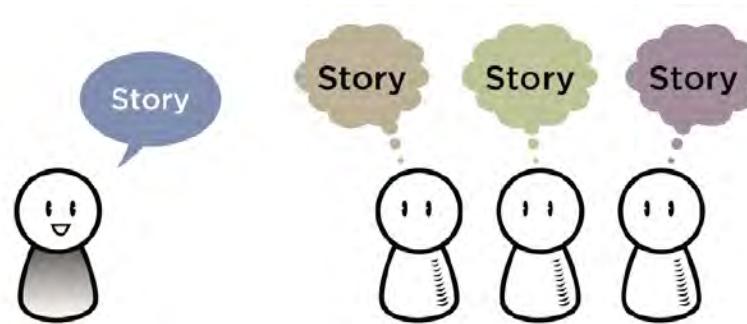


# Storytelling



Stories have an audience

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



Stories need to match audience and purpose

# 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 satisfied

Minor 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

The storyboard consists of two panels. The left panel shows a hand pointing at a list of cities: S.F, S.J, S.B, and HALIFAX. A large 'NO!' is written across the list. The right panel shows two characters, Red and Sean, talking about what to do after a festival.

**CITIES →**

S.F
S.J
S.B
HALIFAX

**NO!**

**RED & SEAN WERE BORED AFTER GOING TO THE BLUEGRASS FESTIVAL, & DECIDED TO FIND OUT WHAT ELSE THEY COULD DO...**

**DUDE, WHAT DO WE DO?!**

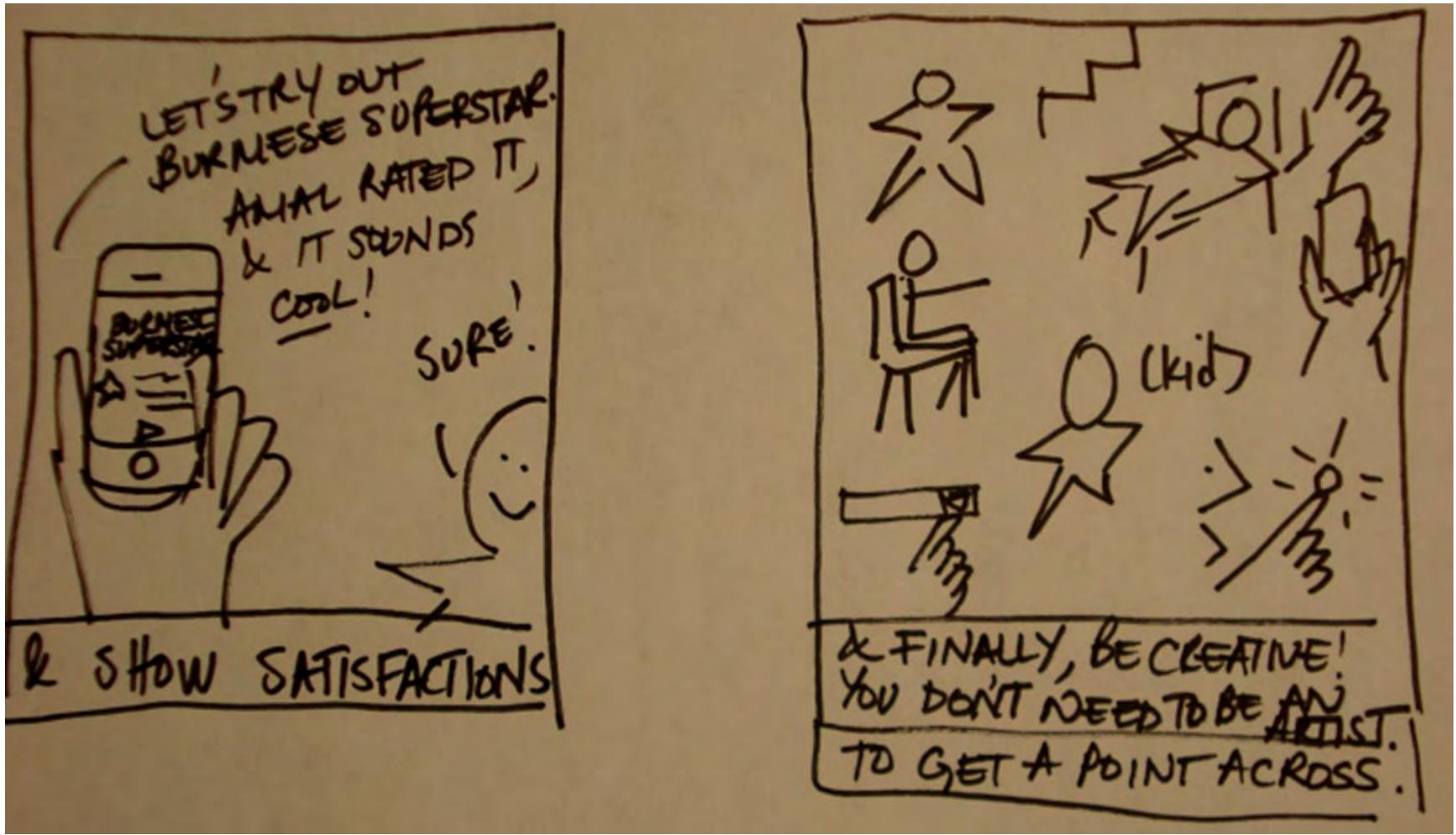
**LET ME USE TOURSAPP! ON MY iPhone!**

**DON'T USE THIS TO ILLUSTRATE ALL THE UI FEATURES & COMPONENTS...\***

**\*This is what paper prototyping is for!**

**INSTEAD, SHOW WHY & WHEN features would be used**

# Amal's Guide to Storyboarding



# 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

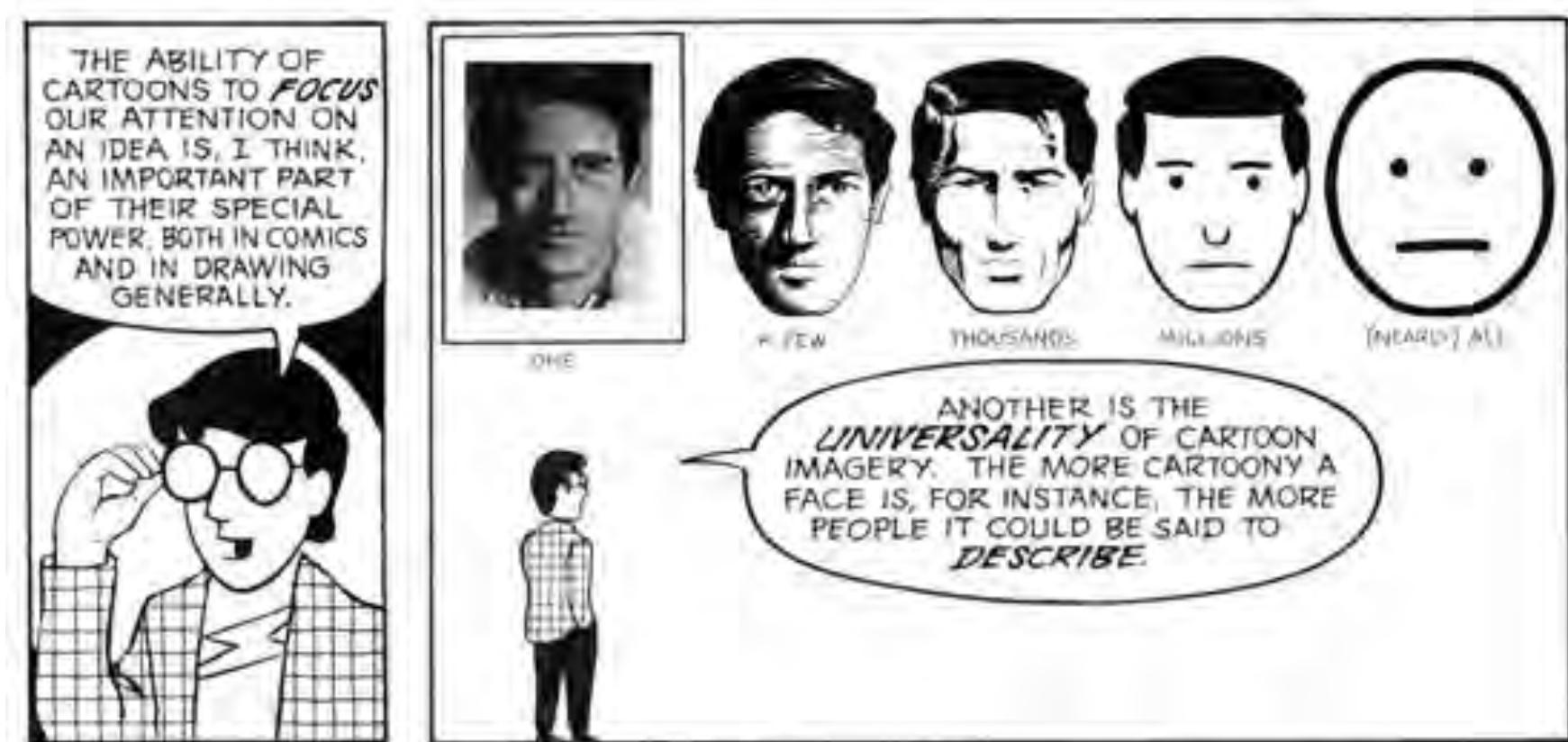
Portrayal of time



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

# 1. How Much Detail?

Guideline: too much detail can lose universality



Scott McCloud

# 1. How Much Detail?

## Sketching People

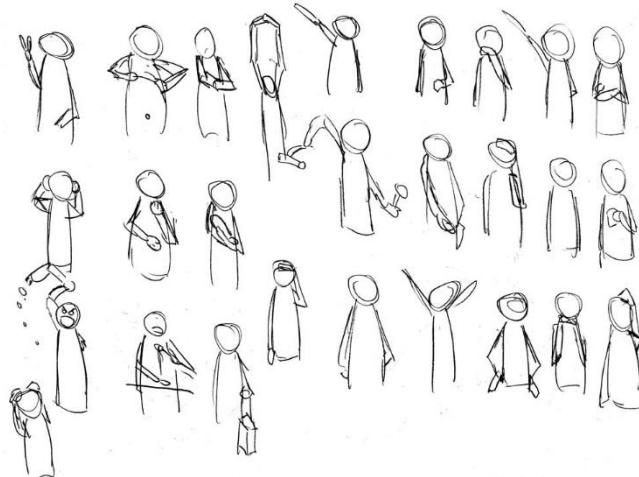


Star people  
by Bill Verplank

PERSON

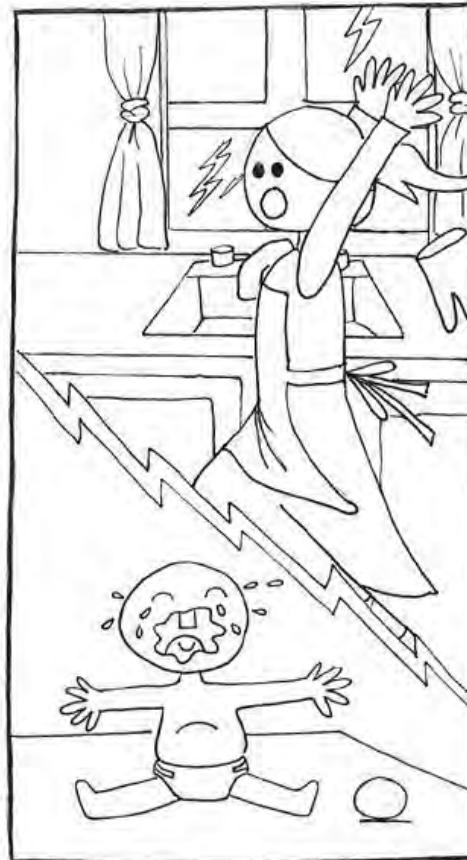


(c) 2009 SACHA CHUA

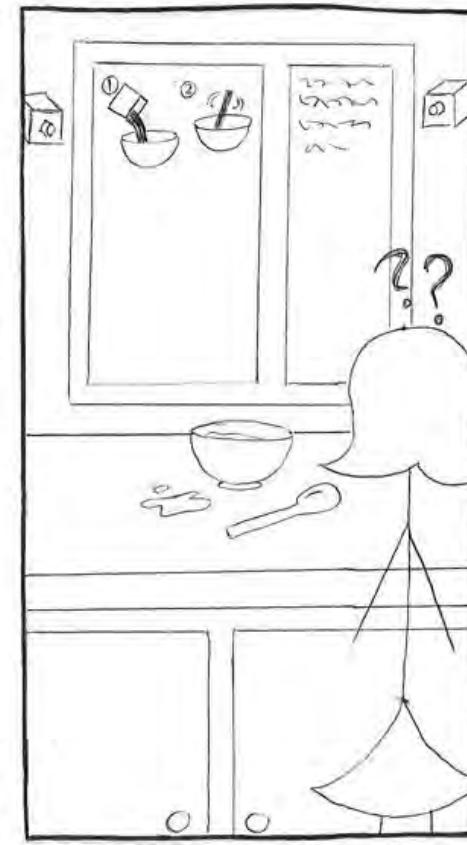
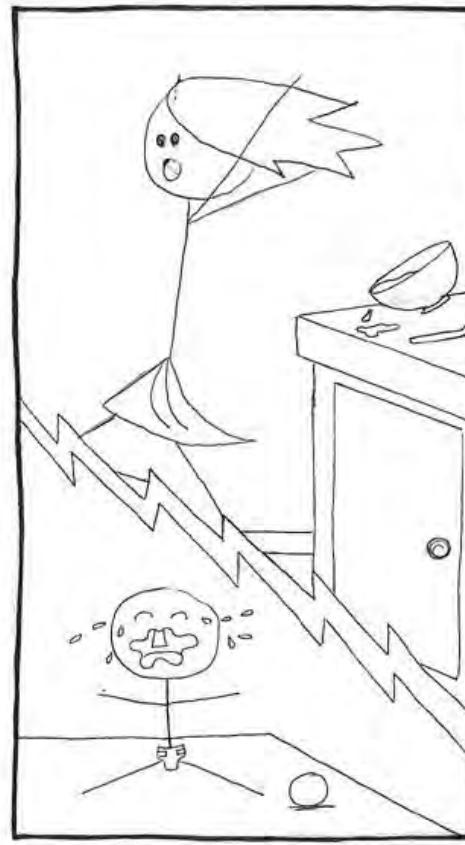
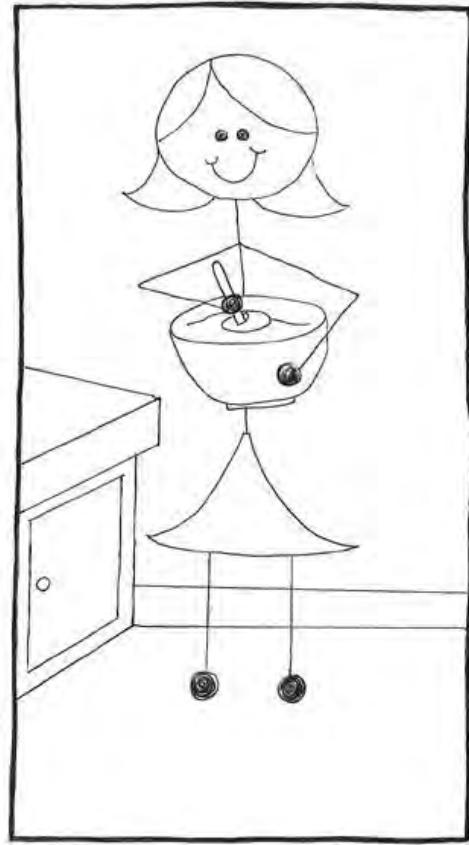


Keith Haring

# 1. How Much Detail?



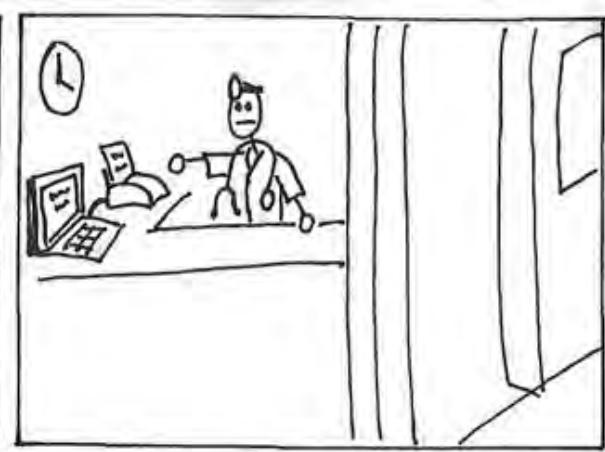
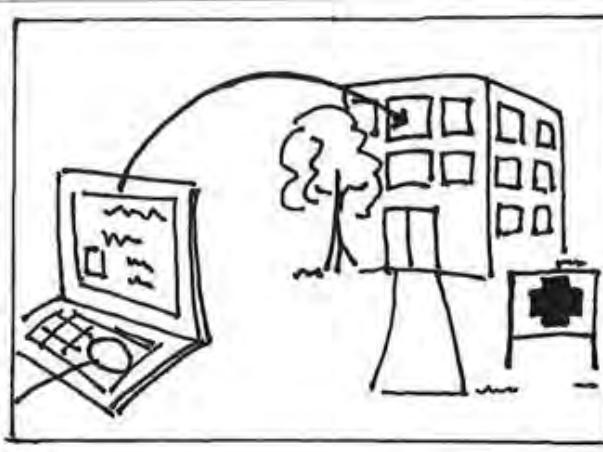
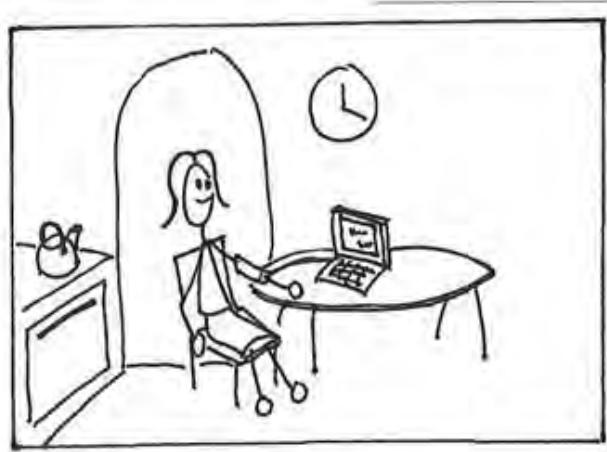
# 1. How Much Detail?



Unnecessary details distract from the story

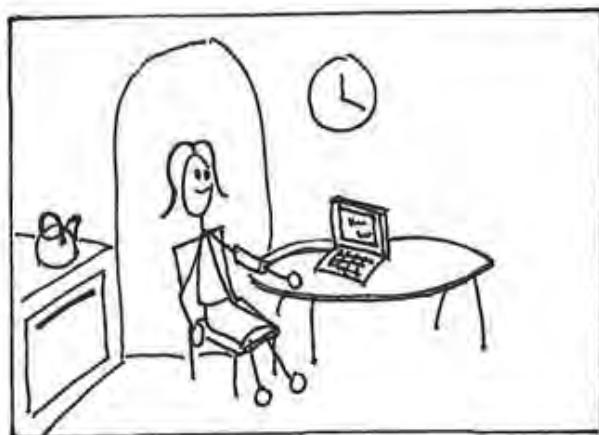
## 2. Use of Text

Guideline: It is often necessary, but keep it short

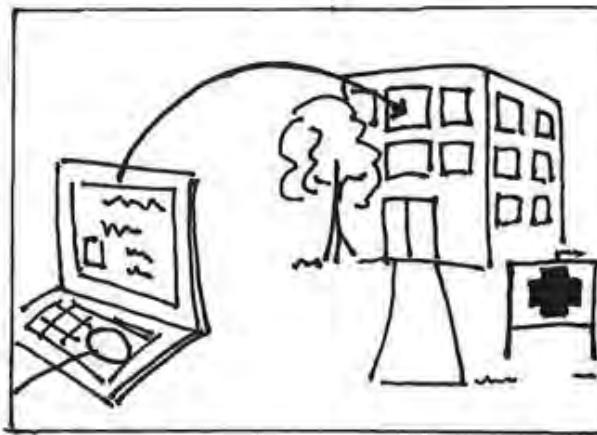


## 2. Use of Text

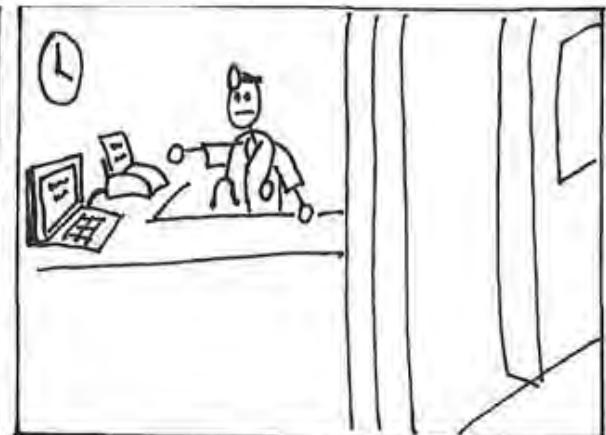
Guideline: It is often necessary, but keep it short



1. At home, Mary checks her blood pressure.



2. After a few simple key presses, her blood pressure readings get sent to a clinic.



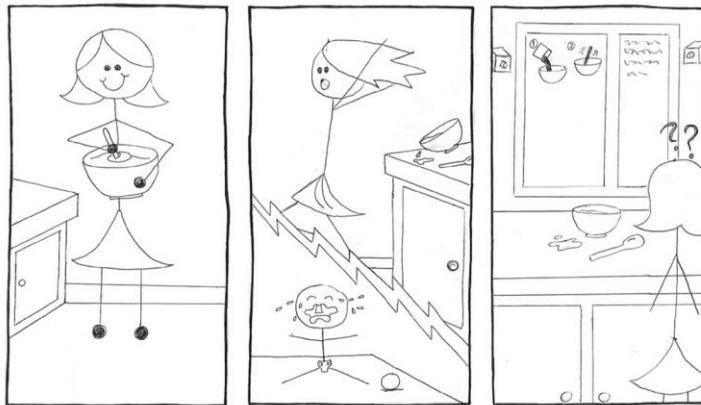
3. The information is made available to her doctor.

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

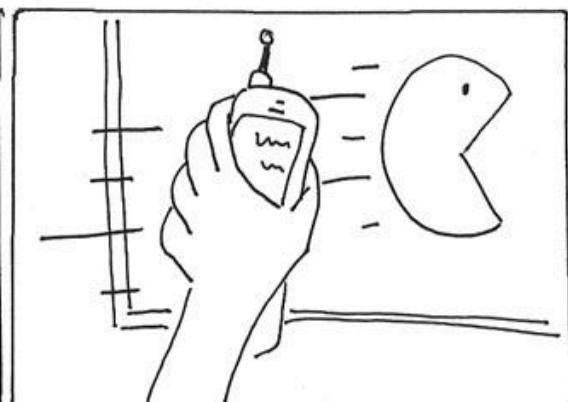
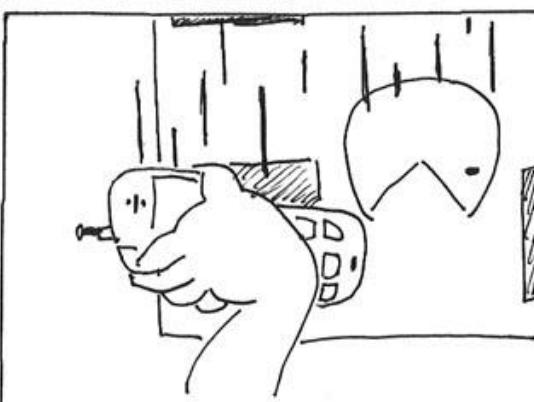
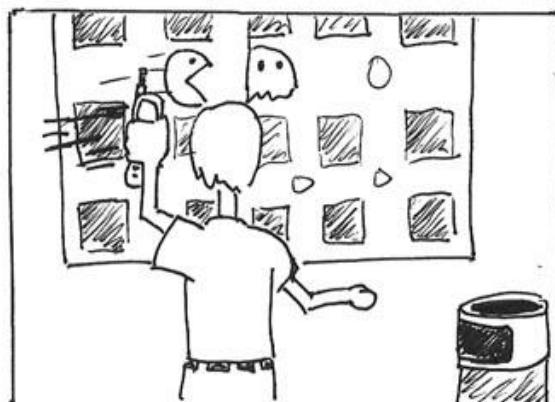
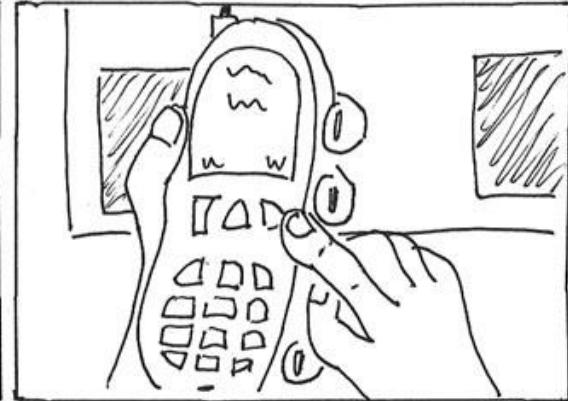
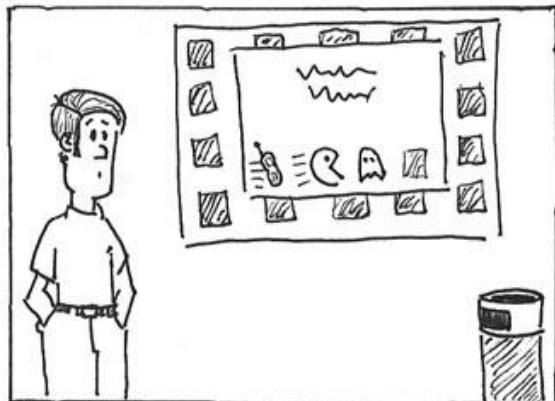
- Potentially longer for design clients

More is not always better

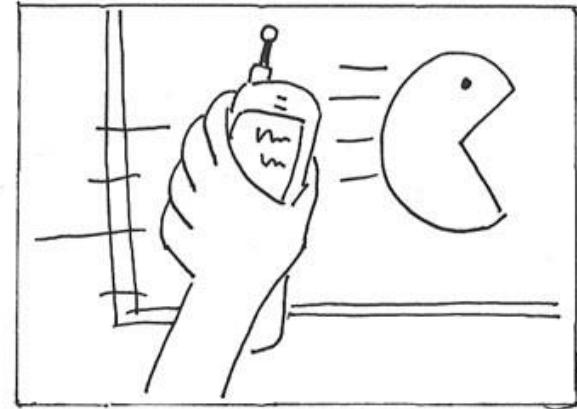
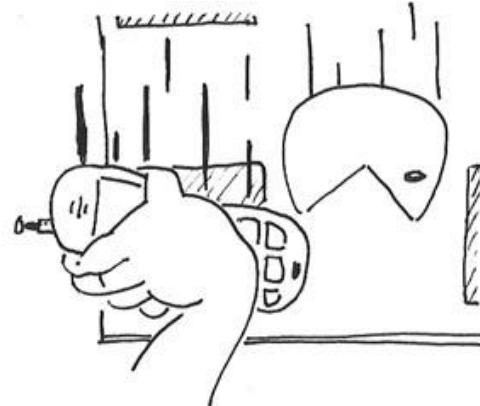
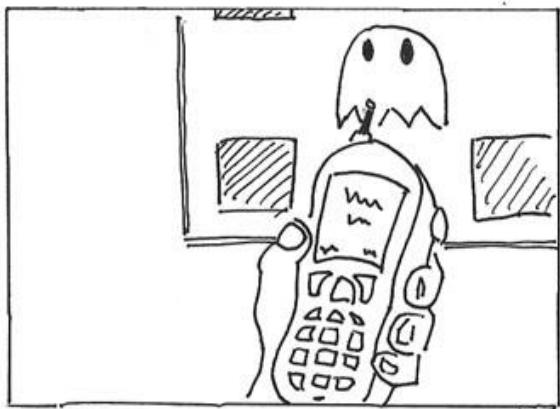
- May lose focus of story

- May lose attention

# 4. How many frames?



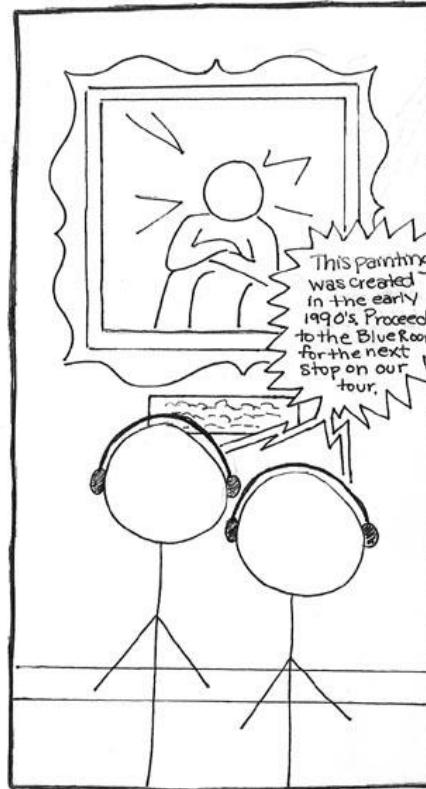
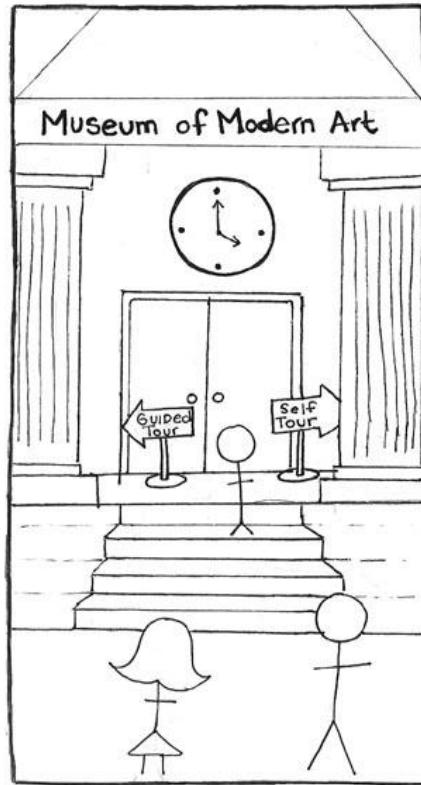
# 4. How many frames?



People found the extra panels were not needed

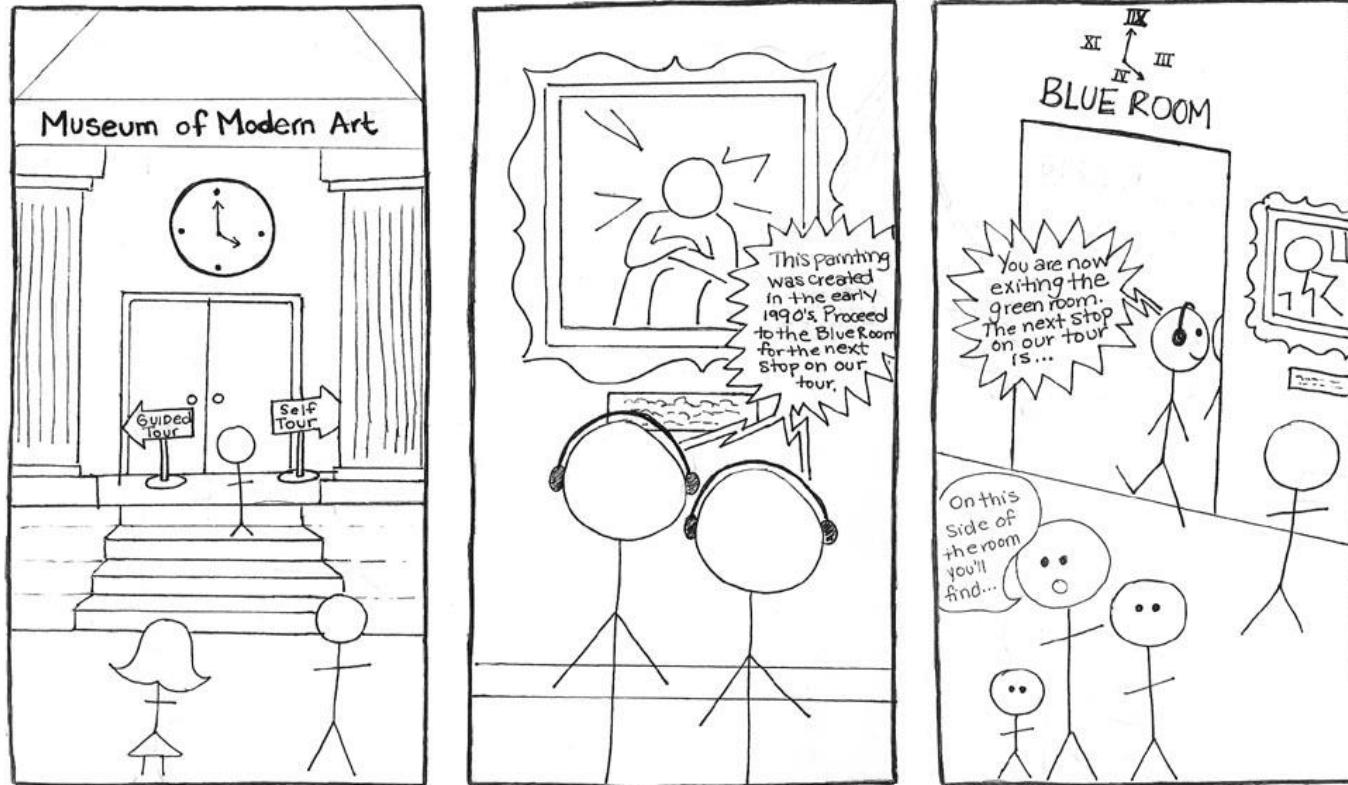
# 5. Passage of Time

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.

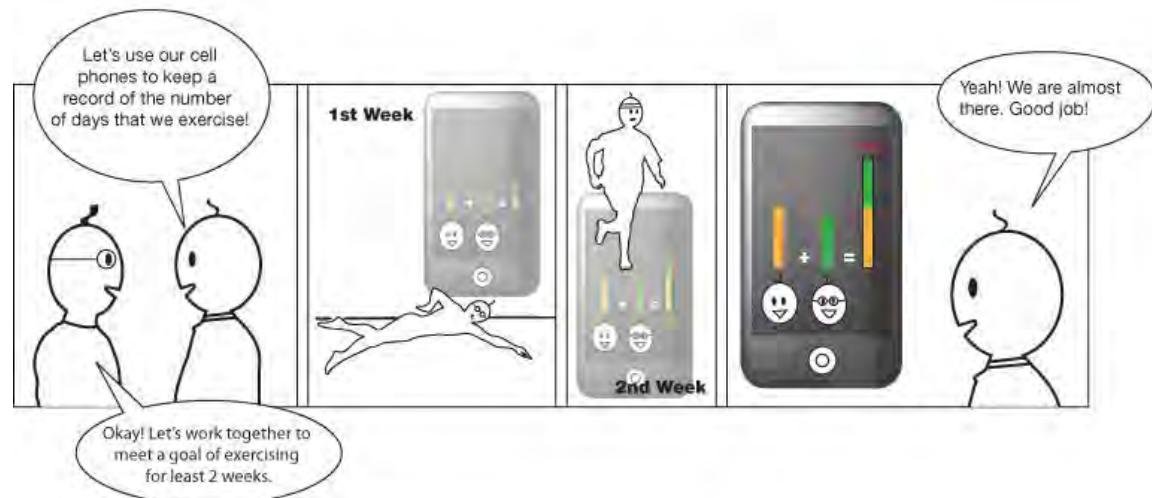
Supportive



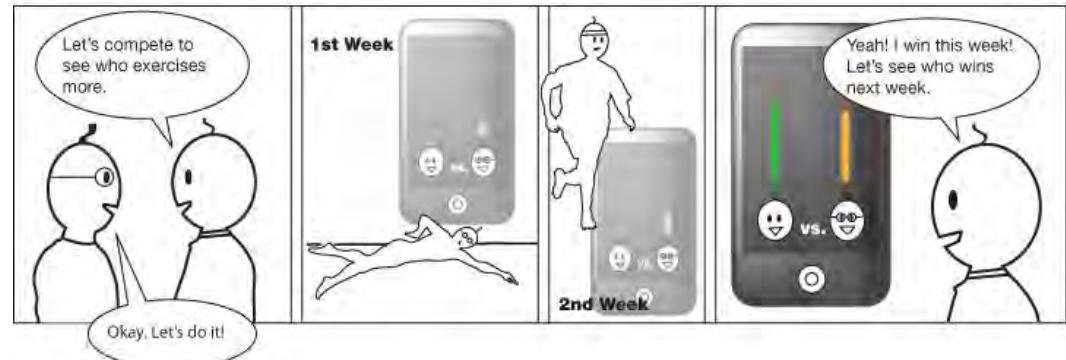
Cell phone is used to keep track of one's fitness goal.

# 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 Saturday night  
(not needed for Friday section)

Will go over these quickly, especially the videos

You then view them outside of class

# Drawing is Hard



IT IS SO DARK JANE CAN  
HARDLY READ HER BOOK



SHE GESTURES IN FRONT OF HER  
SPECIAL PENDANT TO TURN ON  
THE LIGHTS



THE LIGHTS TURN ON!



FINALLY, SHE CAN  
READ HAPPILY.

Will a picture work instead?

# Existing Images from Other Sources



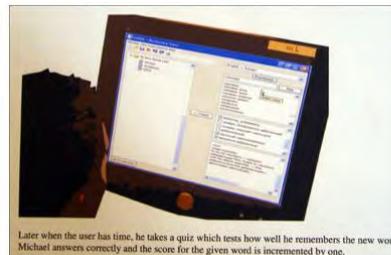
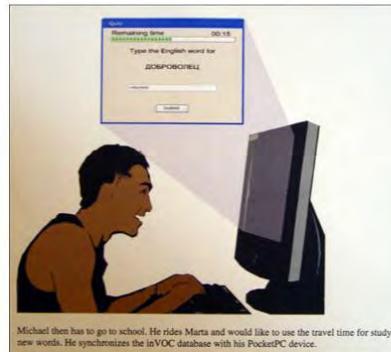
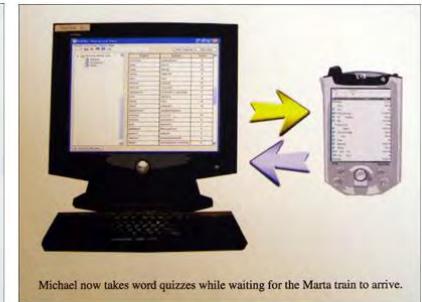
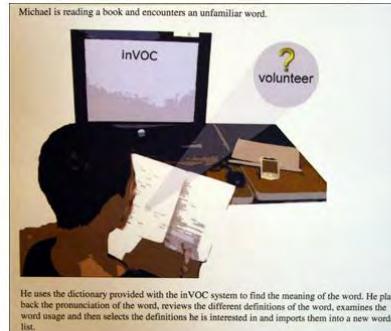
<http://designcomics.org/>

<http://www.pdclipart.org/>

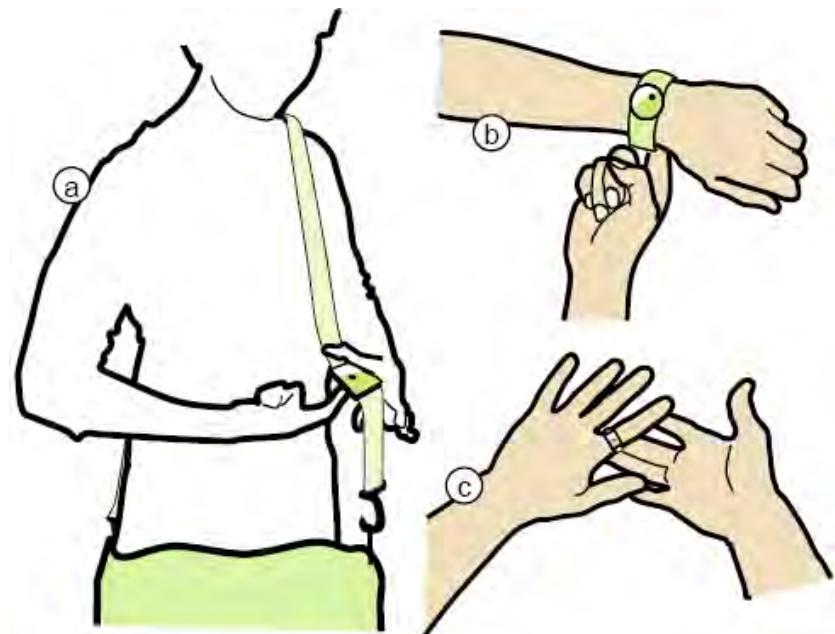
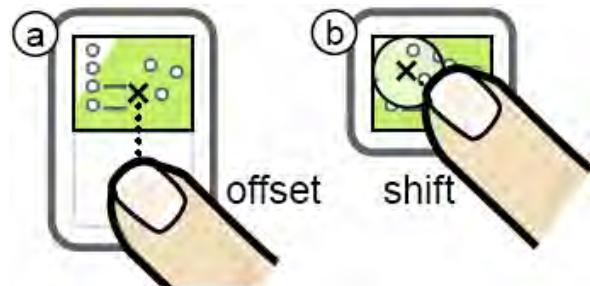


# Blur Out Distracting Details

Using image editing software to simplify photos into sketches

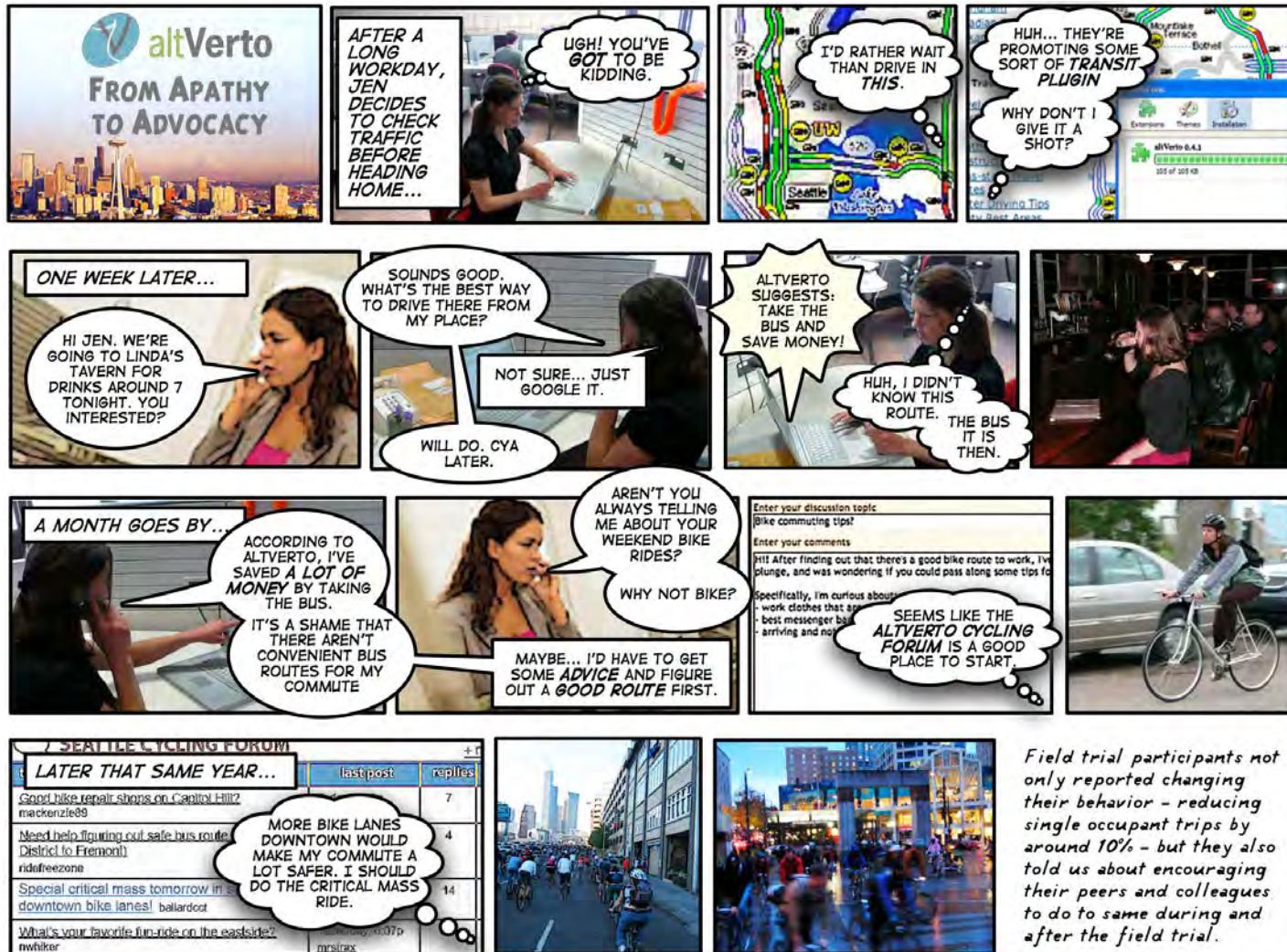


# Tracing Photos

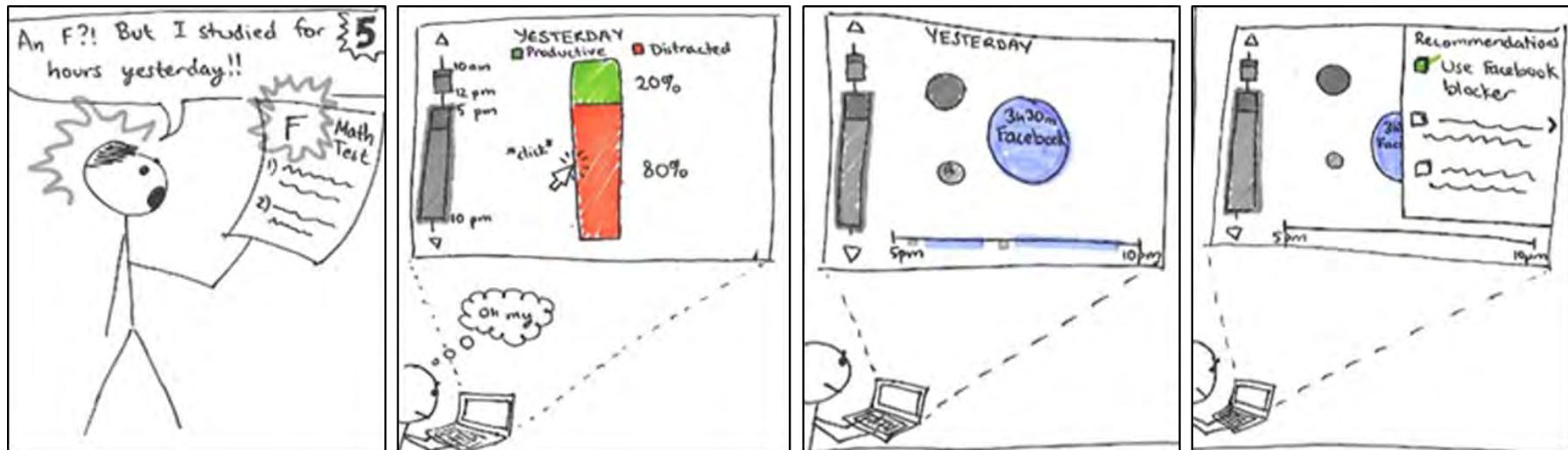


# Comic Presentation

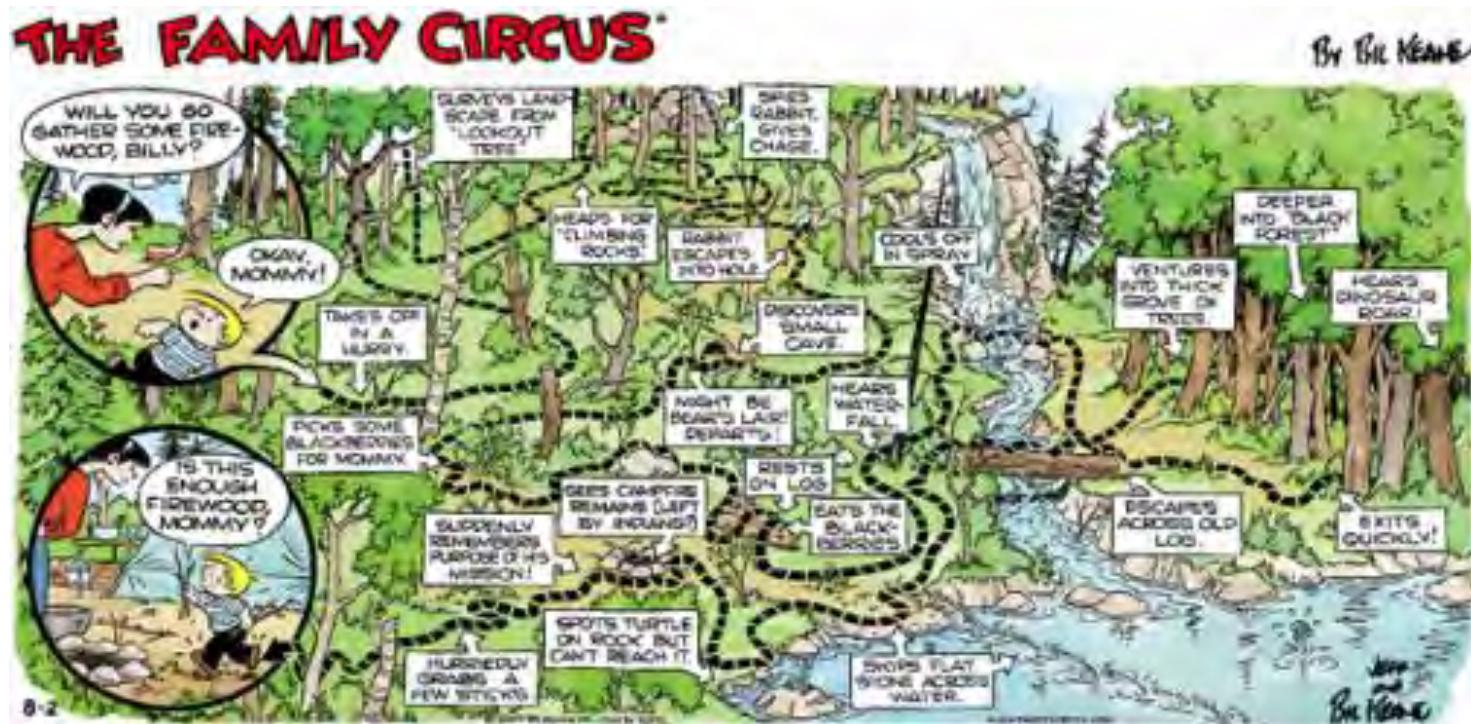
Thought bubbles argue for the design



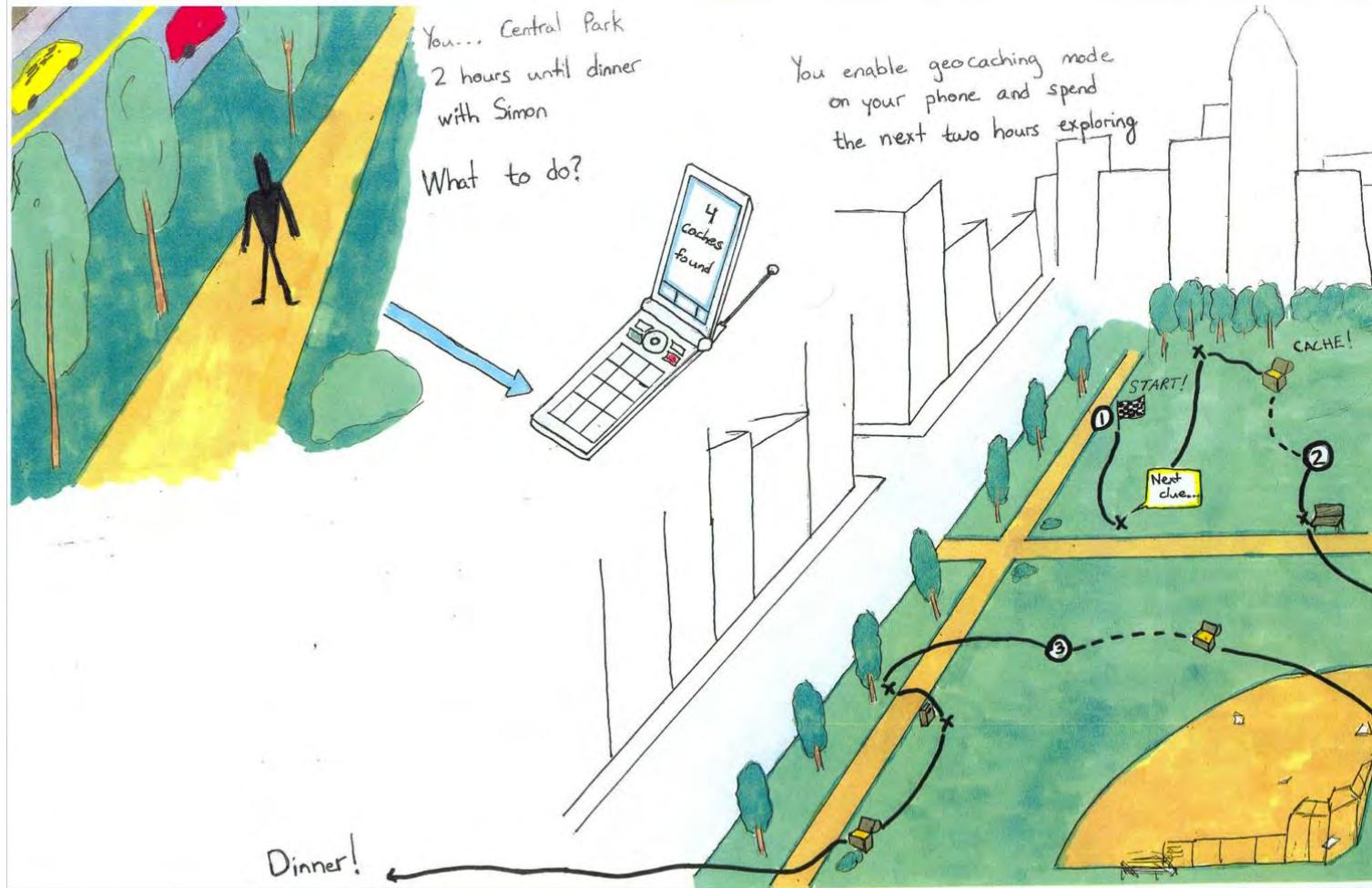
# Selective Use of Color



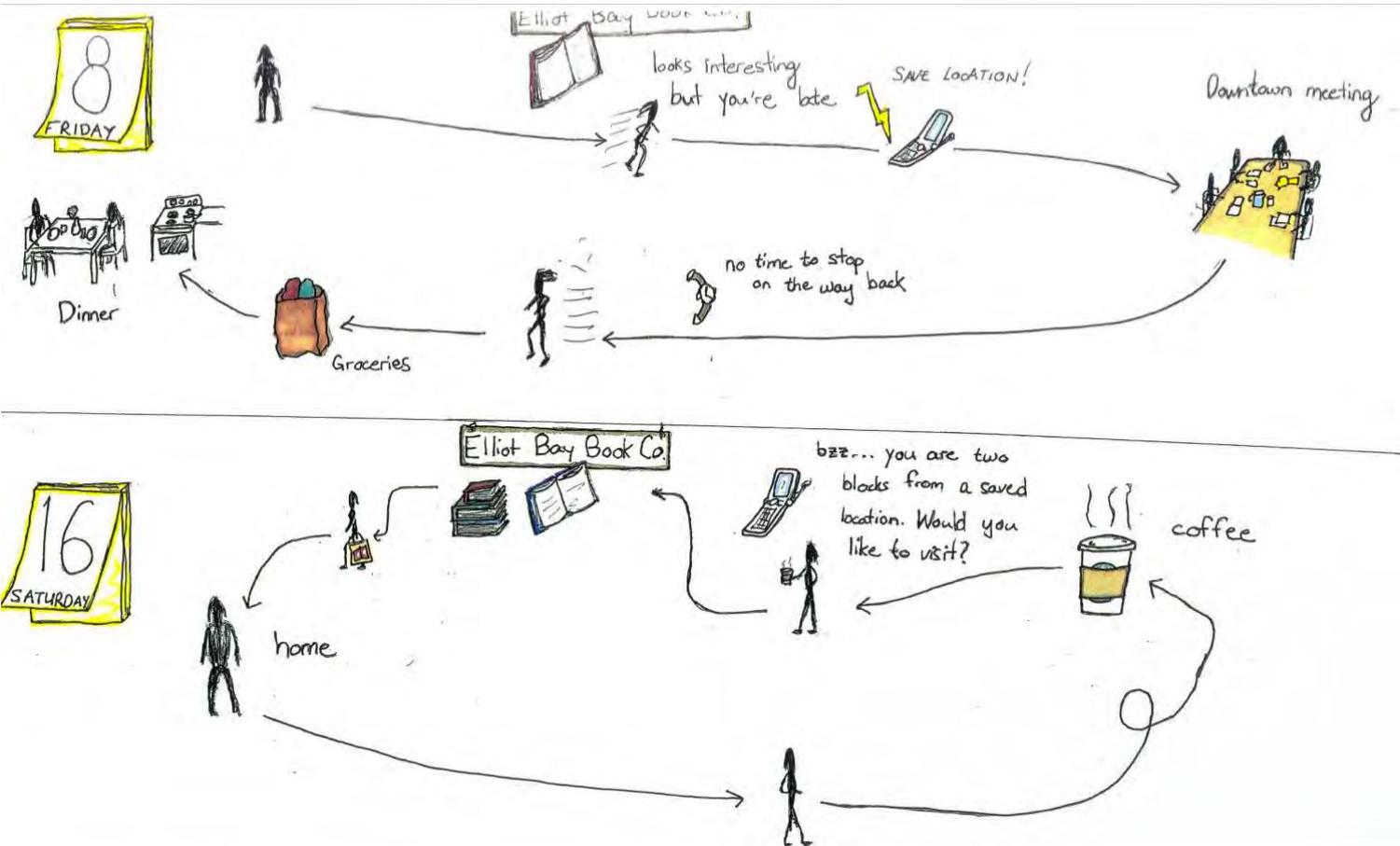
# Route Maps



# Route Maps



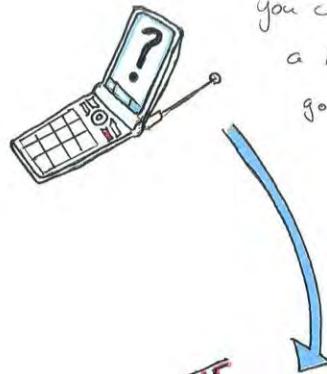
# Route Maps



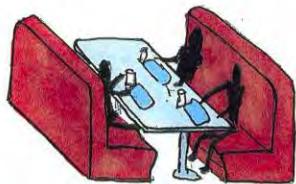
# Route Maps



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 ...

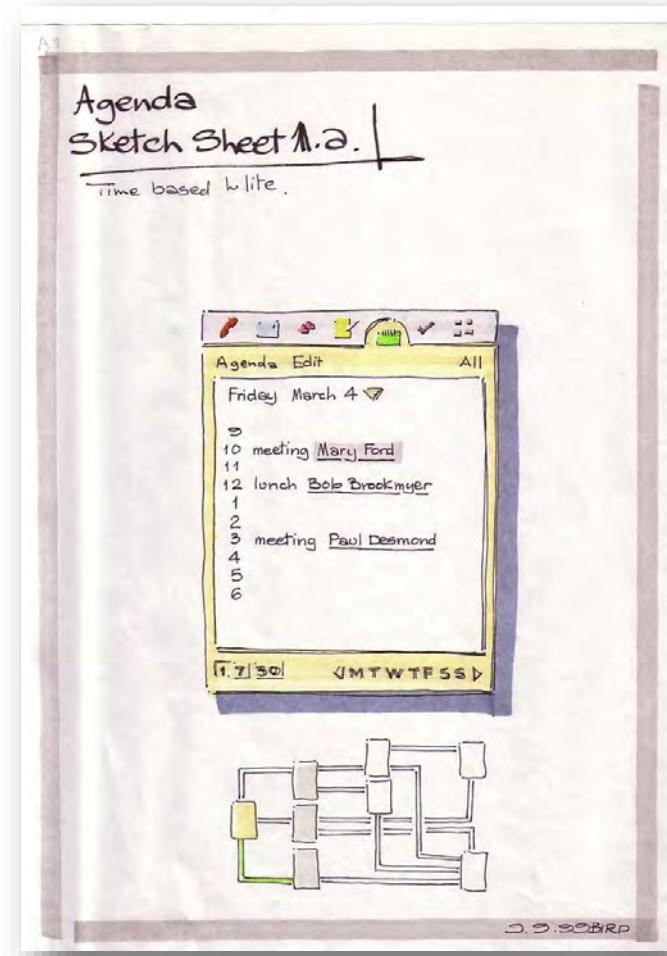
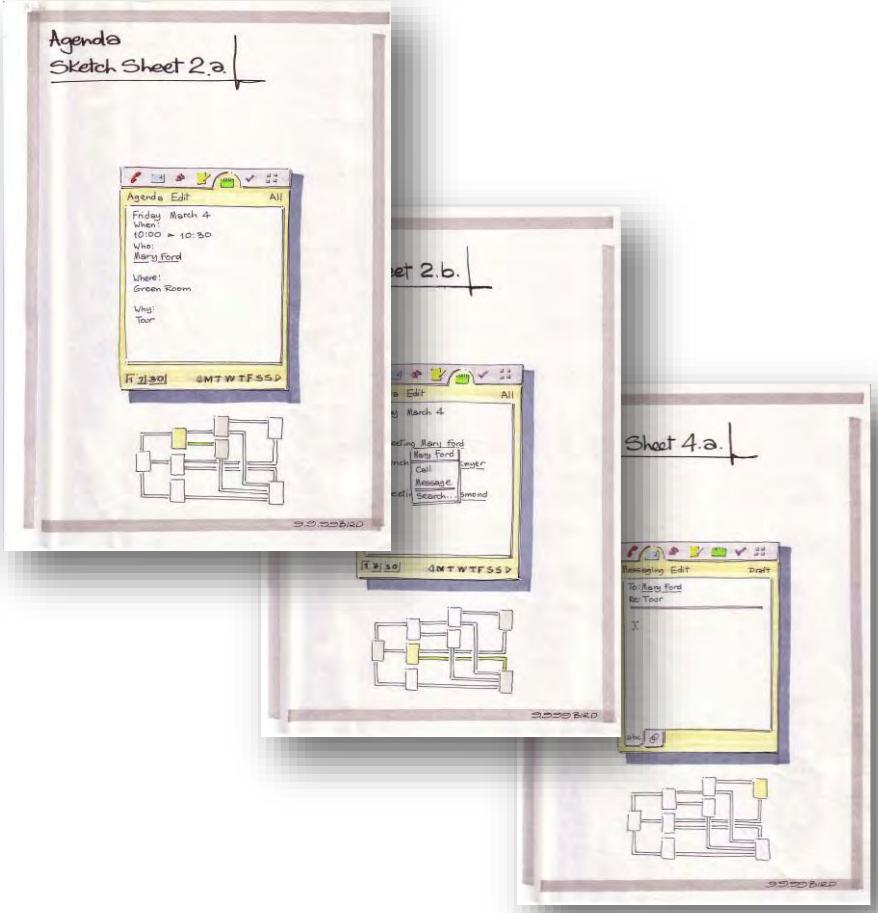


... eventually settling on  
a diner and getting directions  
through your phone.



and discuss the  
food options with  
your friends ...

# Mapping the Space of Interaction



# 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

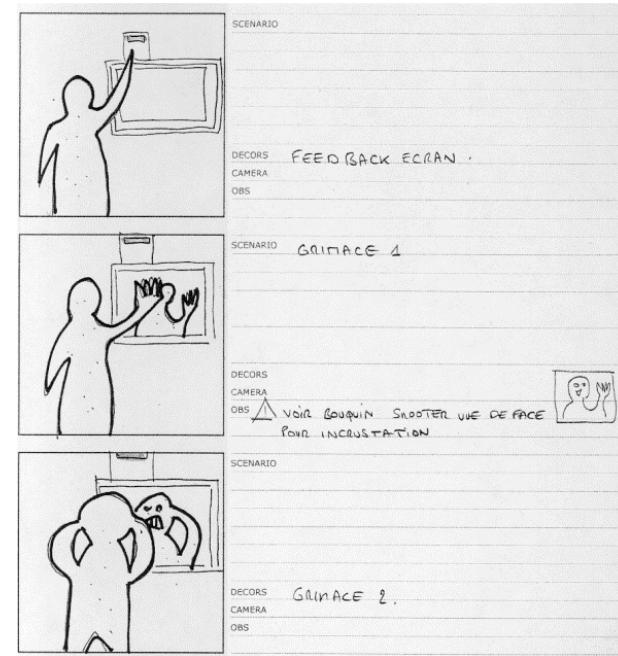
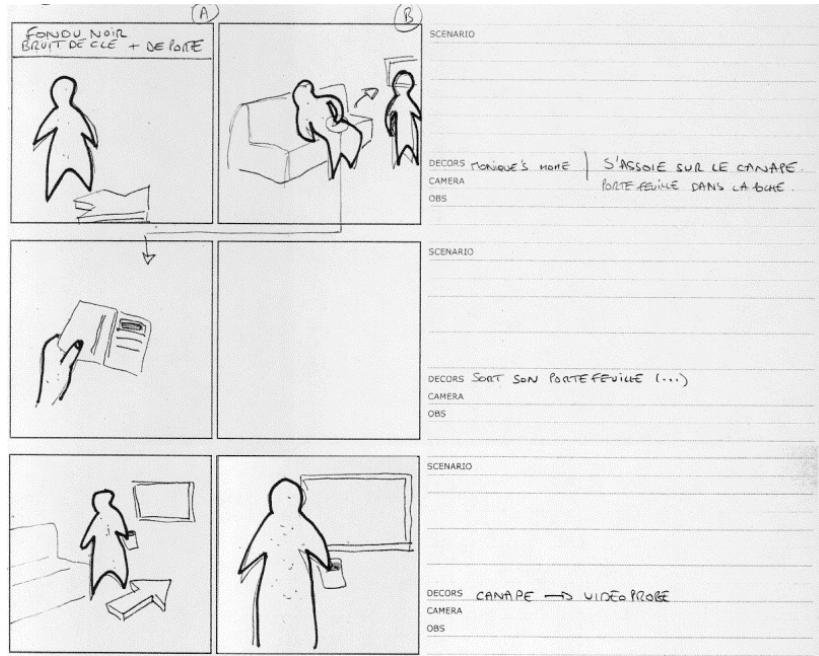
Review field data

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

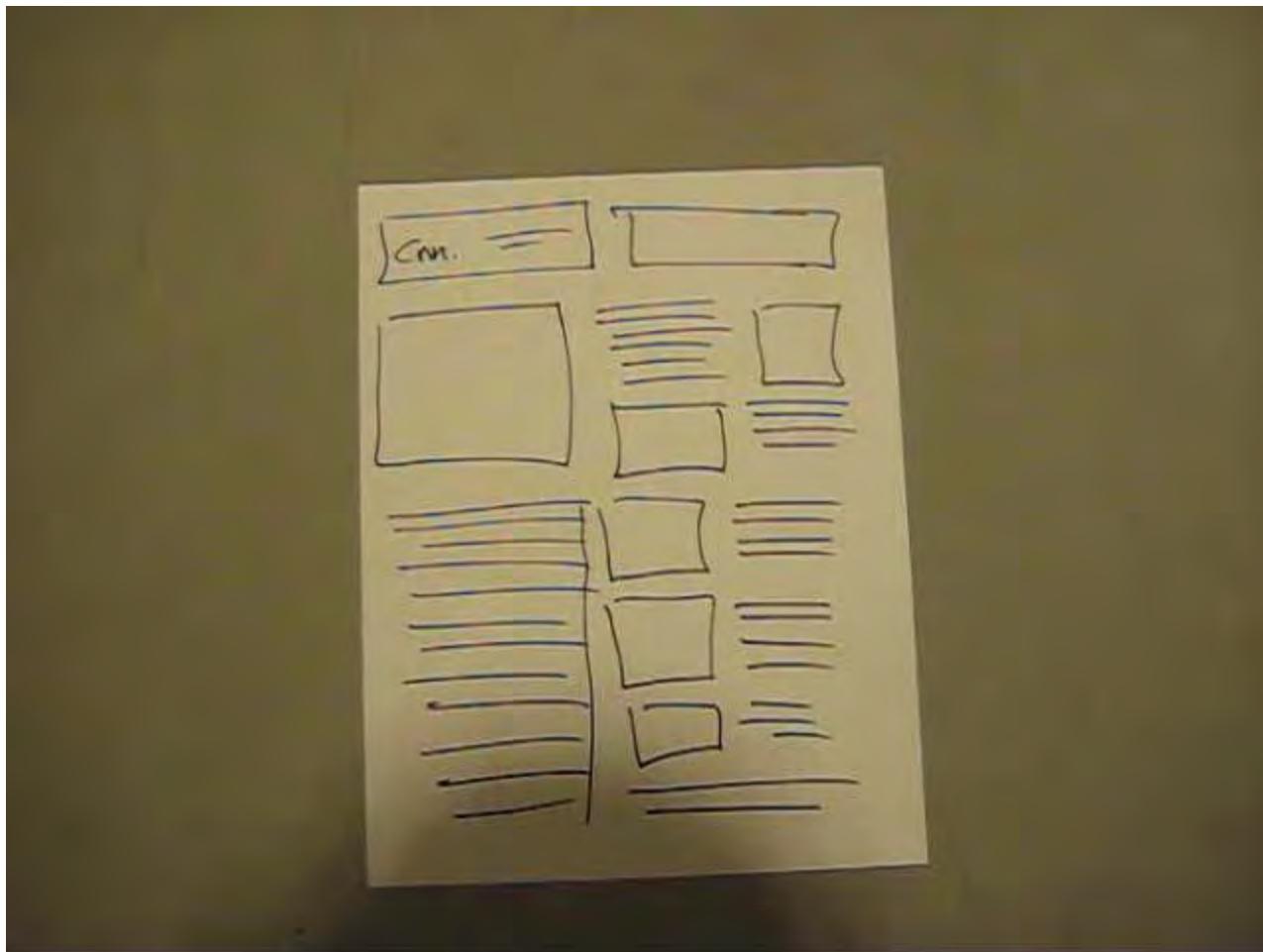
Use titles to separate clips

Like a silent movie

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

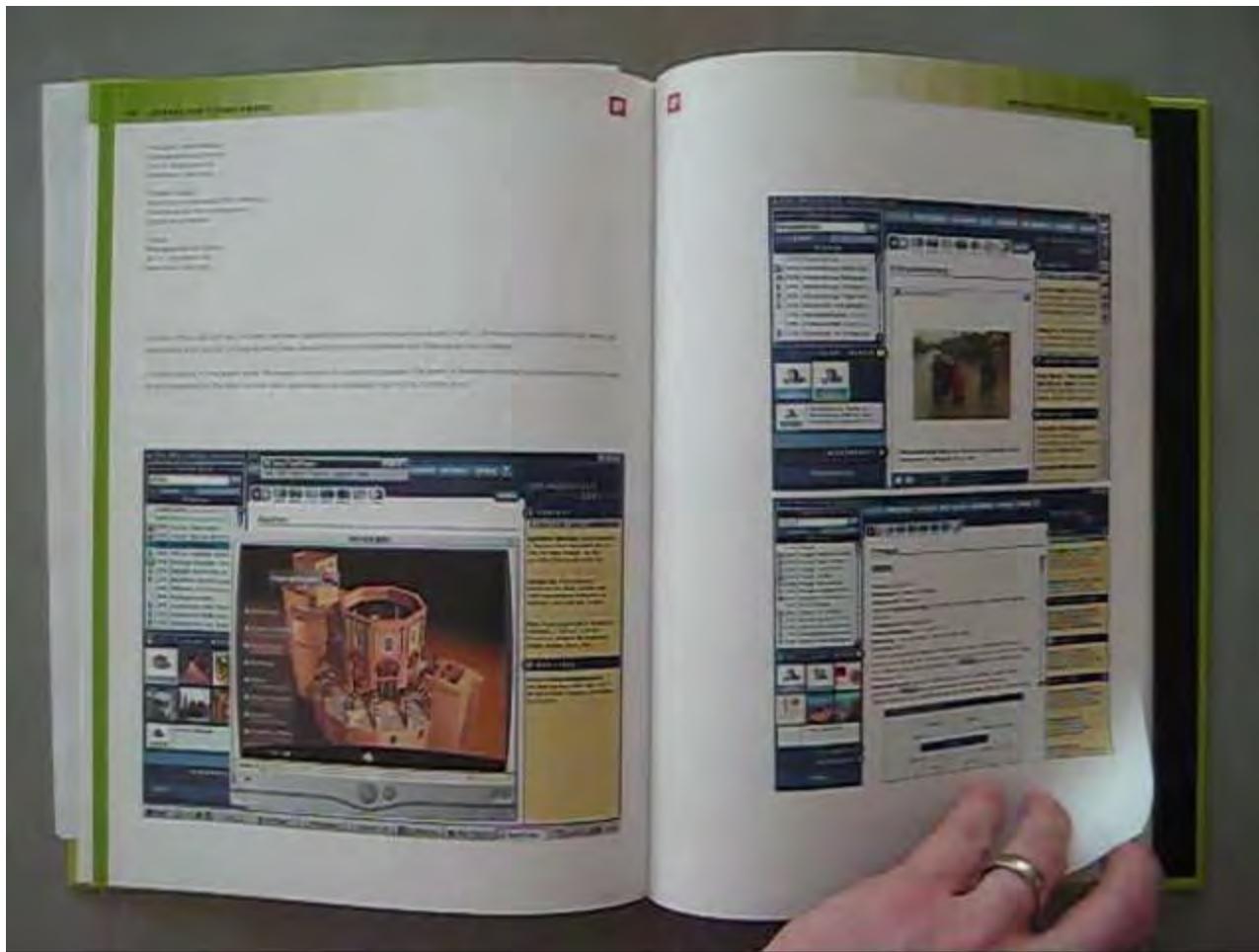
If you make an error, just reshoot it

# 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”

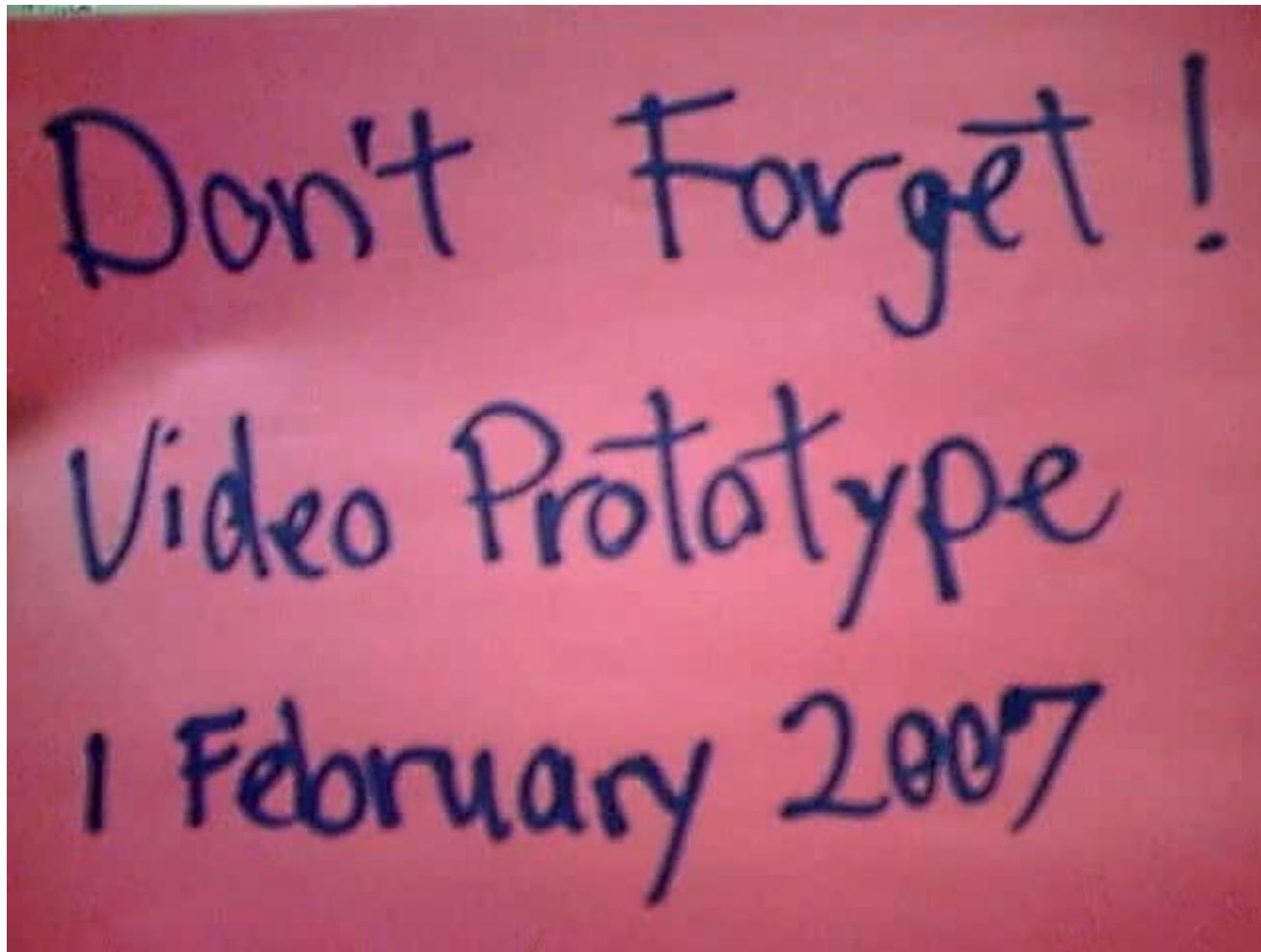
# Narration, Pace, and Flair

**Don't Forget**  
**by Carolyn Holmes and Fred Potter**

<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

**"Don't Forget" Video Prototype  
Chris Govella - Peter Woodman**

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

Don't Forget Version 3

# Using Projectors and Simple Props

Team Buddy Map

Backcountry Savior

Craig Panthen : Philip Kuo : Heidi Tanamulia : Christopher White  
CSE 440F : Professor Landay

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

Buddy Map

# Watch for Pace and Scene Relevance

**Consumester**  
Video Prototype

<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”

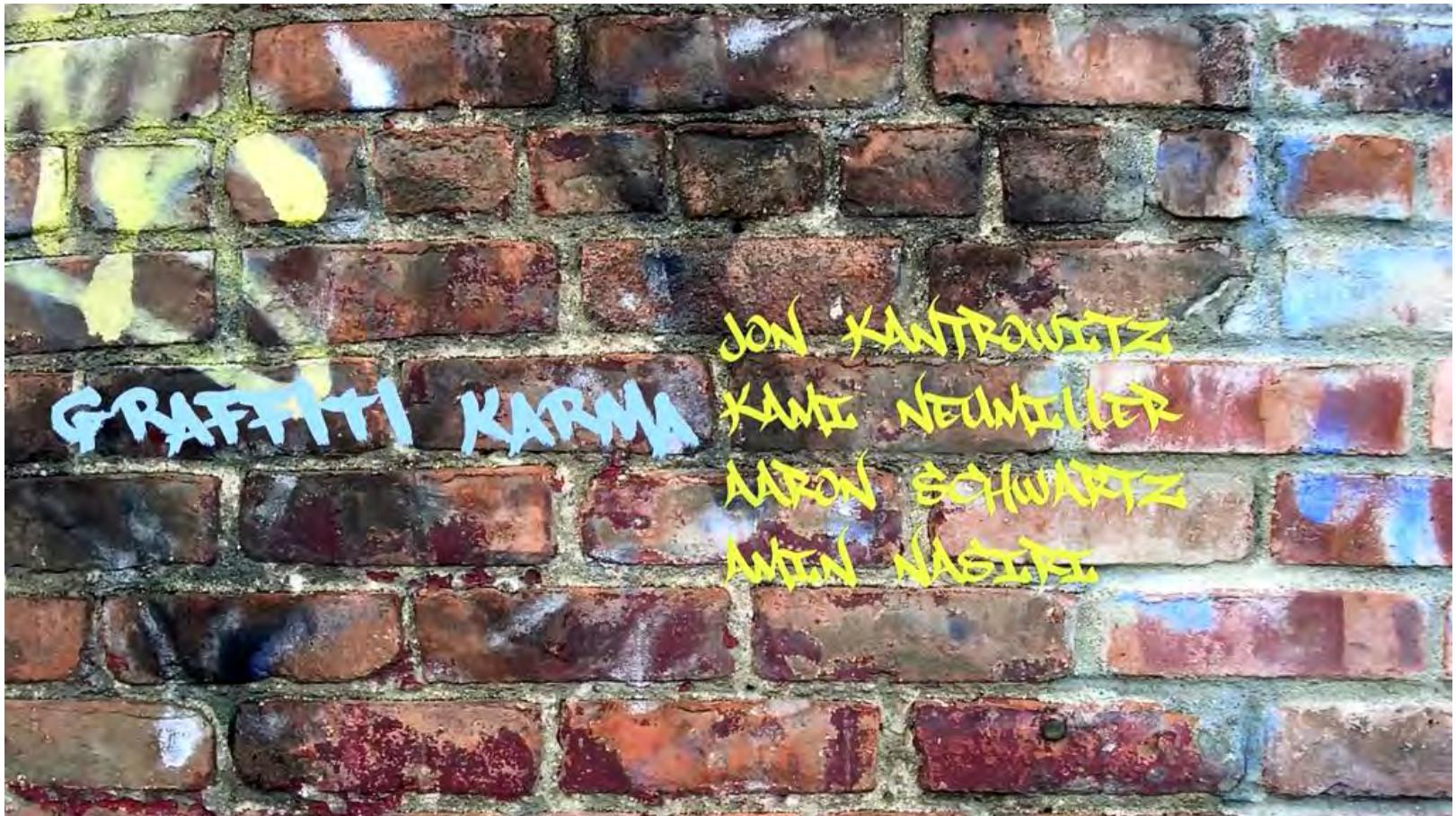
# Split Presentation, Simple Effects



<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>

Graffiti Karma

# 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



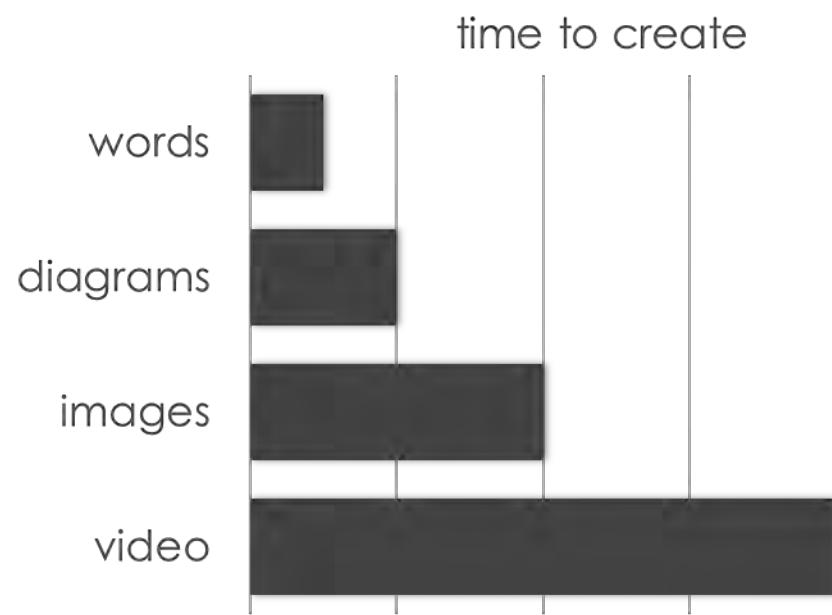
FLUIDUM



FLUIDUM

<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 in Context, Convey Satisfaction

Focus in this course

High-Level Visions

StarFire

Knowledge Navigator

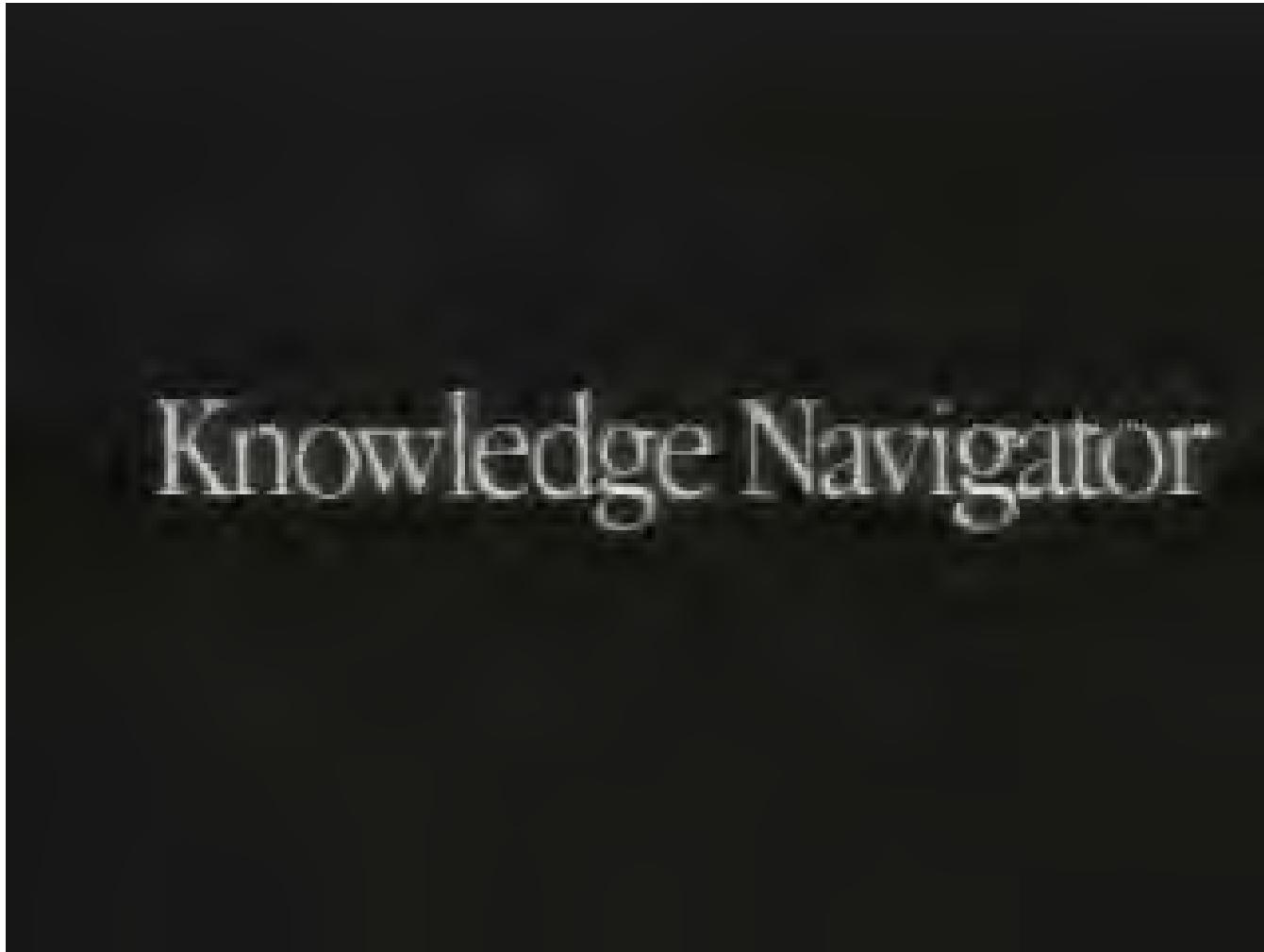
A Day Made of Glass

# 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

Tuesday / Thursday  
12:00 to 1:20

James Fogarty  
Kailey Chan  
Dhruv Jain  
Nigini Oliveira  
Chris Seeds  
Jihoon Suh