Introduction to HCI

Prototyping

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Courses, projects, papers, and more:
http://groups.cs.umass.edu/nmahyar/

Today

- Discussion of readings [10 min]
- Prototyping [35 min]
    - Low fidelity
    - Medium fidelity to high fidelity
- In class activity [20 min]
- Feedback [10 min]

Discussion on requirement readings [10 min]

- A randomly assigned team will summarize and discuss readings:
  - What you learned?
  - What surprised you?
  - How can you use this knowledge in your project?

Learning Goals

- Understand different types of prototyping, purpose and characteristics of each.
- List dimensions of prototyping fidelity and explain how these dimensions may vary;
- Explain how these dimensions might differ in low to med to high fidelity prototypes, and give examples of when/why you may use each type
- Make strategic choices about prototyping tools given your goals and constraints; be able to justify your choice.

review

Conceptual models & conceptual design:

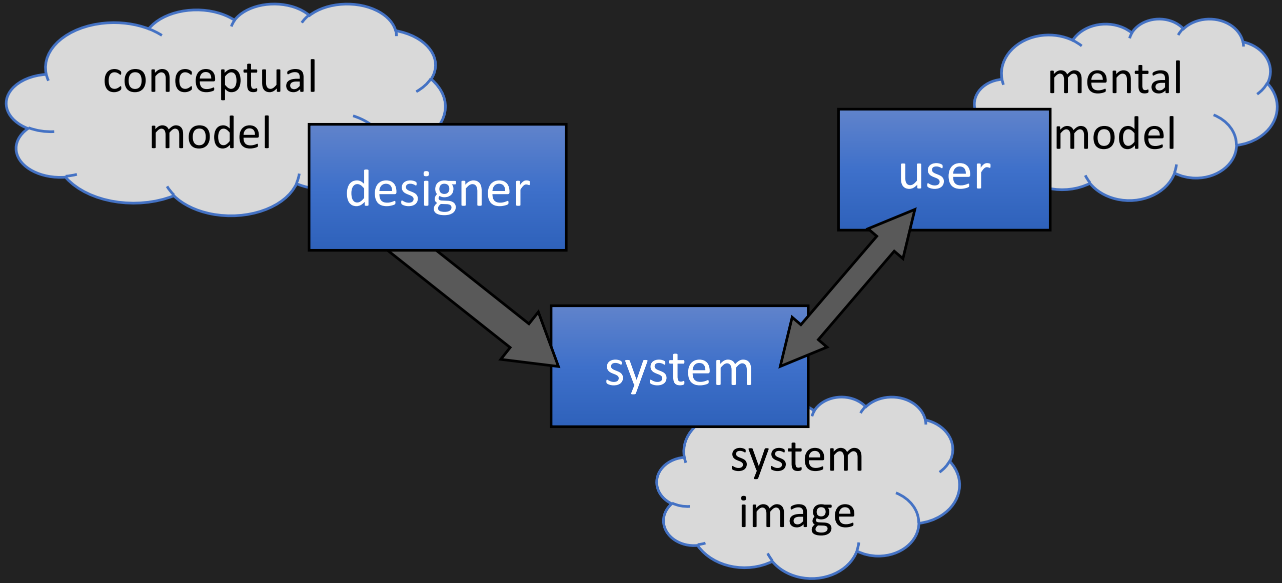
- Conceptual model = the **foundation** of the interface. Different user interfaces could be built upon it.
- ***Interface design* translates the conceptual model** into things we can see and interact with. It involves design choices, but must stay faithful to the concepts and terminology of the conceptual model

review

Conceptual design is:

- Designing systems so users can understand them
- Assisting the user to build useful mental models

- **Interface design is:**
  - Representing the CM to the user



review

From conceptual models to interface design

- **Interface design goal** is to communicate your conceptual model

- Problem:
  - *Designer's* conceptual model is communicated via **system image**':

    Interface, appearance, instructions, system behavior through interaction

  - If system image does not make model clear and consistent:

    → User's mental model will be inconsistent with conceptual model

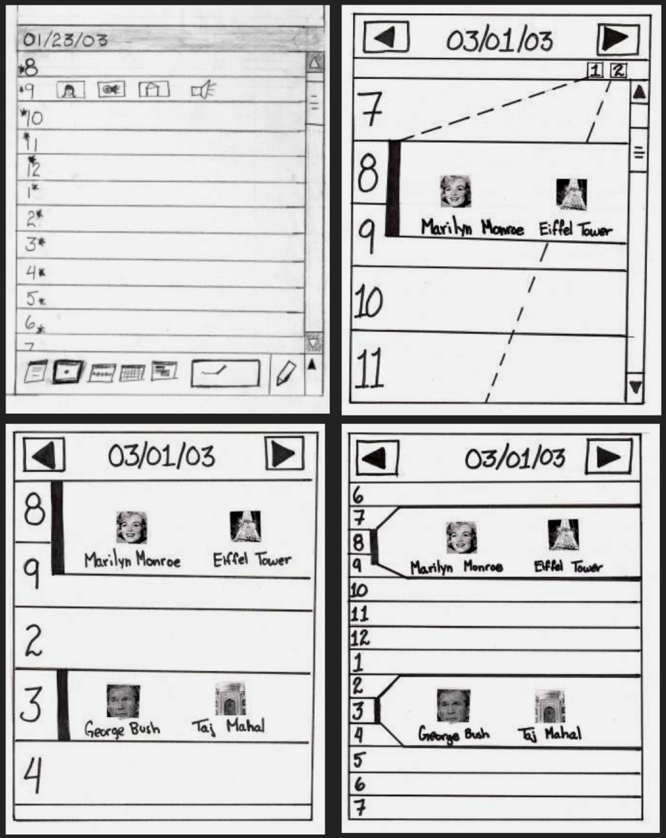
How to get started on interface design?

- Prototyping!

What is a prototype?

Representation of conceptual design for users (and designers, and other stakeholders) **to interact with**

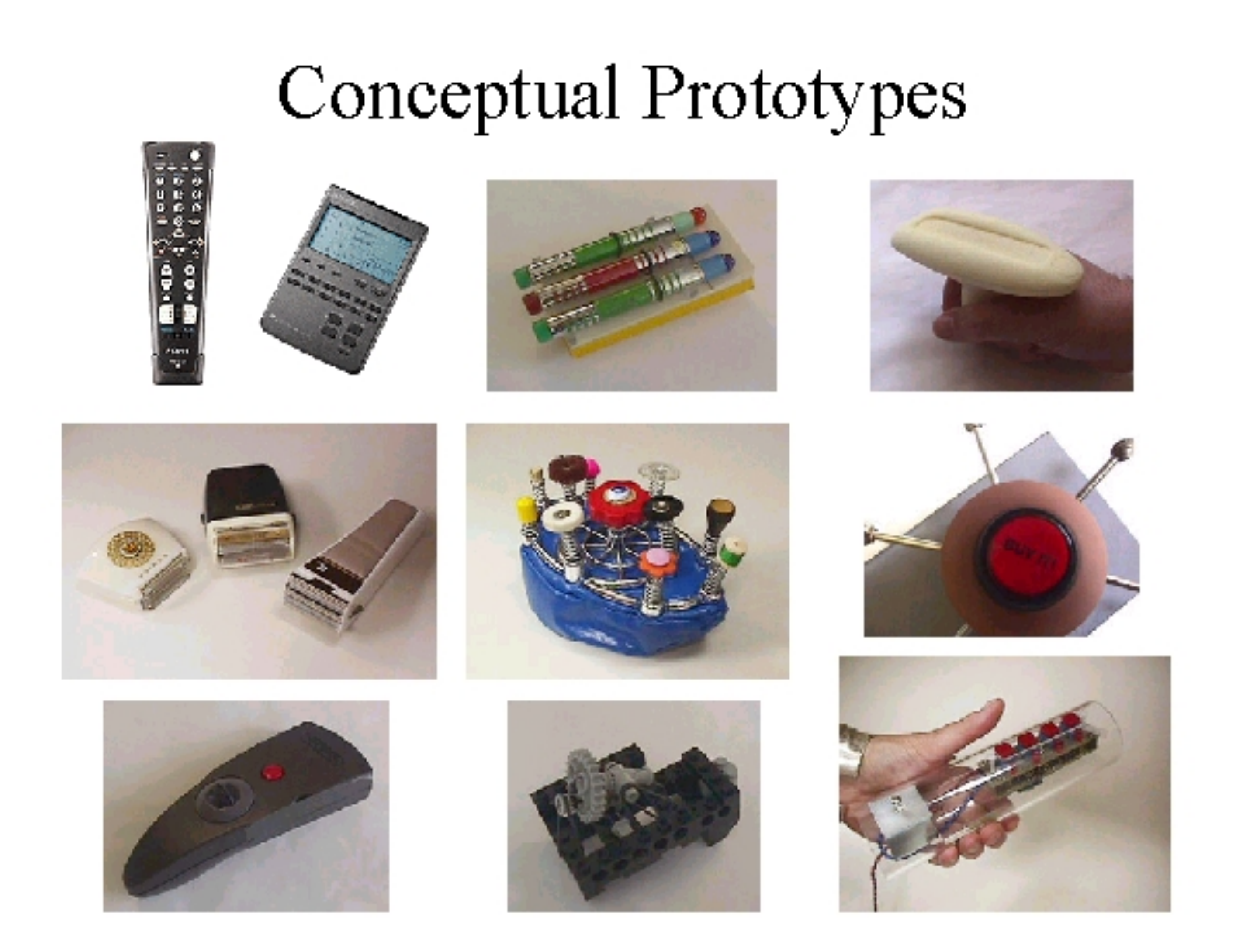
- Prototypes take many forms:
- Cardboard, foam, software, video, clay, paper, hidden people, website, sketches, scripts, index cards etc.



4 designs: image-enhanced planner

② Receive confirmation. Wait until your booking is confirmed via email.
③ Pay for your stay. We accept bank transfer and credit cards. You can cancel your booking up to 30 days prior to your arrival. For more information, visit the payment page.
Still having unanswered questions? Contact the house owner
About your stay
Check-in
Monday, 19th September
Check-out
Sunday 25th September
720 €
6 nights off-season
Number of Guests (incl. you)
–
5
About you
Name
Home
The House
Location
Courses
Request a Booking
Request a Booking
Thanks for sending us your booking request
Interested in taking a course during your stay?
Course Topic
Casa
Explore

Handheld “universal remote control”



Conceptual Prototypes

Google Rapid Prototyping video

Why prototype?

- **Communication**: discuss ideas with stakeholders
  - “Where’s the ON button?”
- Develop **requirements** and/or specifications
  - “Uh-oh, here’s something we forgot.”
- **Learning** and problem solving
  - “Hey, that will work!”
- **Evaluate** interface effectiveness for communicating conceptual model
  - “Whoops, users didn’t understand that.”
- Further develop **conceptual and physical design**
  - “that’s way too heavy”
- **Save time and money**
  - Don’t waste time coding/building the wrong thing

many different kinds of goals and questions possible

Questions that *might* need prototyping to answer:

- For example:
  - Screen too crowded? Actions clear, or lost in clutter?
  - Knob versus slider for controlling volume

    Much more involved for innovative physical interface

    … Imagine the prototyping for the first iphone!
  - Navigation: e.g.
    - Transparent menu versus solid menu
    - How many files to show in file selection box

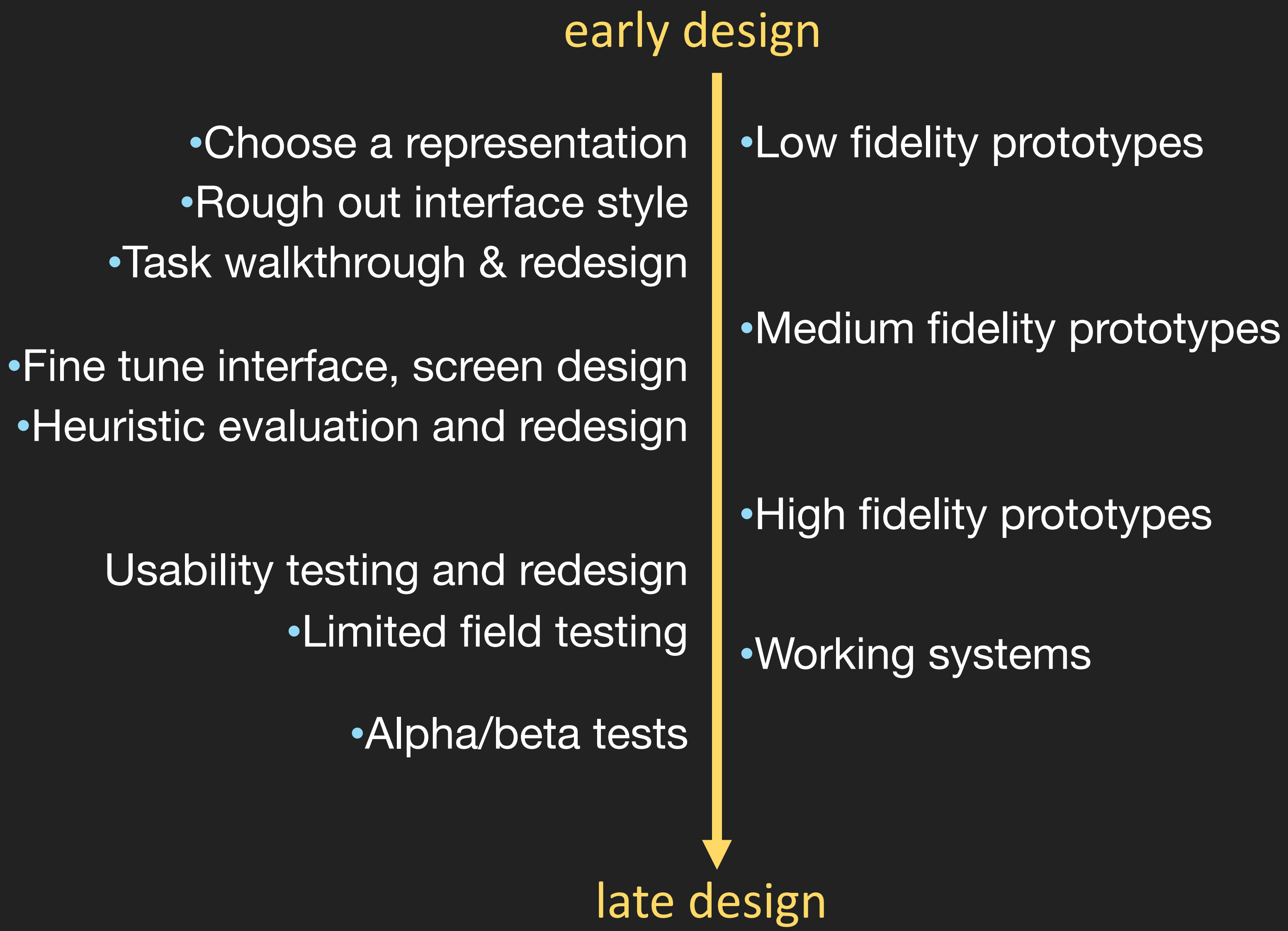
What stage of design would you want to establish this sort of question?

Before you can prototype

Before you build, identify:

- Users and tasks to build your prototype around
- Requirements
- Goals: questions your prototype(s) need to answer

When to use different types of prototypes?



early design

- Choose a representation
- Rough out interface style
- Task walkthrough & redesign

- Low fidelity prototypes

- Medium fidelity prototypes

- Fine tune interface, screen design
- Heuristic evaluation and redesign

- High fidelity prototypes

Usability testing and redesign

- Limited field testing

- Working systems

- Alpha/beta tests

late design

Low fidelity prototypes

Meant to be rough, quick to build, easy to throw away

Purposes

- Proof of concept(s)
- Rough (**but flexible**) interface design
- Facilitate communication with users early on
  - Can be useful for generating and narrowing requirements

Benefits of low fidelity prototypes

Cheap/easy to make

- Try out and explore multiple conceptual models

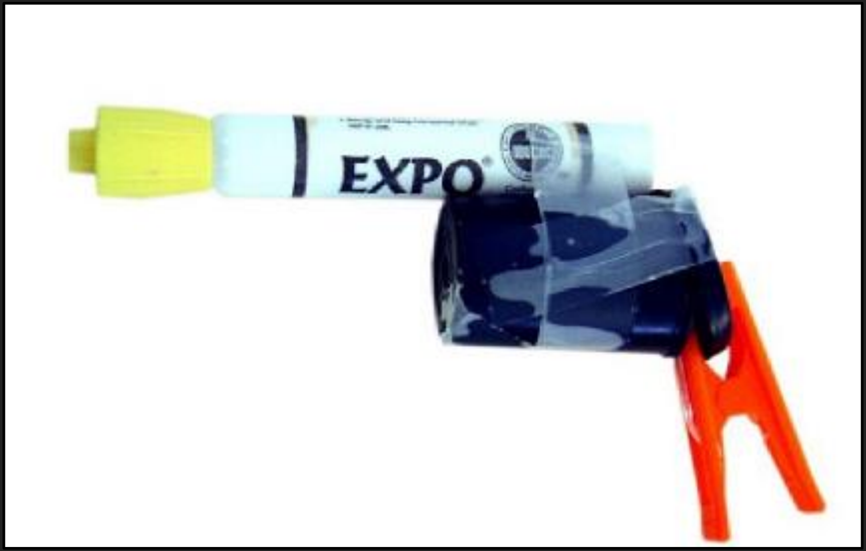
Lack of polish less intimidating to users
this is surprisingly important

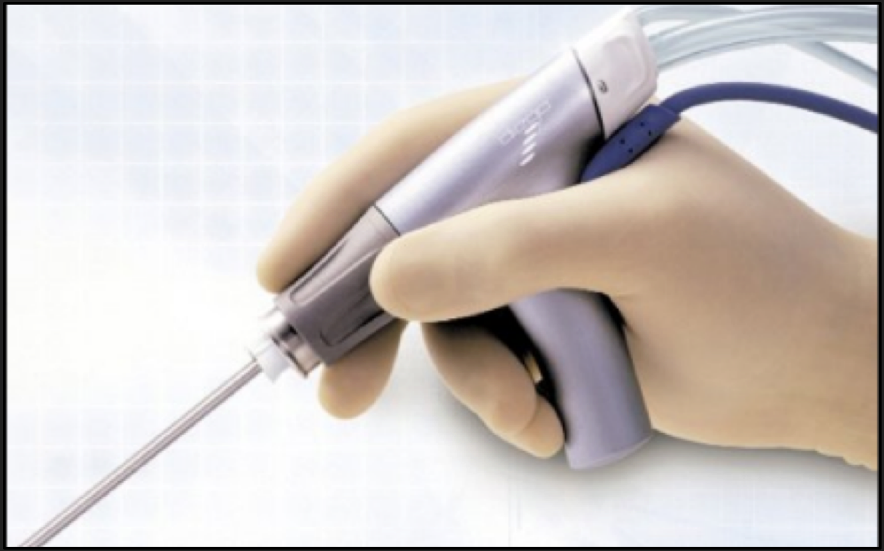
- More willingness to criticize
- Inspires more creative feedback
- Avoids nitpicky feedback

Reduces effort invested by design team

- So easier to make changes, start over

IDEO surgical tool prototype





Approaches to prototype/product integration

- Throw-away
  - Prototype only serves to elicit user reaction
  - Creating prototype must be **rapid**, otherwise too expensive
- Incremental
  - Product built as separate components (modules)
  - Each component prototyped and tested, then added to the final system
- Evolutionary
  - Prototype altered to incorporate design changes
  - Eventually becomes the final product

Approaches to ‘scoping’ prototype functionality

most relevant for low- and med-fi prototypes (when scope is limited)

- **Vertical** prototype
  - Includes in-depth functionality for only a few selected features
  - Key design ideas can be tested in depth
- **Horizontal** prototype
  - Surface layers only: includes the entire user interface with no underlying functionality
  - A simulation; no real work can be performed
- **Prototype scenario**
  - Scripts of particular fixed uses of the system; no deviation supported
  - *See* whole thing (fake)
  - *Use* implemented small part of it.

Paper prototyping

Common low fidelity technique

Popular in industry . . .

Despite prevalence of ‘mockup’ software tools

Because: easy to

- *Build*
- *Alter on the fly*
- *Show*
- *Stick on wall & compare*
- *Discuss*

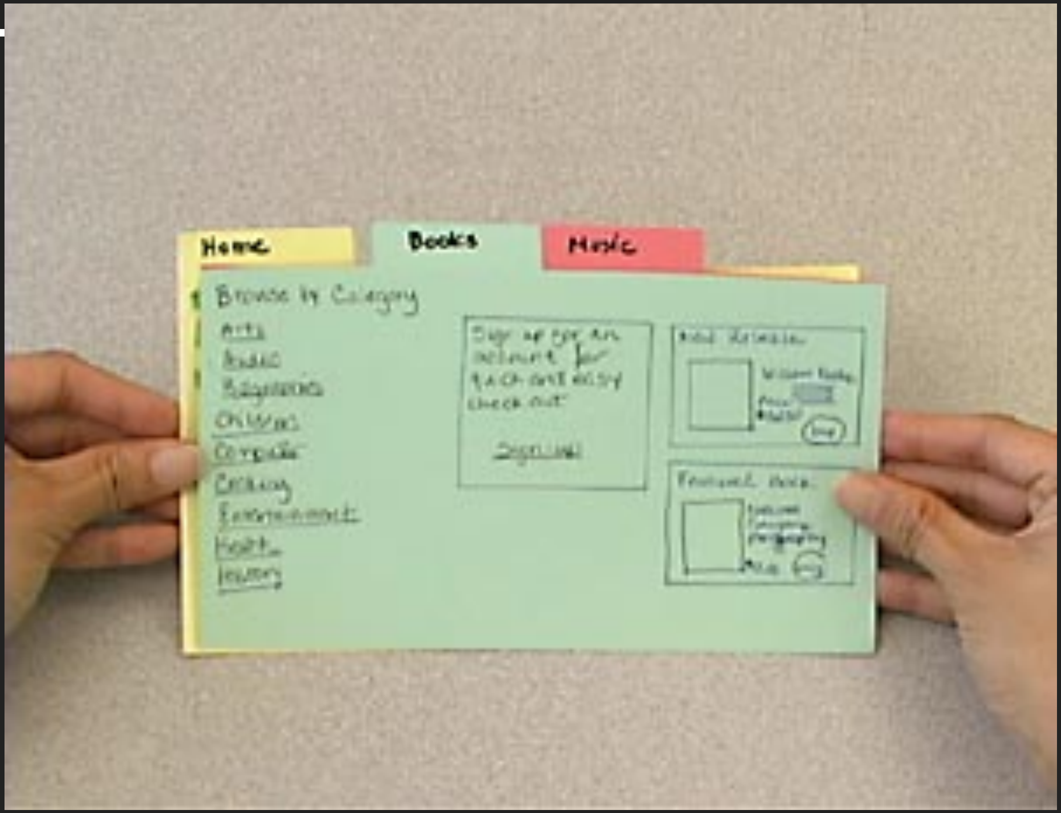


photo: http://hci.stanford.edu/courses/cs247/2009/handouts/paper-2009-exercise.html

Paper prototyping materials

- Interface elements/screens created on paper
  - Or other ‘easy to throw away or modify’ materials, e.g.,

    - Whiteboard, magnetic taps, transparencies

Can incorporate other things that people interact with in completing their task, e.g:

- Other people
- Hardware

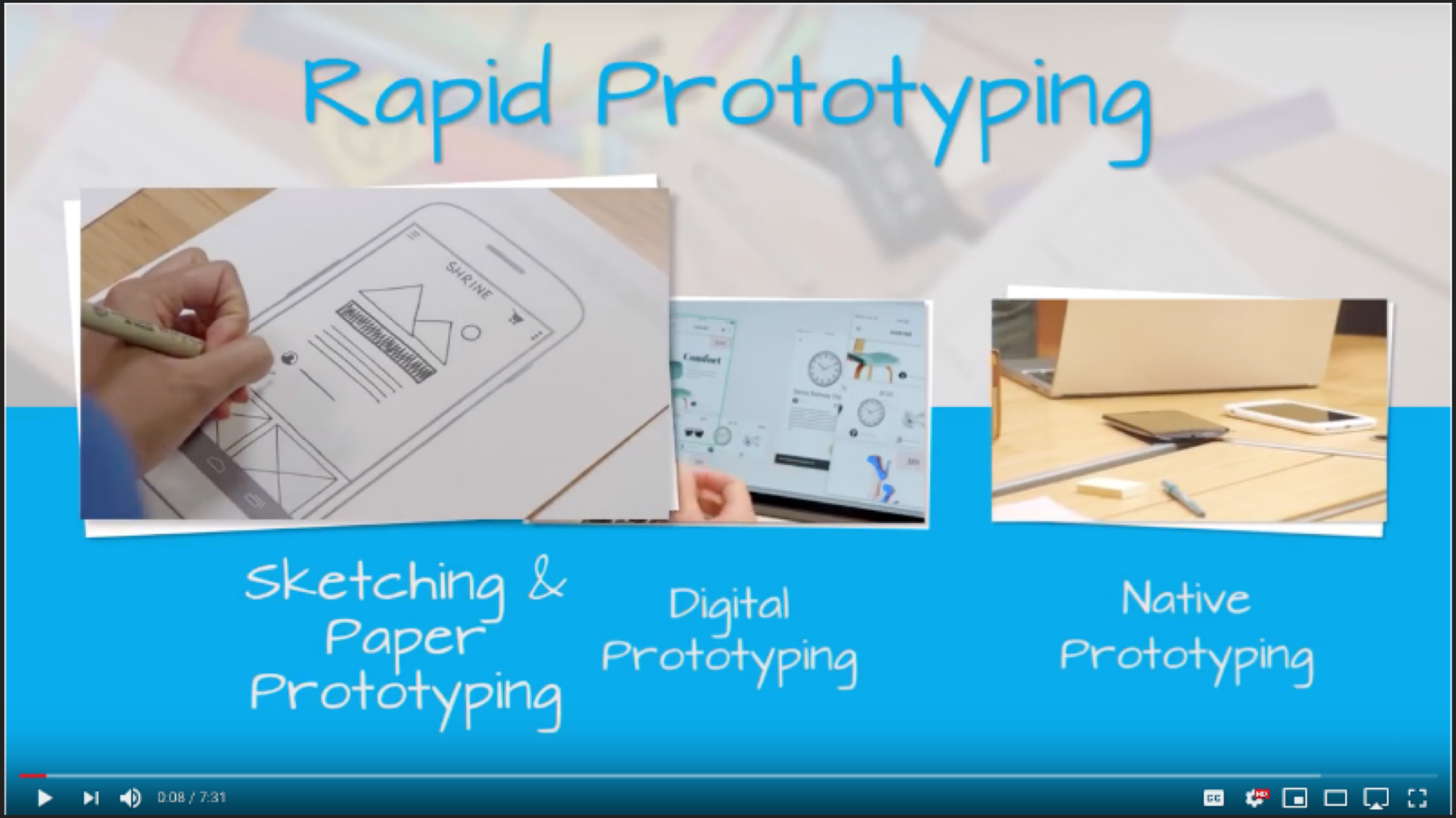
Simulating interactions
in paper prototyping

Can simulate relatively sophisticated interactions

- Complex/subtle interactions won't be perfect
- Requires some imagination on users part
- *Forces you to stay in "early design" mode*

With some creativity, can mockup almost any kind of widget or interaction

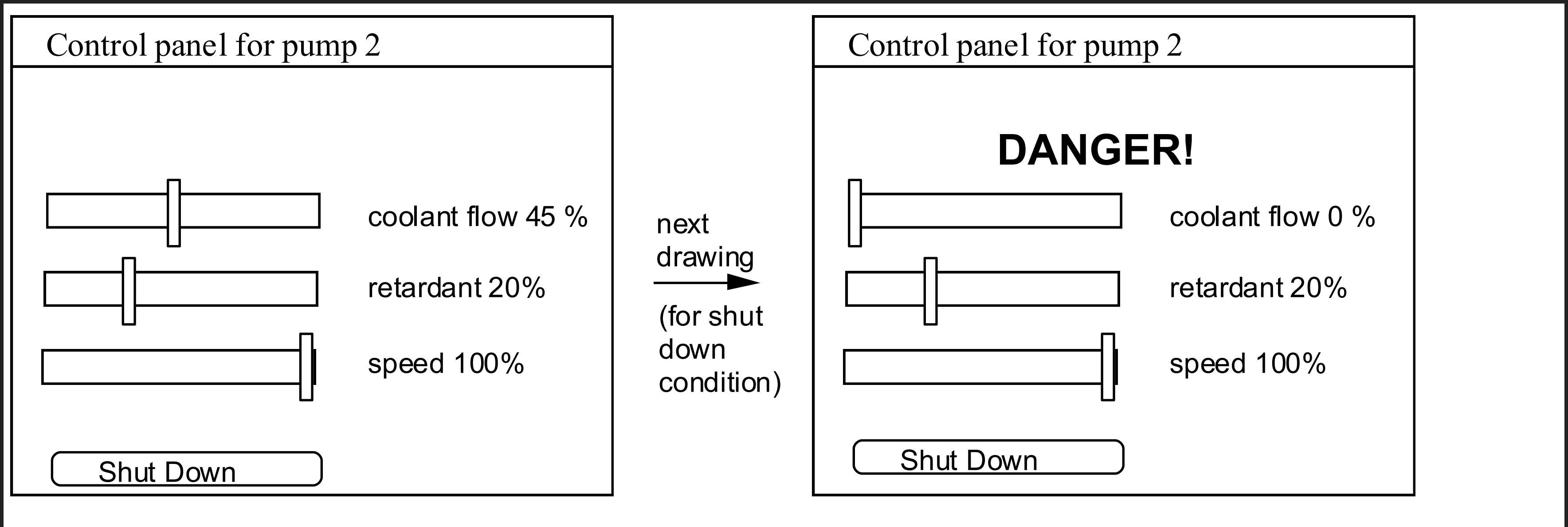
Rapid Prototyping 1 of 3: Sketching & Paper Prototyping



https://www.youtube.com/watch?v=JMjozqJS44M elements aren't active: like paper prototype, but on screen

Technique: digital storyboards

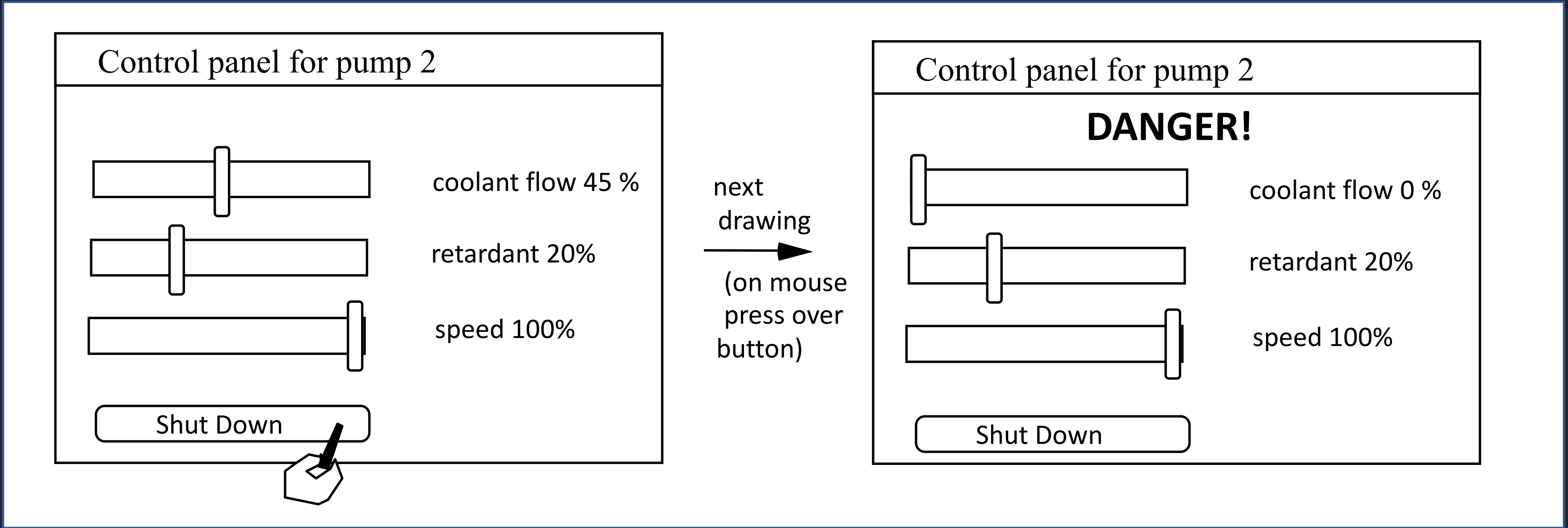
- Draw each storyboard scene on computer
  - Use wire framing/mockup software (e.G., Balsamiq)
  - Or painting/drawing packages (e.G., Photoshop)
- A very thin horizontal prototype
- Does not capture the interaction "feel"



Technique: scripted simulations & slide shows

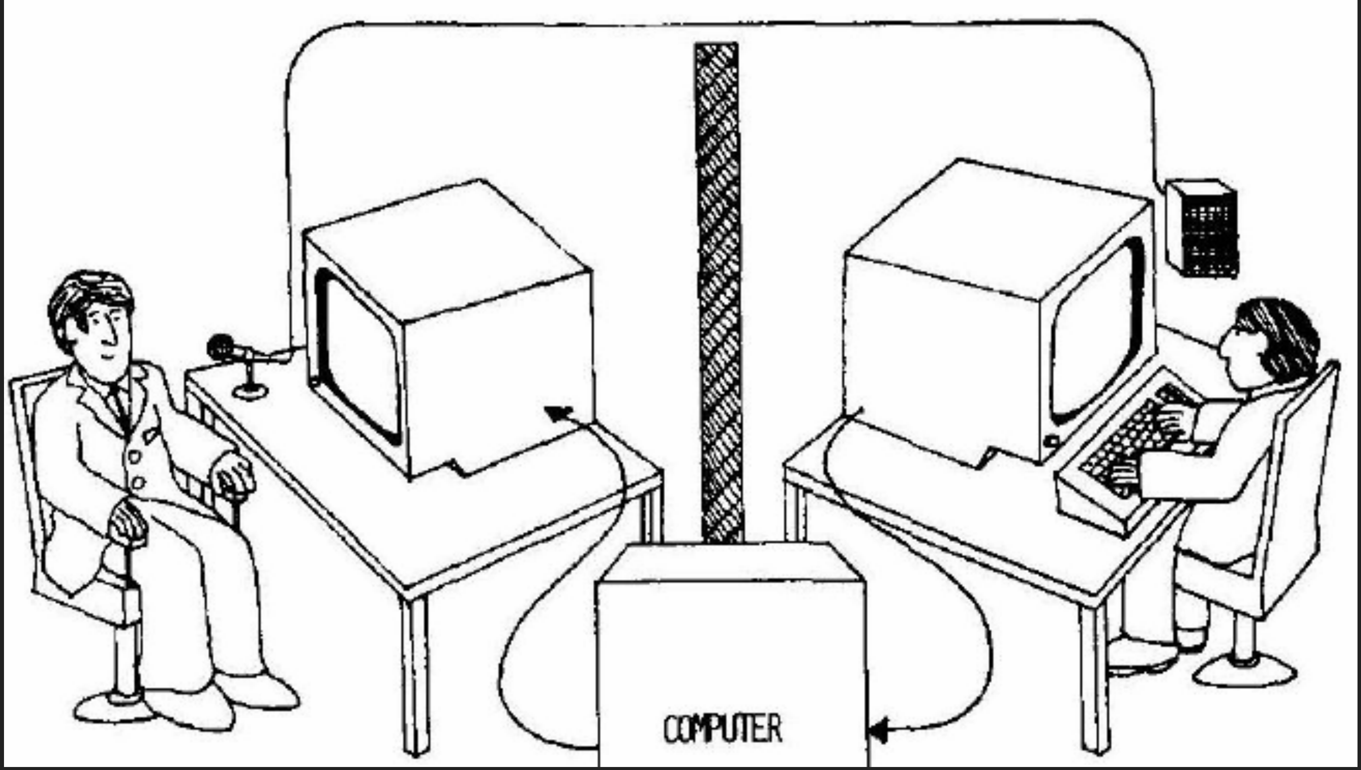
moving towards med-fi
elements can be active –
but still only narrow
functionality

- Encode the storyboard on the computer
  - *Scene transition activated by simple user inputs (i.E. Clickable regions)*
  - A **simple** horizontal and/or vertical prototype
  - Supports ‘limited’ branching
- User given a very tight script/task to follow
  - Appears to behave as a real system
  - But script deviations blow the simulation



Wizard of Oz

- A method of testing a system that does not exist
  - the voice editor, by IBM (1984)



What the user sees

The wizard

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

Wizard of Oz (“WOZ”)

- Human simulates system’s intelligence & interacts with user
  - “Pay no attention to the man behind the curtain!”
- User uses computer as expected
- “Wizard” (sometimes hidden):
  - Interprets subject’s input according to a **preset algorithm**
  - Makes computer/screen behave in appropriate manner
- Good for:
  - Adding simulated and complex vertical functionality
  - Testing futuristic ideas

Wizard of Oz examples

- IBM: an imperfect listening typewriter using continuous speech recognition
  - Secretary (i.E., Wizard) trained to:
    - Understand key words as “commands”
    - Type responses on screen as the system would
    - Manipulate graphic images through gesture and speech
- Intelligent agents / programming by demonstration
  - Person trained to mimic “learning agent”
    - User provides examples of task they are trying to do
    - Computer learns from them
  - Shows how people specify their tasks

Summary of Lo-FI

ON YOUR OWN

- Prototyping
  - Speeds up design and lowers overall cost
  - Allows users to react to the design and suggest changes
  - Prototypes and scenarios are used throughout design
  - Low-fi best for brainstorming and choosing a conceptual model
  - Med/hi-fi prototypes best for fine-tuning and detailed design
- Low-fi prototyping methods
  - Scope: vertical, horizontal prototyping
  - Paper
  - Sketching
  - Storyboarding
  - Scripted simulations
  - Wizard of oz

Medium-fidelity prototypes

- Prototyping with a computer
- Engaging for end users
- Simulate some but not all features of the interface (interactive)
- Can test more subtle design issues

- Pitfalls
- Blinds people to major representational flaws because of a tendency to focus on more minor details
- Users reluctant to change/challenge designer
- Management may think its real!

What’s the difference between “low” and “medium” ?

- *Used to be obvious! Paper vs. Nearly anything else.*

- In last ~10 years: many powerful tools that:
    1. Make it very easy *(a low-fi trait)* to generate mockups
    2. Look real and are at least somewhat interactive *(usually a “medium fidelity” trait)*
- E.G.: Balsamiq, axure – low or medium; usually not high

Many dimensions of “fidelity”

- What are ways a prototype can be ‘true to life”?
  - **Visual realism:** how real it *looks*. Polish, graphic imagery
  - **Physical realism:** shape and form for 3D objects; feel
  - **Scope:** how many functions included; horizontal vs vertical
  - **Functionality:** what actually works? E.G. Web app: links live?
  - **Data:** operates on real vs faked data
  - **Autonomy:** operates alone vs requires “supervision”
  - **Platform:** interim vs final implementation

Important lessons:

1) It is COMPLICATED (slow, expensive) to prototype multiple dimensions at once.

   → So don't. Instead: *modularity of prototyping*.

2) Each prototyping tool has strengths and weaknesses

   - May be *better* (more efficient and capable) for some of these prototyping dimensions than others.

   → You may need multiple tools throughout your design's life cycle.

Matching game:

what medium makes most sense for each dimension?

Prototyping dimension:

- How real it *looks* (polish)
- Scope how many functions included; horizontal vs vertical
- Real vs faked functionality how *much* of it is faked?
- Operates on real vs faked data
- Operates alone vs requires "supervision"
- For 3D products: physical aspects, or just images?
- Interim vs final platform

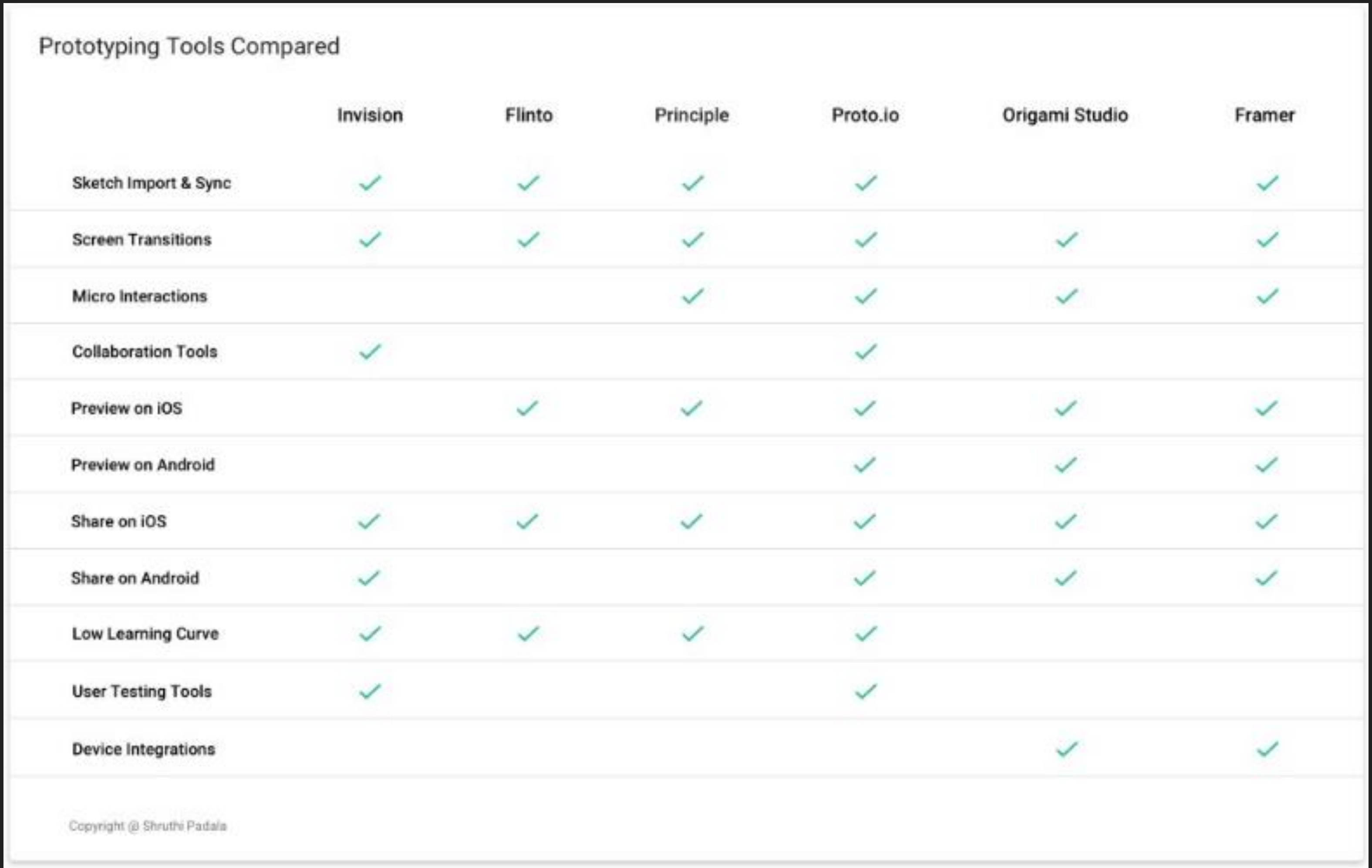
Useful Links:

https://www.creativeblog.com/advice/the-8-best-prototyping-tools-for-2018
https://kfginternational.com/blog/top-prototype-ux-ui-tools/
http://www.nexgendesign.com/top-7-prototyping-mockup-tools

- Prototyping medium:
  - Paper
- Balsamiq
- Axure
- Invision
- Proto.Io
- Flinto
  - Powerpoint
  - Html (or dreamweaver)
  - Java/swing
  - Processing
  - Modeling foam & hot-melt glu
  - Flash
  - Visual basic
  - Photoshop
  - Arduino
  - Found objects
  - Tcl/tk
  - Python
  - Pop

A competitive analysis of prototyping tools

ON YOUR OWN



Prototyping Tools Compared

	Invision	Flinto	Principle	Proto.io	Origami Studio	Framer
Sketch Import & Sync	✓	✓	✓	✓		✓
Screen Transitions	✓	✓	✓	✓	✓	✓
Micro Interactions			✓	✓	✓	✓
Collaboration Tools	✓			✓		
Preview on iOS		✓	✓	✓	✓	✓
Preview on Android				✓	✓	✓
Share on iOS	✓	✓	✓	✓	✓	✓
Share on Android	✓			✓	✓	✓
Low Learning Curve	✓	✓	✓	✓		
User Testing Tools	✓			✓		
Device Integrations					✓	✓

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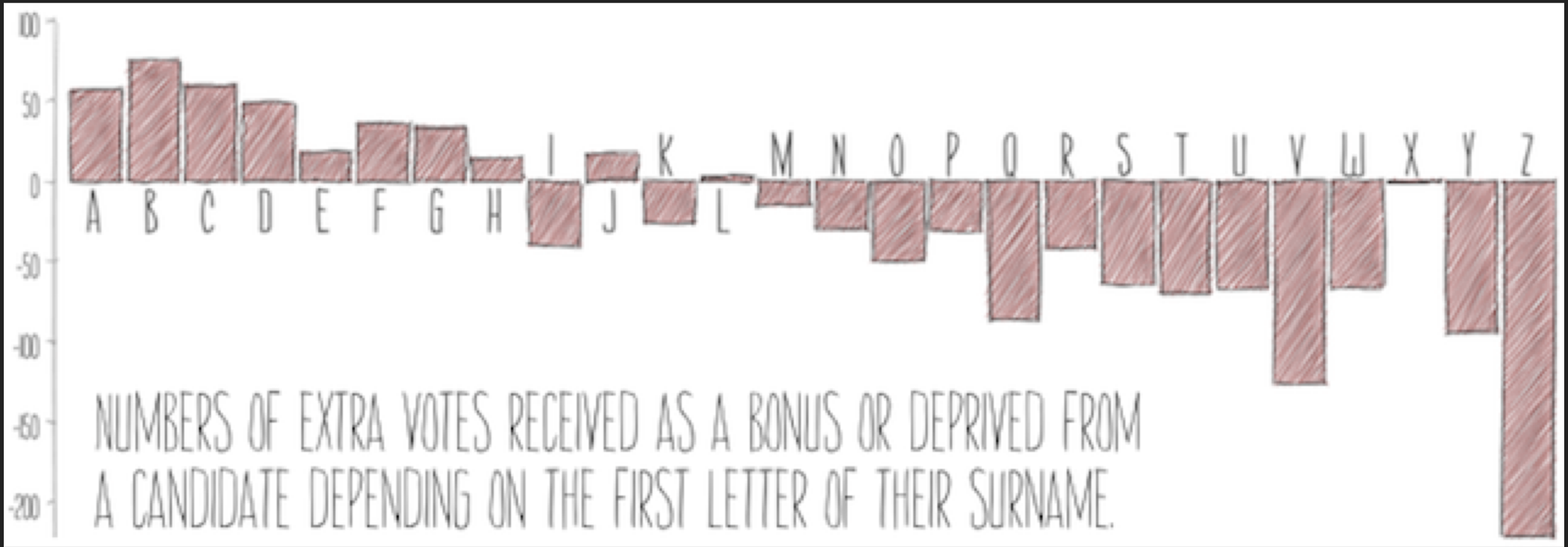
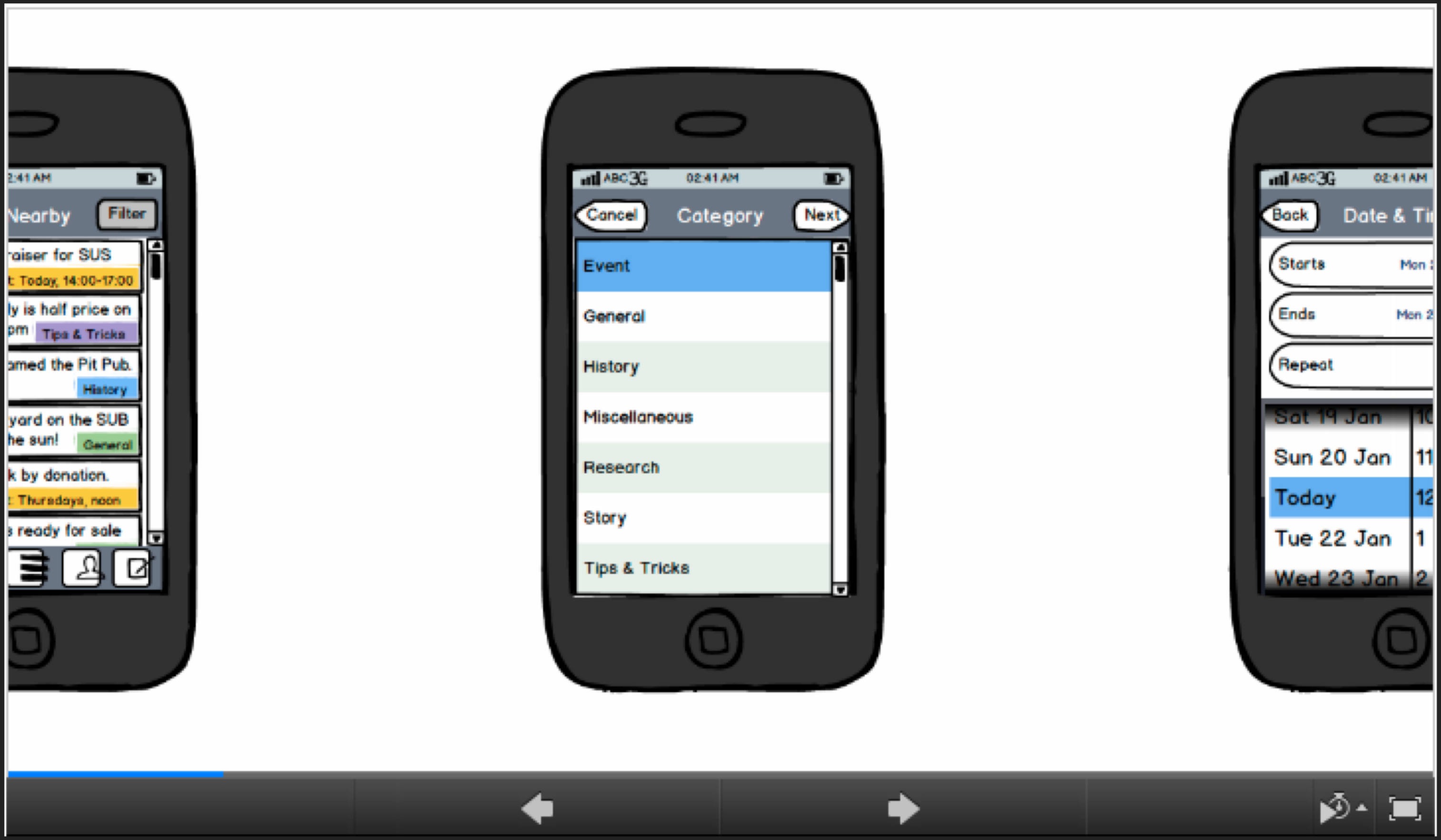
https://uiux.blog/quest-for-the-perfect-prototyping-tool-ef35f89bfb31

You can even make medium-fidelity mockups look low-fi



- this graphic is generated from code (*processing*). http://www.gicentre.org/handy/ [more examples]

Balsamiq: low to medium



- Quickly mock up images and hyperlinked interactivity.
- But - real functionality difficult.

Difference between **med to high-fidelity** prototypes

Increasing in **completeness** and **detail:**

- More aspects being prototyped at same time
- Higher degree of functionality
- Higher degree of polish
- Etc. . .

Fidelity is a **spectrum**

- Not always a firm line between low/med or med/hi

Medium and high-fidelity prototyping what can you use?

- *Many things:*
- Drag-and-drop GUI toolkits for standard UI mockups
  - E.G. Axure, visual basic
- Scripting languages & interface libraries
  - E.G. Python, tcl/tk, java script libraries (e.G., Jquery)
- Graphical languages for visualization & novel interface creation
  - VB, java, flash; processing; D3
- Special purpose tools and environments
  - E.G. Toolkits for integrating speech, haptics, I/O devices

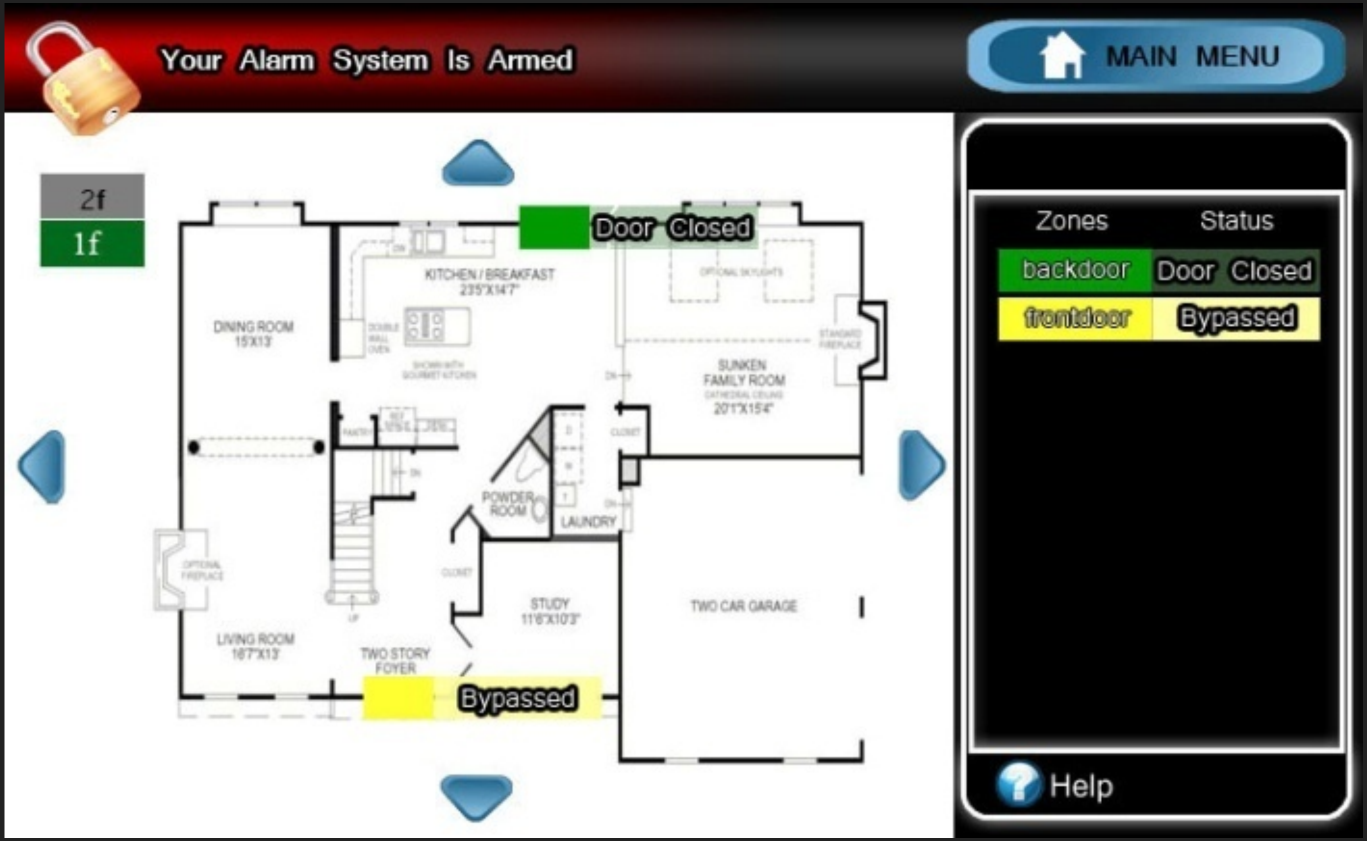
→ **A prototyping platform can be medium- or hi-fi; depends on how you use it.**

ON YOUR OWN

The situation today for prototyping tools
(vs. Developing on final platform)

- For simple prototyping.
  - Balsamiq, axure, html, powerpoint
- More advanced features in e.G. Supercard, director:
  - Text-to-speech, speech recognition, quicktime, filmstrips, graphic import and export, MP3 playback etc.
- Advanced uis still require (scripting) language + libraries
  - HTML + javascript
  - Tool command language/tool kit (TCL/TK)
  - Python
  - Processing (java based, but way more accessible; good for sketching, no good for larger code projects)
  - Still a need for C++, C#, objective C, java

Home alarm system

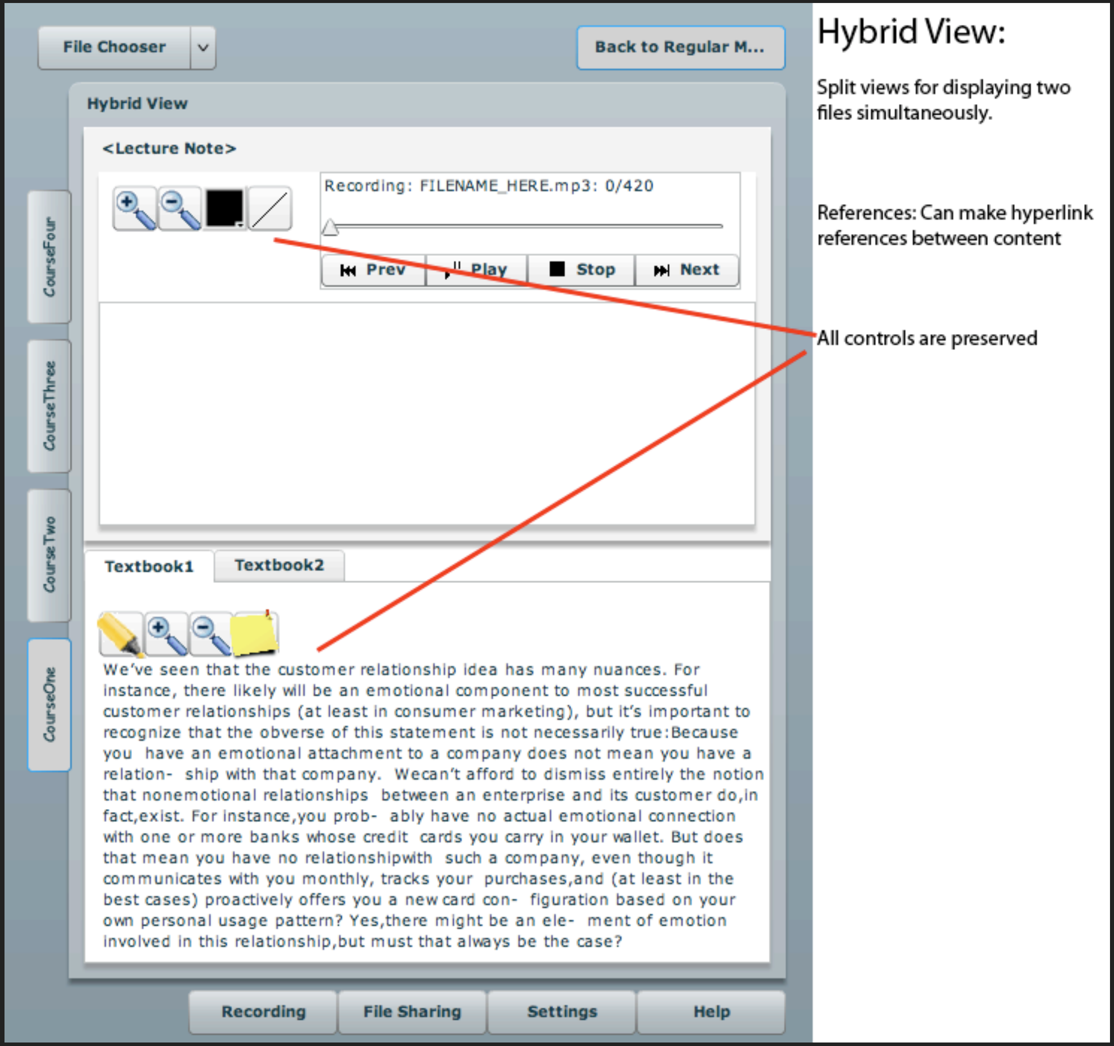


Zones	Status
backdoor	Door Closed
frontdoor	Bypassed

Flash:

- Product for the home
- Needed to gauge reactions to having it in ones house
- Imagery + graphic resolution critical

e-reader & note-taking tool



We've seen that the customer relationship idea has many nuances. For instance, there likely will be an emotional component to most successful customer relationships (at least in consumer marketing), but it's important to recognize that the obverse of this statement is not necessarily true:Because you have an emotional attachment to a company does not mean you have a relation- ship with that company. Wecan't afford to dismiss entirely the notion that nonemotional relationships between an enterprise and its customer do,in fact,exist. For instance,you prob- ably have no actual emotional connection with one or more banks whose credit cards you carry in your wallet. But does that mean you have no relationshipwith such a company, even though it communicates with you monthly, tracks your purchases,and (at least in the best cases) proactively offers you a new card con- figuration based on your own personal usage pattern? Yes,there might be an ele- ment of emotion involved in this relationship,but must that always be the case?

Hybrid View:

Split views for displaying two files simultaneously.

References: Can make hyperlink references between content

All controls are preserved

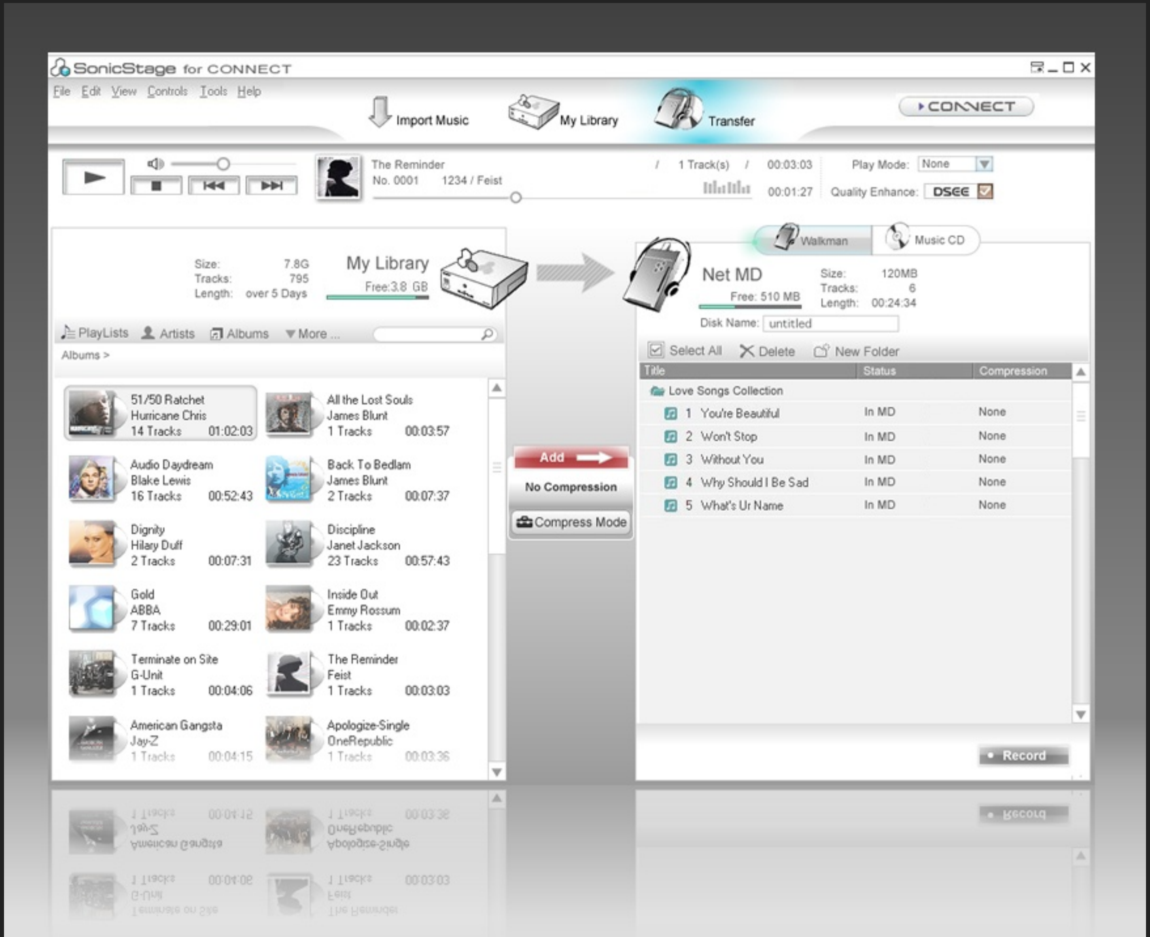
Flex:

needed to test how well the concept worked for **actually taking notes in lecture**

highly functional

detailed vertical

Sonic stage music synchronization tool



The Reminder
No. 0001 1234 / Feist
1 Track(s) / 00:03:03
00:01:27
Play Mode: None
Quality Enhance: DSEE ☑

My Library
Size: 7.8G
Tracks: 795
Length: over 5 Days
Free:3.8 GB

Net MD
Free: 510 MB
Size: 120MB
Tracks: 6
Length: 00:24:34
Disk Name: untitled

51/50 Ratchet	Hurricane Chris	14 Tracks	01:02:03
All the Lost Souls	James Blunt	1 Tracks	00:03:57
Audio Daydream	Blake Lewis	16 Tracks	00:52:43
Back To Bedlam	James Blunt	2 Tracks	00:07:37
Dignity	Hilary Duff	2 Tracks	00:07:31
Discipline	Janet Jackson	23 Tracks	00:57:43
Gold	ABBA	7 Tracks	00:29:01
Inside Out	Emmy Rossum	1 Tracks	00:02:37
Terminate on Site	G-Unit	1 Tracks	00:04:06
The Reminder	Feist	1 Tracks	00:03:03
American Gangsta	Jay-Z	1 Tracks	00:04:15
Apologize-Single	OneRepublic	1 Tracks	00:03:36

Title	Status	Compression
Love Songs Collection		
1 You're Beautiful	In MD	None
2 Won't Stop	In MD	None
3 Without You	In MD	None
4 Why Should I Be Sad	In MD	None
5 What's Ur Name	In MD	None

Flash w/ imported photoshop

observe scanned, hand-drawn sketches

How do you know when you have – or need – a high-fi prototype?

- Scope is complete (horizontal *and* vertical)
- Prototype can be tested in just about every way performance as well as subjective and cognitive analysis; more realistic scenarios; in field
- Feels like time to switch to final development platform
- Design is becoming rigid and finalized

On deck…

- Next class …
  - Tuesday oct 22: midterm
  - No class on Thursday oct 24

Activity [20 min]

Discuss the following questions for your own projects:

- What are the main challenges that your prototype means to solve?
- What fidelity seems right for your prototype?
- What dimensions you need to consider?
- What are some possible tools for your project? What are the tradeoffs?

Extra slides

summary
low fidelity vs. high fidelity

- cheap
- easy to build lots
- facilitate communication
- gross design (layout)
- market requirements
- proof-of-concept
- limited error checking
- hard to get to code
- facilitator driven
- limited functionality

- complete functionality
- interactive
- user-driven
- exploration and testing
- look and feel of final product
- provides specification
- marketing and sales tool
- expensive
- time consuming
- inefficient proof-of-concept
- poor for requirements gathering
- can be hard to throw away

Tools available to you

- *Balsamiq*
- *Axure*
- *The Adobe Suite,* Photoshop, InDesign, Illustrator, Premiere, and Dreamweaver

  Microsoft Office suite (PPT can be useful).
- Note that many tools have 30-day free trials