CS3205 – HCI IN SOFTWARE DEVELOPMENT

MORE PROTOTYPING STRATEGIES

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* Material from: Floryan (UVa) Klemmer (UCSD, was at Stanford)

WHAT ARE WE DOING TODAY?

• High-fidelity, Mock-ups

• Wizard of Oz Prototyping

WHAT IS A HIGH-FIDELITY PROTOTYPE?

• "A prototype that mimics the design very closely, but remains functionally incomplete."

• This might be actual code, or actual physical devices that don't work fully.

• For things on screens, how might this be created?

- Using the final, target implementation language
 - Qt, Java Swing, Tkinter, HTML, Android,...
 - How's that different than version 1?
- Using a tool to create a wire-frame or mock-up
 How's that different than low-fidelity prototyping?

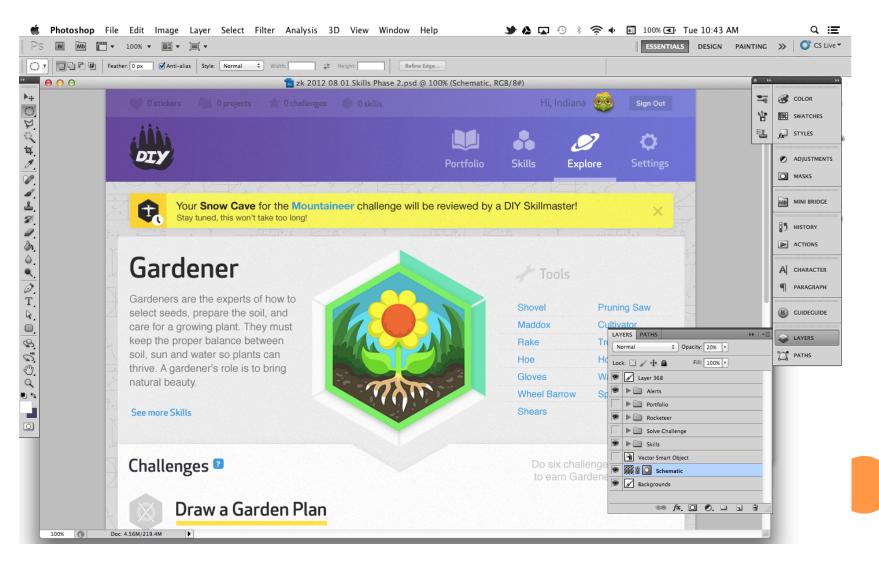
WIRE-FRAMES, DIGITAL MOCKUPS

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DIGITAL MOCKUPS



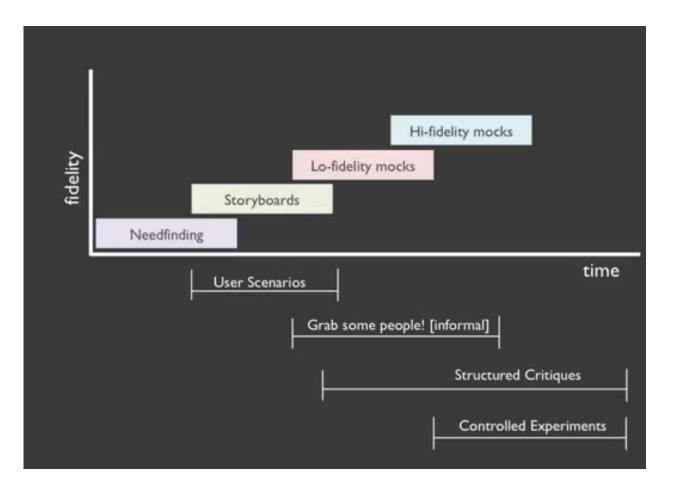
OBSERVATIONS ABOUT EXAMPLES

- Both clearly are not "functional"
- Balsamiq example:
 - Looks low-fi. Does it really mimic the final design closely? What's missing?
- Photoshop
 - What's there?
 - Layout, organizations, size of things.
 - Color, fonts
- Which took more time to create?

TOOLS

- Free software exists for doing this!
 - <u>http://mashable.com/2012/06/07/mockup-tools/</u>
- Balsamiq Mockups (desktop application)
- Mockingbird (online in-browser mockups)
- Mockup Builder
- POP (Prototyping on paper) app
- Can also use tools like Powerpoint or Photoshop to simulate a design relatively effectively.

PROTOTYPING OVER TIME



WHEN DOES IT BECOME HI-FIDELITY?

• When you:

- take the time to put in more and more detail,...
- that's closer to the final design, ...
- that includes "fit and finish"
- When the goal is
 - More about refinement about a designed you've chosen,
 - And less about exploring alternatives.
- You might be using the same tool to create the representation, so that's not necessarily the difference.

WIZARD OF OZ PROTOTYPES

MOTIVATION: PROTOTYPING PROBLEM

• Need feedback from real people in order to improve your design. However,

• Can't get feedback unless you have something built and working!

• What if your system is very complicated?

MOTIVATION: WHAT IF WE COULD...

• Make an *interactive* application without (much) code, but still:

• Get feedback from real users.

WIZARD OF OZ PROTOTYPING!



WIZARD OF OZ PROTOTYPING

- Human operator simulates the functionality of the system behind the scenes.
- Don't need to build the whole system! Just have your "wizard" simulate it for the user.



WIZARD OF OZ TECHNIQUE

- Make an interactive application without much code.
 - Front end interface is coded.
 - A remote wizard controls the interface's characteristics based on user input directly.
 - Makes sense to do this if it's faster/cheaper/easier than making a real thing.
- Get feedback from real users.
 - Users will think the system is more real if done well!

ANOTHER EXAMPLE: SPEECH RECOGNITION

• There was a time when:

- Speech recognition software was NOT good at all (still not great).
- We knew it would get better.
- We wanted to know what user's interactions with this technology should be like.
- How to study this without building a speech recognition system ourselves?



ANOTHER EXAMPLE: SPEECH RECOGNITION

• Wizard of Oz the interaction!

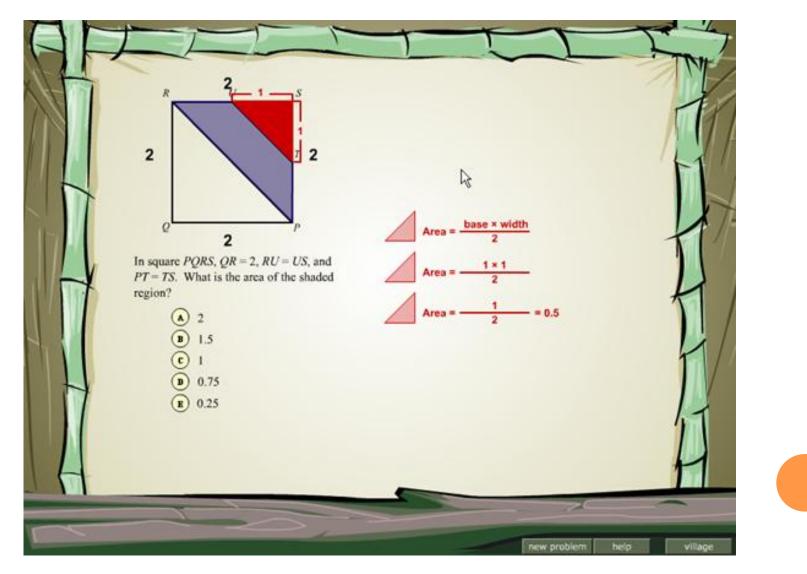
- Human listens to the voice commands of the user.
- Adjusts the interface accordingly.



FUNNY EXAMPLE

o https://www.youtube.com/watch?v=AlyvYLLtQOg

ANOTHER EXAMPLE: INTELLIGENT TUTORS!



WHEN TO USE WIZARD OF OZ?

• Useful when:

- There is an advanced technology in your system that you don't have time to build / incorporate into prototype.
 - Speech recognition, artificial intelligence, etc.
- You haven't determined how best to implement a feature (e.g., personalized feedback) and want to test it first.

WIZARD OF OZ CAN BE LOW-FIDELITY!

- In low-fidelity evaluations, "playing the computer" is a form of WOO
 - You are essentially the "Wizard" controlling interactions with a paper prototype while users use it.
- However, remember that the more 'real' the wizard's mirage is, the more realistic the user's reactions will be.

MAKING A WOO PROTOTYPE

- 1. Map out scenarios and application flow.
 - Enumerate ALL scenarios if possible.
 - If not, provide guidelines in as specific a format as possible.
- 2. Put together interface "skeletons"
- 3. Develop "hooks" for wizard input.
 - If paper, hooks will be very manual.
 - If done in software, some code will need to be developed.

MAKING A WOO PROTOTYPE

• 4. Put it all together.

- Where and how will the wizard provide input?
- How will the wizard receive input from the user?
- * Remember that you'll need to build actual software for wizard's role eventually, so it must be possible!
- 5. Rehearse wizard role with a colleague.
 - Being the wizard is surprisingly difficult.
 - Work out easy bugs in interaction before using real users.

COLLECTING DATA FOR WOO PROTOTYPES

- Practice with friends first.
- Once comfortable, recruit "users"
- Two roles: facilitator and wizard
 - Facilitator: Provides tasks (paper) and takes notes.
 - Wizard: Operates the interface.

COLLECTING DATA FOR WOO PROTOTYPES

- User feedback can be:
 - Think aloud (speak freely as performing tasks)
 - Retrospective (discuss task afterwards)
 - Heuristic Evaluation (experts are watching interaction unfold)
- Interaction is normally video taped so designers can review later.
- Always debrief users, reveal the wizard if necessary / appropriate.

WIZARDS THROUGHOUT DEVELOPMENT

• Functionality vs. Time graph

ADVANTAGES OF WIZARDS

- Faster to make / cheaper, thus more iterative prototypes possible.
- Creating multiple variations is very easy (no code to rewrite).
- More "real" than pure paper prototyping or mockups.
- Identifies bugs and problems with current design.
- Places user at center of development.
- Can envision challenging to build application.
- Designers learn by playing wizard.

DISADVANTAGES OF WIZARDS

- Can you really "hide behind the curtain" in a non-distracting way?
- Simulations may represent otherwise imperfect (or impossible) tech.
- Wizards require training and can be inconsistent.
- \circ Playing the wizard can be exhausting \otimes
- Some features are difficult (or impossible) to simulate perfectly.
- May be inappropriate in some venues.



PROTOTYPES: QUANTITY VS. QUALITY

• Is it better to produce a large quantity of designs, or to focus on creating the best one design?

QUANTITY VS. QUALITY

• Bayles and Orland put this to the test.





QUANTITY VS. QUALITY

• Well, come grading time and a curious fact emerged: the works of highest quality were all produced by the group being graded for quantity. It seems that 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, Orland]

FUNCTIONAL FIXATION

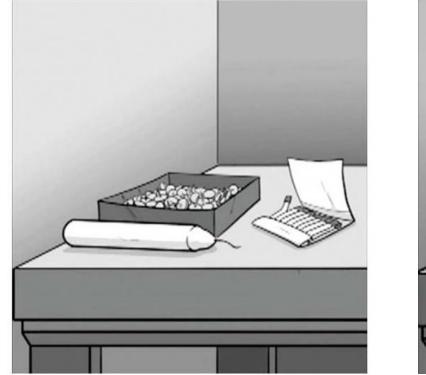
- You make a set of decisions that produce one prototype (or anything)
- You get feedback or (re)evaluate it
- But the improvement you make to this are minimal
 - You stick with the same essential design approach
 - You are reluctant to break the mold and try something very different
- You get an idea and stick with it! (It's human nature! Search for psychological concept of "functional fixedness.")
 - <u>https://en.wikipedia.org/wiki/Functional_fixedness</u>
 - <u>https://www.mendix.com/blog/functional-fixation-and-the-power-of-parallel-prototyping/</u>

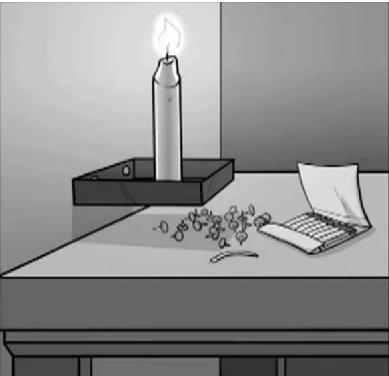
FUNCTIONAL FIXATION



[Duncker, 1945]

FUNCTIONAL FIXATION





[Duncker, 1945]

BETTER APPROACH?

• Parallel Prototyping:

- Making multiple prototypes in parallel
- Studies show that this leads to better designs!
 - i.e., designs led to statistically higher values in quantifiable variables of interest (more on this later).
 - *Klemmer, Gentner, Loewenstein, Thomson, etc.

• Seperates Ego from Artifact

- i.e., a criticism of one design is NOT a criticism towards the designer.
- Supports TRANSFER of positive attributes across designs.

OK FINE...SO HOW DO WE COMPARE PROTOTYPES?

- We perform an evaluation!
- An *evaluation* is an experiment (or set of experiments) meant to provide answers to at least one design question.

• The next topic!

o <u>https://www.youtube.com/watch?v=kCSzjExvbTQ</u>

QUESTIONS?