Design Prototyping
& An Exercise in Design Creativity

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Prototyping can be used:

- In good iterative design practices
  - To refine designs with formative evaluations
- In good participatory design
  - Allows for collaboration in interim stages
- To keep the scope of your class projects reasonable

What to prototype

- We'll first discuss prototyping computer applications
  - Applications, databases, web sites, etc.
- Then devices

Types of design prototyping

- High-fidelity prototyping
- Sketches
- Paper prototyping
- Storyboarding
- Web-based prototyping
- Software prototyping
- Video prototyping
- Wizard of Oz

High-fidelity prototyping

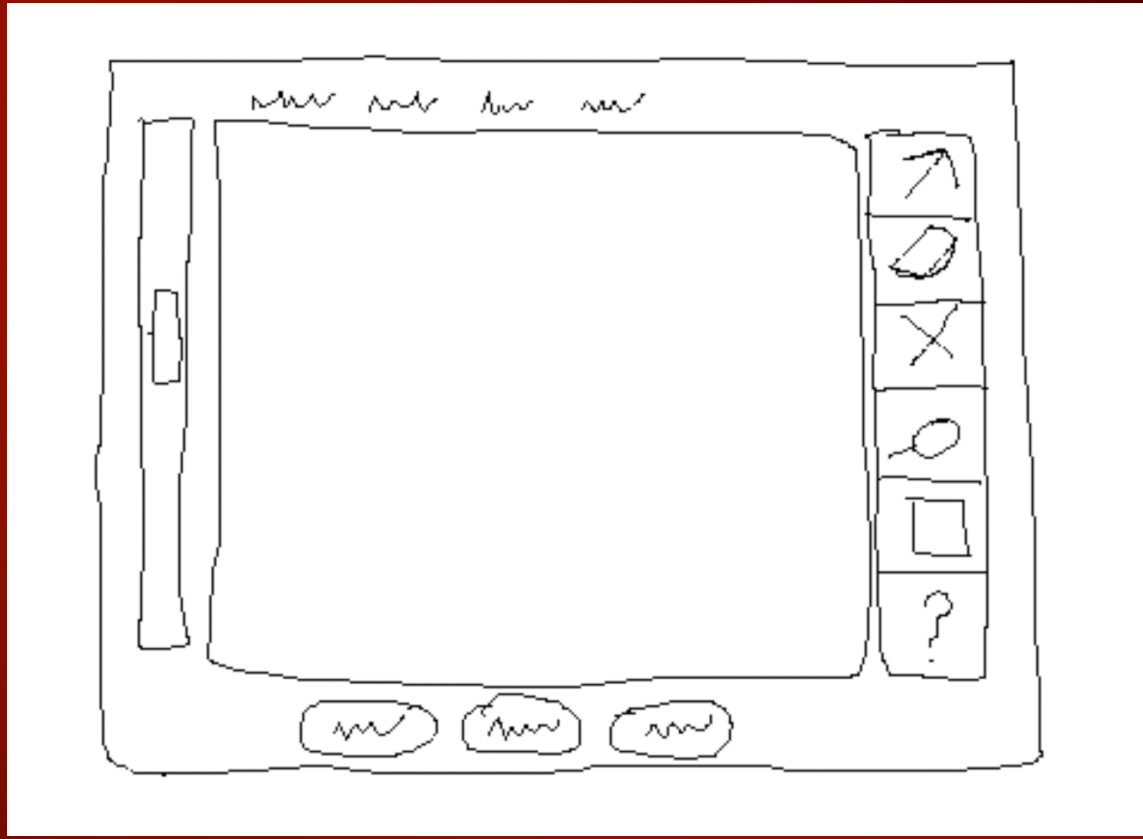
- Provides (near) complete functionality to the target system
- Fully interactive (like the target system)
- Has the look and feel of the target system
- Can be used for quantitative experimentation

High-fidelity prototyping

- Take long to build and change
- Expensive
- Users may refrain from giving feedback, for they see it is already locked in stone
- Users tend to comment on surface issues, not core functionality
- Developers resist changes
- Prototype can set expectations that are hard to change
- A single bug in a hi-fi system can thwart the whole test

Initial sketches

Low fidelity prototyping



http://www.cs.cmu.edu/~landay/research/publications/SILK_CHI/jal1bdy.html

Paper prototyping

- Mock up the interface with a series of paper elements
- Evaluator manipulates the elements to model the interface
- User simulates interaction by pointing and/or speaking
- The prototype provides detail into the function and flow of the system, but is not true to the look and feel of the final system.

- Source: http://www.usabilitybok.org/methods/p312

Paper prototyping tools

- Big heavy paper (bigger than 8.5x11)
- Lots of 5x8 inch cards
- Adhesives (tape, post-it glue)
- Markers, pens, pencils
- Sticky note pads of various sizes
- Acetate sheets
- Scissors, exacto-knives
- Excellent *how to:* Prototyping for tiny fingers: http://portal.acm.org/citation.cfm?id=175276.175288

Storyboard

- Storyboard depicts a series of illustrations representing
  - A process
  - Flow through a web site
  - Function of an application
- Can be used to check if the steps of an application make sense to the user.

Web-based prototyping

- Use HTML to mock-up the interface of an application without implementing the functionality behind it.
- Use web-based form elements
  - Text input boxes
  - Check boxes
  - Radio buttons

Software prototyping

- Develop a demo of an application
- Some semblance of a user interface.
- Perhaps little or no functionality

- E.g. in Flash

Video prototyping

- Develop a (paper, web-based, software) prototype
- Videotape a user interacting with hit
- Videotape can be edited to simulate functionality
- Show it to target end users to get feedback

Wizard of Oz

- Mock up a web-based or software interface

- User interacts with the system, as if it was fully functioning
- Hidden developer (*wizard*) processes inputs and responds with simulated outputs.
- Especially suited for intelligent interfaces
  - (e.g. tutors, natural language interfaces)

Devices, sensors, robots

- Devices, sensors, and robots can be similarly prototyped.
- Using easy to use materials, such as
  - LEGO
  - aluminum,
  - and off-the-shelf parts
- Demonstrate ideas
  - with human control
  - with remote control
- Rapid Prototyping of Small Robots
  - http://www.cs.cmu.edu/~illah/PAPERS/pprk.pdf

Logistical Considerations

- Time and cost to get to a prototype
- Fidelity to key functionalities
- Is it suitable to do a formative evaluation with?
- What are the infrastructure requirements? For example, what are the power needs? Communication constraints? Etc.
- Content creation and language needs
- Cultural appropriateness
- Distribution and maintenance

Ethical and Legal Considerations

- Users outside the design team may be required to sign a consent form before participating in a prototype evaluation session.
- IRB approval may be required
- Check with faculty first to be sure
- Design user studies that benefit the users in the study in some way
- Be careful with using control groups

Some Brainstorming hints

- Everyone contribute.
- If you can't think of something useful to say, say something ridiculous
- Don't critique, build upon.
- Change agent focus (what if you were the trafficked, the trafficker, the family, the John)

SCAMPER

(A brainstorming generator list)

- Substitute
- Combine
- Adapt
- Minimize/Magnify
- Put to other uses
- Eliminate/Elaborate
- Reverse/Rearrange

An exercise in design creativity

Instructions:

- Break up into groups
- Spend 20 minutes brainstorming about creative technology solutions for the scenario below.
- Keep in mind that the goal of this assignment is not to think through complete solutions; the goal is to motivate initial brainstorming that encourages creativity in technology solutions within identified constraints and requirements.
- Your solutions can involve any current technology or likely innovations in the next 10 years (you will need to justify this somewhat)
- After further investigation, you may discover that some of your ideas are not suitable or feasible – that is ok; your goal in this exercise is to be as creative as possible while taking into account any immediately obvious restrictions

Scenario:

From Himalayan villages to Eastern European cities, people - especially women and girls - are attracted by the prospect of a well-paid job as a domestic servant, waitress or factory worker. Traffickers recruit victims through fake advertisements, mail-order bride catalogues and casual acquaintances. Upon arrival at their destination, victims are placed in conditions controlled by traffickers while they are exploited to earn illicit revenues. Many are physically confined, their travel or identity documents are taken away and they or their families are threatened if they do not cooperate. Women and girls forced to work as prostitutes are blackmailed by the threat that traffickers will tell their families. Trafficked children are dependent on their traffickers for food, shelter and other basic necessities. Traffickers also play on victims' fears that authorities in a strange country will prosecute or deport them if they ask for help. The Global Program against Trafficking in Human Beings (GPAT) is looking for assistance in alleviating this situation. How can technology help?

Basis for scenario:

http://www.unodc.org/unodc/trafficking_human_beings.html