MOBILE COMPUTING

CSE 40814/60814
Spring 2021

Today: Mobile App Development

• Sketches, wireframes, prototypes
Specifications

- **List of requirements that project/product must meet**
- Specifications do NOT state how to build it
- Written document:
  - “formal document used to describe a product's intended capabilities, appearance, and interactions with users in detail for software developers”
  - Do not specify components; focus on WHAT, not the HOW!
  - Written in third person
  - State purpose of project clearly
    - Why are you building it?
    - What will the finished device/app do?
  - Be specific (often tables or drawings)

Specifications

- **Examples (Hardware):**
  - Battery life: 6 months continuous use
  - Solar powered; charge time < 6 hours for full charge under cloudy conditions
  - Display:
    - Illumination: visible in strong sunlight
    - Size: min. 4” height and 6” width
    - Resolution: min 800x600 pixels
  - Communication range: 200 feet
  - Weight: max. 15lbs
  - Ruggedness: waterproof to 20 feet; survive 10 feet drop
  - Temperature range: -40 to 120 F
  - Memory capacity: 512MB RAM min.
  - Bootup time: max. 5 seconds
Specifications

• Examples (Software):
  • User registration, login, password recovery
  • Display items by price, reviews, popularity
  • Display users on map
  • Make purchases using Visa, MC, Paypal, Square, …
  • Peak performance: serve up to 10,000 requests per second
  • Storage for 10 million users and 1GB per user
  • Availability of 99.9%
  • Latency < 500ms
  • Notify user of price changes via text or email

Specifications

• Examples (Mobile App):
  • Screens/views
    • Visual materials, navigation, “look & feel”, portrait/landscape
  • Usability features
    • Swipe, motion, speech, …
  • Social media integration
  • Server integration
  • Offline work
  • In-app purchase
  • Geo-location services
  • Push notifications
Sketches vs. Wireframes vs. Prototypes

- Sketches are about **exploring** ideas
- Wireframes are about **refining** ideas
  - Low-fidelity representation of design
  - "Mid- to high-fidelity representation of final user interface": prototype
- Mock-ups & Prototypes are about **testing** ideas
  - Mid- to high-fidelity representation of final user interface

Process

- Sketch: brainstorm design & user experience
- Wireframe: basic visual guide
- Mock-up & Prototype: preliminary model (sometimes partially/fully functional)

Process of designing your first app
Sketches vs. Wireframes vs. Prototypes

Process
- Sketch: explore ideas, brainstorm
- Wireframe: basic visual guide, structure/flow
- Prototype: refined structure/flow plus details

- No clear boundaries!!
Sketch vs. Prototype/Wireframe

“Sketching User Experiences” by Bill Buxton

<table>
<thead>
<tr>
<th>Sketch</th>
<th>Prototype/Wireframe</th>
</tr>
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<tbody>
<tr>
<td>Invite</td>
<td>Attend</td>
</tr>
<tr>
<td>Suggest</td>
<td>Describe</td>
</tr>
<tr>
<td>Explore</td>
<td>Refine</td>
</tr>
<tr>
<td>Question</td>
<td>Answer</td>
</tr>
<tr>
<td>Propose</td>
<td>Test</td>
</tr>
<tr>
<td>Provoke</td>
<td>Resolve</td>
</tr>
<tr>
<td>Tentative, non committal</td>
<td>Specific Depiction</td>
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</tbody>
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*The primary differences are in the intent*

Prototype vs. System Development

- In engineering, prototyping *is* system development: building the first example of a system by hand
- In user interface design, the effort on the *functionality* of the system is minimized for the prototype
  - Focus on the "visible" parts of the system
  - Still a range, in terms of *fidelity* and *level of activity*, in relation to the final product
What is a prototype?

In designing interactive systems, it can be:

- a series of screen designs (e.g., from Photoshop)
- a storyboard, i.e., a cartoon-like series of scenes
- a PowerPoint slide show or HTML pages
- a video simulating the use of a system
- a lump of wood
- a cardboard mock-up
- a piece of software with limited functionality written in the target language or in another language

Why prototype?

- **Evaluation and feedback** are central to interaction design
- Users can **see, hold, interact with a prototype** more easily than a document or a drawing
- You can **test out ideas for yourself**
- It **encourages reflection**: important aspect of design
- Prototypes **answer questions**, and support designers in **choosing between alternatives**
Low-Fidelity Prototyping (Lo-Fi)

- Wireframing

- Very far from the final product, e.g., paper, cardboard

- Examples: sketches of screens, task sequences, etc.
  - Post-it notes
  - Storyboards
  - Scenarios

High-Fidelity Prototyping (Hi-Fi)

- Prototype looks more like the final system than a low-fidelity version

- Common hi-fi prototyping tools:
  - Macromedia Director, Flash, Visual Basic
## Lo-Fi vs. Hi-Fi

<table>
<thead>
<tr>
<th></th>
<th>Lo – Fi</th>
<th>Hi – Fi</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advantages</strong></td>
<td>• Fast</td>
<td>• Better sense of finished product</td>
</tr>
<tr>
<td></td>
<td>• Cheap</td>
<td>• Can judge aesthetic appeal</td>
</tr>
<tr>
<td></td>
<td>• Easy – kindergarten skills!</td>
<td>• More realistic experience</td>
</tr>
<tr>
<td></td>
<td>• Can simulate actual product</td>
<td>• Can evaluate experience</td>
</tr>
<tr>
<td></td>
<td>• Can simulate actual product</td>
<td></td>
</tr>
<tr>
<td><strong>Disadvantages</strong></td>
<td>• Slow response time</td>
<td>• Users may focus on unnecessary details</td>
</tr>
<tr>
<td></td>
<td>• Can’t get feedback about aesthetics</td>
<td>• Takes a lot of time to make</td>
</tr>
<tr>
<td></td>
<td>• User may question design quality</td>
<td>• Users may lose track of big picture</td>
</tr>
</tbody>
</table>

Great for “big picture” | Great for feel of final product & details

## Horizontal vs. Vertical

- **How much to represent?**
  - “Deep” or “vertical” prototyping
    - provide a lot of detail for only a few functions
  - “Broad” or “horizontal” prototyping
    - provide a wide range of functions, but with little detail
Horizontal vs. Vertical

Mobile apps:
- Horizontal: views/screens & flow between them
- Vertical: details of each view

Prototyping Recommendations

- Start early
- Careful with evolutionary prototypes
  - Temptation is too great to stick with bad ideas
- Start with idealistic (rather than realistic) prototypes
- Level of polish should reflect maturity of the prototype
Paper Prototyping

- Easy and fast to do
- Helps you think of specifics
- Usually good as a first round prototype
- Can still do usability testing, even with paper
- Paper Prototyping video:
  - https://www.youtube.com/watch?v=FS00UIo12Xk

Experience Prototyping

- The key is making the interactions and experience as authentic to the real thing as possible
- Typically a hi-fi experience
- Use **Wizard-of-Oz** (or Oz Paradigm) to save time and avoid complicated/costly implementation
Wizard of Oz

• A method of testing a system that does not exist
  • Simulated listening typewriter (IBM Research 1983)

http://www.youtube.com/watch?v=NZR64EF3OpA&feature=related
Important Note

- Up until the point the wizard is discovered, the thoughts, feelings, and actions of Dorothy and the others were all genuine
- They were genuinely experiencing what it would be like to talk to a powerful and terrible wizard

Wizard of Oz

- Human ‘wizard’ simulates system response
  - interprets user input according to an algorithm
  - controls computer to simulate appropriate output
  - uses real or mock interface
  - wizard sometimes visible, sometimes hidden
    - “pay no attention to the man behind the curtain!”
- Good for:
  - adding simulated and complex vertical functionality
  - testing futuristic ideas
WoZ Example - Sketch-a-Move

Prototypes vs. Wireframes

• Prototypes are usually intended to be shown to the end user
• Wireframes are usually more of a design document to go from design to actual system
  • Usually contain annotations specific to the design team and are not intended for end-user consumption
• Wireframes can be used as a low-fidelity prototype to save time
  • Remove annotations, make it interactive

http://www.youtube.com/watch?v=O-XNwam3LOs
Example of a Wireframe

**Example of a Wireframe**

**Example of a Wireframe**
Practical Prototyping/Wireframing Tools

• PowerPoint Prototyping

• UX-Specific Tools
  • Axure (websites, free for students)
  • Balsamiq (free for 30 days)
  • Mockplus (free, Mockplus Pro $15/month)
  • Moqups (free trial)
  • LucidChart (free trial)
  • Mockingbot (free)
  • Pencil Project (free)
  • Concept.ly (free for up to two projects)
  • Fluid (1 project free)

• Photoshop + HTML/Dreamweaver

• Visual Studio

• OmniGraffle, Gimp

• Xcode, Android Studio

• Hardware Prototyping (Arduino, Phidgets)

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PowerPoint

• Advantages:
  • Almost everyone has it
    • Ubiquitous format
  • Fast and easy to use
  • Can use hyperlinks to simulate interaction

• Disadvantages:
  • Must be used at a computer
    • e.g., difficult to do mobile-based interactions
  • Somewhat limited functionality
  • Cannot be reused for final implementation
Blackboard Wireframing Example

• Fancy Weather App

That’s it for today…

• Next up: Mobile app development basics & concepts