Big questions

• What's the point of prototyping? Should I do it?
  – If so, when in the overall process or "lifecycle" should I?

• Should I make my prototype on paper or digitally?

• How do I know whether my UI is good or bad?
  – What are the ways in which a UI's "quality" can be quantified?
  – What are some examples of software you use that have especially good/bad UIs? What do you think makes them good/bad?
usability: The effectiveness with which users can achieve tasks in a software environment.

- studying and improving usability is part of Human-Computer Interaction (HCI)
- usability and good UI design are closely related
- a bad UI can have unfortunate results...
Achieving usability

• some methods to achieve good usability:
  – user testing / field studies
    • having users use the product and gathering data
  
  – evaluations and reviews by UI experts
  
  – card sorting
    • Show users various UI menus and ask them to group the ones that are similar, to see what UI tasks are seen as being related by users.
  
  – prototyping
    • paper prototyping
    • code prototyping

• Good UI design focuses on the user, not developer or system.
Prototyping

- **prototyping**: Creating a scaled-down or incomplete version of a system to demonstrate or test aspects of it.

- What are some possible benefits of prototyping?
  - aids UI design
  - help discover requirements
  - help discover test cases and provide a basis for testing
  - allows interaction with user and customer to ensure satisfaction
  - team-building
Some prototyping methods

- **UI builders** (Visual Studio, etc.)
  - draw a GUI visually by dragging/dropping UI controls on screen

- **implementation by hand**
  - writing a "rough" version of your code

- **paper prototyping**: a paper version of a UI
  - paper prototype much faster to create than code
  - can change faster than code
  - more visual bandwidth (can see more at once)
  - more conducive to working in teams
  - can be done by non-technical people
Where does it fit in?

• At what point in the software lifecycle should we do (paper) prototyping? When would it be most useful to do it? Why?

• We talk about requirements being about "what" and design being about "how." Which is paper prototyping?

• Paper prototyping
  – helps uncover requirements and also upcoming design issues
  – can do it during or after requirements; before design
  – "what" vs. "how": it shows us "what" is in the UI, but it also shows us details of "how" the user can achieve goals in the UI
P.P. usability session

- user is given tasks to perform using paper prototype
- session can be observed by people or camera
- one developer can "play computer"
How to watch users

• Brief the user first (being a test user is stressful)
  – “I’m testing the system, not testing you”
  – “If you have trouble, it’s the system’s fault”
  – “Feel free to quit at any time”
  – Ethical issues: informed consent

• Ask user to think aloud

• Be quiet!
  – Don’t help, don’t explain, don’t point out mistakes
  – Sit on your hands if it helps
  – Two exceptions: prod user to think aloud (“what are you thinking now?”), and move on to next task when stuck

• Take lots of notes
Schneiderman's 8 Golden Rules

- Strive for consistency.
- Give shortcuts to the user.
- Offer informative feedback.
- Make each interaction with the user yield a result.
- Offer simple error handling.
- Permit easy undo of actions.
- Let the user be in control.
- Reduce short-term memory load on the user.

(from Designing the User Interface, by Ben Schneiderman of UMD, HCI/UI expert)
UI design examples

// CSE 143, Winter 2010, Marty Stepp
// An ArrayIntList object stores an object of type IntList
// an unfilled array.
// This is an unfinished "in-progress"
// We will work on it more in Tuesday'

public class ArrayIntList {
    private int[] elementData; // storage
    private int size; // number
}
Apple Mac user interfaces
UI Hall of Shame

Layout and color
Bad error messages
When should we use:
- A button?
- A check box?
- A radio button?
- A text field?
- A list?
- A combo box?
- A menu?
- A dialog box?
- Other..?
UI design - buttons, menus

- Use **buttons** for single independent actions that are relevant to the current screen.
  - Try to use button text with verb phrases such as "Save" or "Cancel", not generic: "OK", "Yes", "No"
  - use **Mnemonics** or **Accelerators** (Ctrl-S)
  - tool tips are helpful, but don't rely on them (many users don't know to hover to find them)

- Use **toolbars** for common actions.

- Use **menus** for infrequent actions applicable to many screens.
  - *Users don't like menus!* Try not to rely too much on menus. Provide another way to access the same functionality (toolbar, hotkey, etc)
Checkboxes, radio buttons

- Use **check boxes** for independent on/off switches (boolean)
- Use **radio buttons** for a small number of related choices, when only one can be activated at a time (enum / constants)
Lists, combo boxes, etc.

- use **text fields** (usually with a label) when the user may type in anything they want
  - you will usually have to **validate** the input

- use **lists** when there are many fixed choices (too many for radio buttons to be practical) and you want *all* choices visible at once

- use **combo boxes** when there are many fixed choices, but you don't want to take up screen space by showing them all at once

- use a **slider** or **spinner** for a numeric value with fixed range
• Did the designer of this UI choose the right components?
  – assume there are 30 collections and 3 ways to search (by title, author, relevancy)
UI design - multiple screens

- you can use a **tabbed pane** when there are many screens that the user may want to switch between at any moment
  - or multiple pages, if it's a web site

- use **dialog boxes** or **option panes** to present temporary screens or options
  - users *hate* popup dialogs; use them very rarely
  - don't prompt for lots of user input by popping up dialogs
    - instead, put the choices on the existing window as buttons, etc.
"Wizards"

- **wizard**: series of dialog boxes to progress through a task

- In the mid-1990s, Microsoft changed most of its Windows apps to use "wizards" for installation and settings.
  - Why did they do this?
  - What are the pros and cons of a "wizard" UI?
Creating a paper prototype

• gather materials
  – paper, pencils/pens
  – tape, scissors
  – highlighters, transparencies

• identify the screens in your UI
  – consider use cases, inputs and outputs to user

• think about how to get from one screen to next
  – this will help choose between tabs, dialogs, etc.
Application backgrounds

- draw the app background (the parts that matter for the prototyping) on its own, then lay the various subscreens on top
Representing a changing UI

- layers of UI can be placed on top of background as user clicks various options
## Representing interactive widgets

<table>
<thead>
<tr>
<th>widget</th>
<th>how to simulate it</th>
</tr>
</thead>
<tbody>
<tr>
<td>buttons or check boxes</td>
<td>tape</td>
</tr>
<tr>
<td>tabs and dialog boxes</td>
<td>index cards or small papers</td>
</tr>
<tr>
<td>text fields</td>
<td>removable tape</td>
</tr>
<tr>
<td>combo boxes</td>
<td>put the expanded choices on a separate paper / Post-It</td>
</tr>
<tr>
<td>selections</td>
<td>highlighted piece of tape</td>
</tr>
<tr>
<td>a disabled widget</td>
<td>cut out a separate gray version that can be placed on top of the normal one</td>
</tr>
</tbody>
</table>
Example paper prot. screen
Example paper prototype
Let's draw a prototype for a music player (e.g. iTunes).

- Assume that the program lets you store, organize, and play songs and music videos.
- Draw the main player UI and whatever widgets are required to do a search for a song or video.
- After the prototypes are done, we'll try walking through each UI.

Things to think about:

- How many clicks are needed? What controls to use?
- Could your parents figure it out without guidance?