University of Regina

CS 455/855
Mobile Computing

The User Experience & Design

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Readings

- iOS Human Interface Guidelines
  - UI Design Basics
  - Design Strategies
  - UI Elements
  - Icon and Image Design
  - (other topics as necessary for your projects)

The Importance of the Interface

- The user interface is an especially important aspect of software development for mobile devices
  - how people use mobile devices is different than how they use their regular computers
    - short usage sessions
    - use the device while they are "on the go"
    - use the device while performing other tasks
  - even if we create the best application anyone has ever thought of, if the interface is difficult to learn or use, people will not be able to appreciate how great the rest of the application is

- As such, we should not think of the user interface as something that we tack on at the end, but instead as an integral part of the application we are developing

Platform Differences

- There are a number of very important differences between the desktop computing platforms we are familiar with and those supported by mobile devices:
  - compact screen size
    - focus on the essential information the user needs to see
  - limited memory
    - ensure that you do not allocate more memory than is required for a task
  - one screen at a time
    - interacting with multiple views is done serially (not in parallel)
  - one application at a time
    - suspend and re-activate times must be as short as possible to give the user the sense of smooth switching between applications
  - minimal tolerance for instructions/documentation/help
    - ensure the users can “walk up and use” your application

Application Styles

- We can define a number of different application styles, based on an understanding of:
  - the visual and behavioural characteristics of the application
  - the data model
  - the desired user experience

- The three primary types of application styles for mobile devices are:
  - productivity applications
  - utility applications
  - immersive applications

Productivity Applications

- A productivity application supports tasks that are based on the organization and manipulation of detailed information
  - e.g., email clients, list applications, photo browsers, etc.
  - users will appreciate a streamlined interface that does not hinder them
  - our applications should provide just enough functionality to complete the task; no more, no less
- The user experience should be focused directly on the task at hand
- Allow the user to quickly find what is needed, perform the necessary actions, complete the task, and then move on to something else

Productivity Applications

Utility Applications

- A utility application performs a simple task that requires minimal user input
  - e.g., weather applications, currency converters, bus schedules, etc.
  - show a quick summary of information
  - allow the user to perform a simple task on a small number of objects

- The user experience should be focused on allowing the user to quickly glance at the application and find the information they need
  - make the interface visually attractive, but in a way that enhances the information being displayed without overshadowing it
  - information visualization methods can be very useful

Utility Applications

Immersive Applications

- An immersive application provides a full-screen, visually rich environment that is focused on the content and the user's experience with that content
  - e.g., games, media applications, applications that mimic real-world devices/tools
  - the user's focus is on the visual content and the experience, not on the data within the application
- The device's core interface is hidden by the immersive interface, strengthening the user's sense of entering the world of the application
- Interaction controls might be embedded in the interface, or based on physical movement of the device

Immersive Applications

Choosing an Application Style

- When choosing which style to use for your application, you should consider:
  - what is the user's motivation for using the application?
  - what is your intention for the user's experience while using the application?
  - what is the goal/focus of your application?
  - how is the information the users care about organized?

- You aren't restricted to a single application style; your application may be best served as a hybrid of two or more of these styles

Principles of HCI

- There are a number of important principles of HCI that are well-suited to mobile devices
  - metaphors
    - model your applications objects and actions on real-world objects and actions
    - allows novice users to quickly grasp how to use your application
  - direct manipulation
    - allow the users to directly control the objects that are on the display
    - supports the users in feeling that they are controlling something tangible
    - users will more readily understand the results of their actions when they can directly manipulate the objects involved

Principles of HCI (2)

- see and point
  - provide lists of options that a user can select from, rather than requiring them to enter textual commands
  - supports recognition, rather than recall
- feedback
  - respond to every user action with a visible or physical change
  - provide instant feedback for actions, or status reports for when the feedback cannot be instant
  - animation is a powerful method for providing feedback; you must ensure that it is subtle and meaningful, and that it enhances the user experience

Principles of HCI (3)

- user control
  - allow the users, not your application, to initiate and control actions
  - keep actions simple and straightforward so that users can easily understand them and remember them
  - support undo and cancel operations
- aesthetics
  - pay attention to how the application looks and how the information is organized
  - an application that is cluttered or illogical will be hard to understand and use

Producing a Positive User Experience

- There are a number of characteristics that will result in a positive user experience:
  - simplicity and ease of use
  - focus on the primary task
  - communicate effectively
  - support gestures appropriately
  - quick start and exit

- The ultimate goal is for the interface to become invisible, allowing the user to focus exclusively on the task at hand (rather than on how to operate the interface)

Simplicity and Ease of Use

- Simplicity and ease of use are fundamental principles for all user interfaces
- It is especially important for mobile device interfaces, where the user may not be able to give their full attention to your application
- guidelines:
  - make it obvious how to use your application
  - concentrate frequently-used, high-level information near the top of the screen
  - minimize text input
  - express essential information succinctly, and in the terminology that is familiar to the user
  - provide fingertip size target areas for all tapable elements
  - consider how the mechanics of the thumb when placing tapable elements on the interface

Focus on the Primary Task

- The first step in designing an application that focuses on the primary task of the user is to fully understand the tasks the users need to perform
- In each context of use, you should ask yourself:
  - what is the user trying to do?
  - what functionality does the user need right now?
  - what is the critical information that will allow the user to fulfill their task?
- Be careful not to build an application that tries to do too much at the same time
  - if you want to make a general application that fulfills many roles, give the users the option to customize it to hide the things they don't want

Communicate Effectively

- Communication and feedback are essential in giving the user a sense of control, and in supporting the user's awareness of the outcomes of their actions
- Users need to know whether their requests are being processed and when their actions might result in data loss or other problems

- Animation, when used well, can be a very powerful tool in communicating with the user
  - subtle and appropriate animation can communication status, provide useful feedback, and help users visualize the results of their actions

Support Gestures Appropriately

- One of the great advances in mobile devices in recent years is their ability to support direct-manipulation gestures via a touch-screen
  - our fingers are always available, are capable of many different movements, and give us a sense of immediacy and connection with the device
- We should use the three easiest gestures (tap, swipe, and drag) as the primary interaction technique
- The more complicated gestures (flick, pinch, double-tap, touch-and-hold, etc.) should be used minimally
- Be careful to not overload the default action of these standard gestures
- Only define new gestures when absolutely necessary

Quick Start and Exit

- It is important for your application to be able to start, suspend, re-activate, and end quickly
- In addition, whenever possible (and useful), you should save the application state on exit, and load it on start

- When starting the application
  - display a launch image that closely resembles the first screen of the application (this will decrease the perceived launch time)
  - load only as much data into memory as is necessary to begin operations

Quick Start and Exit

- Our applications need to be prepared to receive an exit or terminate notification at any time
- When this occurs, we need to be able to exit as quickly as possible

- As such, we should:
  - save user data as soon as possible, and as often as is reasonable
  - save the current state on exit, and at the finest detail possible

- Other tips
  - never quit your application programmatically (it will look like a crash)
  - if your application cannot operate due to external influences (e.g., no network connection), display a useful and meaningful message

Self-Exercise: Inspection of a Mobile App

- The Weather Network App
  - application style?
  - HCI principles:
    - metaphors
    - direct manipulation
    - see and point
    - feedback
    - user control
    - aesthetics
  - characteristics:
    - simplicity and ease of use
    - focus on the primary task
    - communicate effectively
    - support gestures appropriately
    - quick start and exit

Application Design

- Like any other software development activity, it is important to think about the design of the software prior to doing any coding
- In a perfect world, the requirements will be well-specified in advance, and the design flows logically from these requirements
- For small applications with short development timelines, it is common for the requirements analysis and design to be performed together
  - we can think of this as "discount software engineering"
    - benefit: we can reduce the overhead of the project
    - drawback: we may end up discarding some design work as the requirements are refined

Interface and Interaction Constraints

- With every software development project, there will be a set of constraints under which our application must work
- For mobile device software development, many of these constraints are imposed by the limitations and features of the device
  - Display size
    - many different devices with different display sizes and resolutions
      - big: iPad, iPad Pro
      - middle: iPad mini, iPhone 8 Plus, iPhone Xs Max
      - smaller: iPhone Xs, iPhone 8, iPod Touch
      - small: iPhone SE, older iPod Touches
  - Interaction methods
    - difficult to type or precisely control a cursor
    - other interaction mechanisms must be employed
      - single-touch, multi-touch, gestures
      - motion sensing
      - GPS
      - camera, video

Interface/Interaction Design

- In order to simplify the way we think about the design of a mobile device application, we can focus on two related but separate activities:
  - interface design
    - information-centric
    - what information is available?
    - what do the users need to see?
    - how can we organize the information in a way that will allow the user to efficiently and effectively complete the primary task?
  - interaction design
    - action-centric
    - what does the user need to do?
    - what can the user do?
    - how can we allow the user to interact with the device to fulfill some goal

Our Design Tools

- When designing the interface and the interaction of a system, there are two tools that we can use:
  - sketching
  - storyboarding

- We should think about these tools not as a way of documenting our final design solution, but instead as a way of **creating** our design solution
  - we should be willing to discard and re-create any sketches or storyboards that we feel are not working as expected
  - it will be much easier to discard a sketch than re-build a poorly planned application

Sketching

- Sketching is an important part of any design process
- This holds for all design-oriented disciplines
  - HCI
  - InfoVis
  - Engineering
  - Software Development
- The “sketch” may take on very different formats depending on the domain
- The purpose of the sketch remains constant:
  - thinking and reasoning about potential designs
  - shaping new ideas

Sketching

- When designing an interface, the sketching process can be thought of as a **prototyping** method

- The goal of the prototype is to externalize and test our design decisions regarding:
  - organization of the information
  - presentation of the information
  - navigational cues
  - task support

- We should be considering whether the user will be able to understand what they are seeing

Storyboarding

- For highly interactive interfaces (as is the case with many mobile device software projects), it is often beneficial to develop a set of connected sketches that tell a story of use:
  - multiple sketches
  - linked by user actions
  - enough description to explain a scenario of use

- As with sketching, developing a storyboard allows us to reason about whether we can reasonably expect the user to be able to do what is needed to complete some activity with the interface

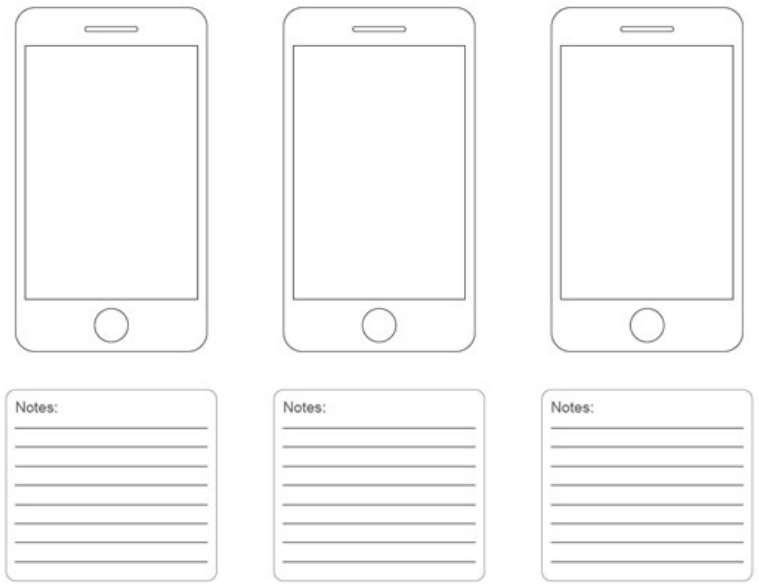
Caution: Sketch by Hand!

- Many people are scared of sketching because they can't draw
  - sketches aren't about creating a complete or final interface design
  - they are a tool to help you to make design decisions
  - they are supposed to be refined and re-drawn

- You may be tempted to create your sketch on the computer directly – DON'T DO THIS!
  - as soon as you spend the time making it on the computer, you get invested in the design and resistant to changing it (because it takes work)

Use Stencils to Help

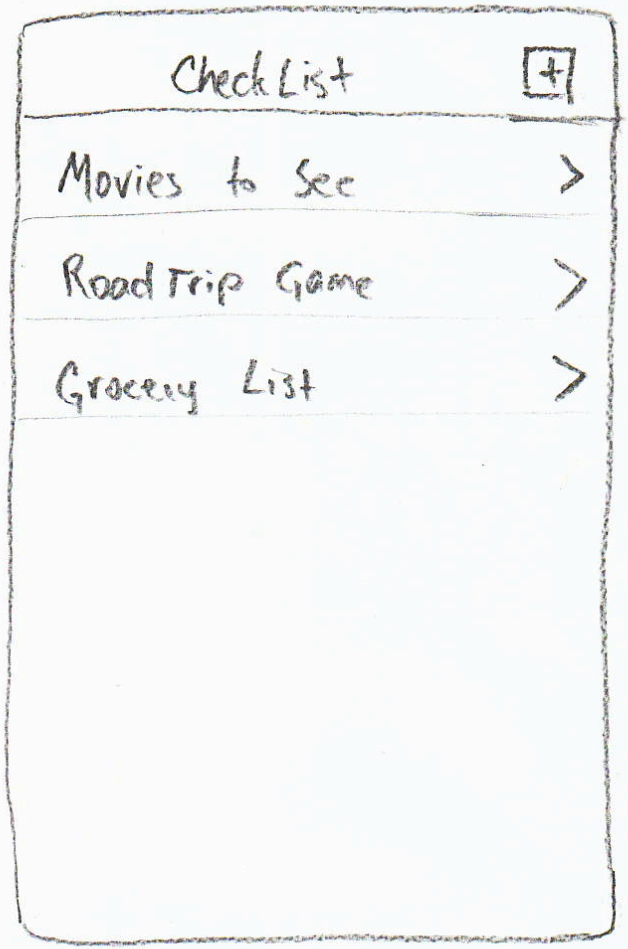
- www.uistencils.com
- search the Internet for “iPhone sketch template”

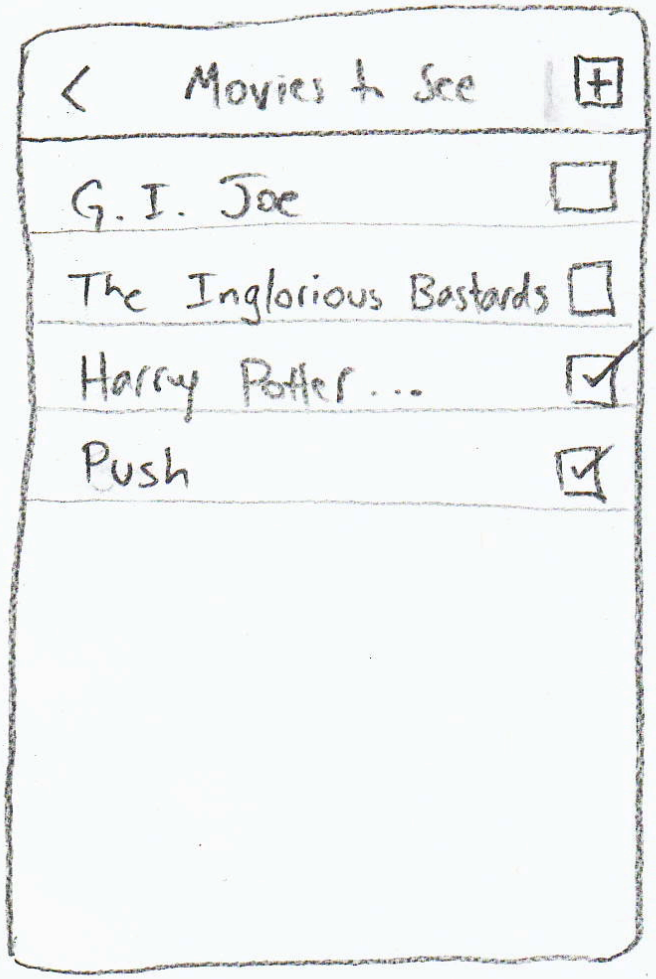


Example: CheckList application

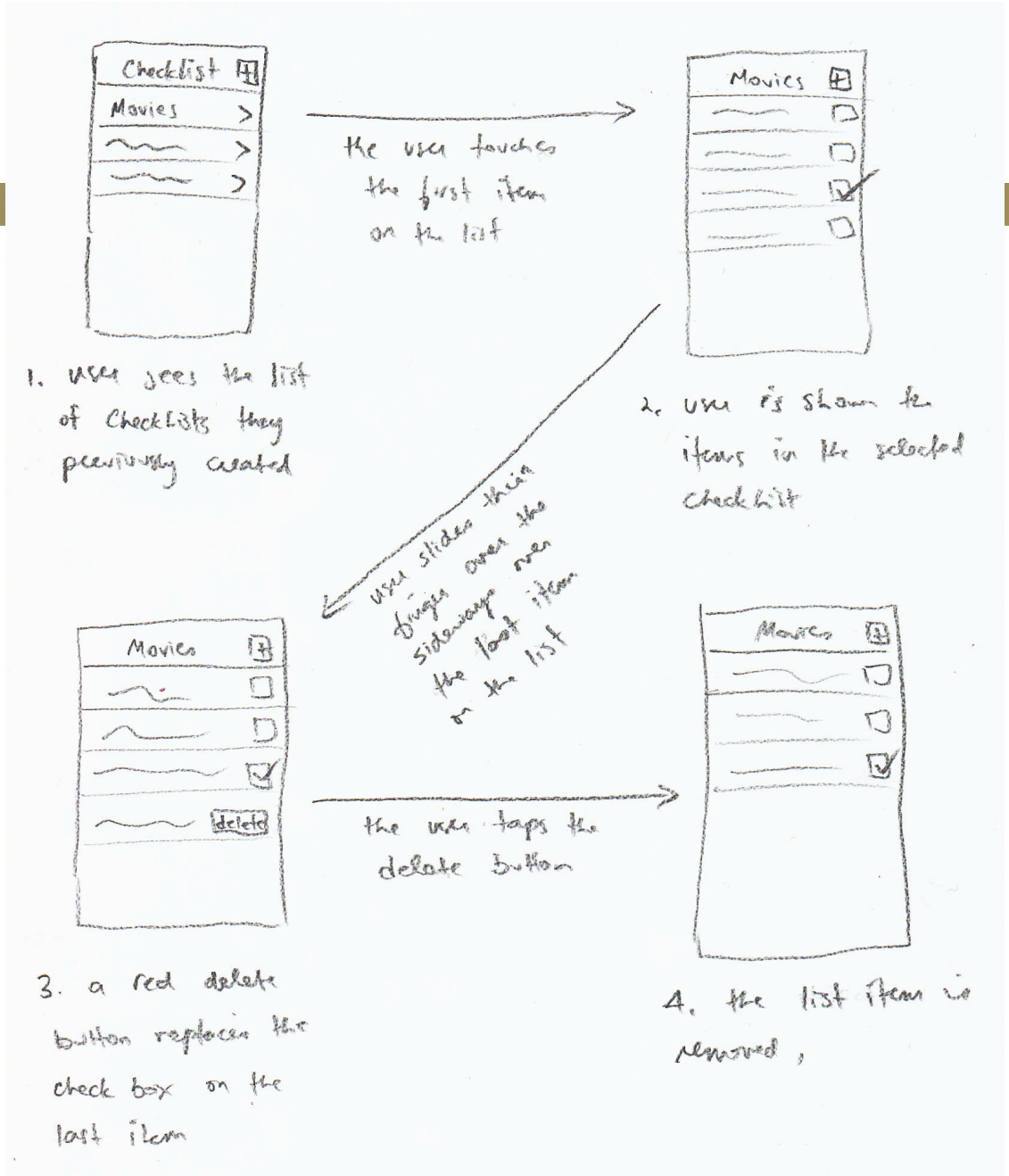
- Goals:
  - Allow people to create lists of items, and then be able to check things off on the list
  - Useful for:
    - grocery lists
    - tasks
    - other list-based activities
- High-level requirements
  - support for multiple lists
    - add new lists
    - switch between lists
  - add/remove/check items

Sketch of CheckList Interface





Storyboard: Item Removal



Summary

- The interface in mobile applications is critically important
- People use their mobile devices differently than their computers
  - acknowledge and embrace this difference
- Different application types
  - productivity, utility, and immersive
- Our designs should be guided by fundamental principles of HCI
- We should also be aware of some characteristics that make for good mobile applications
- Use sketching and storyboarding to design the interfaces and interaction mechanisms

Homework

- Next Class Topic: Touch Programming

- Assignment #1
  - due Friday October 5
- Short Paper # 1 (CS 855)
  - due Friday October 12
- Project Milestone 2: Project Design
  - due Wednesday October 17