Introduction

- Human factors (perceptual, cognitive, ergonomic capabilities) vs. HCI (how humans use those capabilities to interact with systems)
- HCI seeks to:
  - understand the relationship between human users and digital technological artifacts (science)
  - design new, effective ways for humans to use technologies (engineering, art)
- “Computer” in HCI has a very broad definition
- “Effectiveness” in HCI can also mean many things
- UX design as a series of tradeoffs
Overview

- Understanding the user experience (models and theories of HCI)
- Design principles and guidelines
- Engineering the user experience (UX engineering process)

Understanding UX

Human Processor Models
- Model human processor
- Keystroke-level model
- GOMS
- Touch-level model
Understanding UX

User Action Models

- Seven stages of action
- Gulfs of execution and evaluation
- User action framework

Understanding UX

User Action Models

- User-system loop
Understanding UX

Conceptual Models and Affordances

- Designer’s model
  - Correct, complete, systematic
- User’s model
  - Incomplete mental model formed through ad hoc interaction
- Affordances
  - Cognitive
  - Physical
  - Functional
  - Sensory

Activity Theory

- Framework considering interaction within complex real-world contexts
- Principles:
  - Object-orientedness
  - Activities are hierarchical
  - Internalization and externalization
  - Mediation and development
  - Activity system model
Understanding UX

Embodied Interaction
- Interaction with computer systems that occupy our physical and social world and that exploit this fact in how they interact with us
- Tangible computing
- Social computing, CSCW

Design Principles and Guidelines

Goal-Oriented Design Rules
- Simplicity
  - Reduce clutter
  - Provide customizability
- Structure
  - Break complex tasks into simpler subtasks
  - Sequence actions logically
  - Group related or comparable functions
- Visibility
  - Make controls perceivable
  - Employ familiar visual icons and symbols
Design Principles and Guidelines

**Execution-Oriented Design Rules**
- Affordance
  - Leverage familiarity
  - Provide direct manipulation
  - Be consistent
- Ergonomics
  - Clearance
  - Reach
  - Posture
  - Strength

**Error prevention**
- Valid actions
- Confirm irreversible actions
- Offer to complete common outcomes

**Outcome-Oriented Design Rules**
- Automation
  - Avoid requiring tedious input
  - Complete common action sequences automatically
  - Allow completion of similar actions all at once
- Control
  - Avoid too much automation
  - Facilitate both novice and expert use
  - Avoid missing or incorrect functionality
Design Principles and Guidelines

Evaluation-Oriented Design Rules

- Feedback
  - Respond immediately to every user action
  - Provide informative feedback
- Error recovery
  - Provide easy-to-reverse actions
  - Provide undo and redo

General Design Rules

- **Accessibility**: make the UI usable by all intended users
- **Vocabulary**: use the terminology used by the intended users
- **Recognition**: Provide the knowledge required to interact instead of requiring users to recall it
  - Place needed information in the context of use
  - Let users know what their options are
  - Use visual representations when possible
System Goals and Concepts

- Goals:
  - Improving usability
  - Striving for usefulness
  - Emotionally impacting the user

- System concept: concise summary of the goals of an envisioned system or product (i.e., mission statement)
Requirements Analysis

- Contextual inquiry
  - In the field
  - Interviews/observations
- Contextual analysis
  - Model stakeholders
  - Model work activities/tasks
  - Model work environment
  - Represent findings with problem scenarios, personas, and claims
- Requirements extraction
  - Functional requirements
  - Performance requirements
  - Interface requirements

The Design Process

- Design tools
  - Ideation and sketching
  - Critiquing
- Design perspectives
  - Interaction perspective
  - Ecological perspective
  - Emotional perspective
Engineering the User Experience

The Design Process
- Design approaches
  - Activity design
  - Information/interaction design
  - Participatory design
- Design representations
  - Metaphors
  - Design scenarios
  - Storyboards
  - Physical mockups

Prototyping the Design
- Breadth vs. depth
- Prototype fidelity
- Prototype interactivity
  - Animated
  - Scripted
  - Fully programmed
  - Wizard of Oz
Engineering the User Experience

Evaluating Prototypes

- Formative vs. summative
- Rapid vs. rigorous
- Analytic vs. empirical
- See chapter 11 for much more on evaluation

Conclusion

- HCI is a mature and rich interdisciplinary field, offering:
  - Models and theories
  - Design principles and guidelines
  - Systematic design and development processes
- 3D UI design should be built on HCI foundations
Next Class

- Visual Displays
- Readings
  - LaViola – Chapter 4