CSE452 Computer Graphics

Lecture 14: User Interface
Purpose of UI

- A dialogue between the user and the machine
- The key to productivity
  - Provide usable, functional, safe, efficient systems for people
  - Concentrate on user-centered design
  - UI now much more important than features
    - 10% of features used 90% of time
    - In many modern programs, the user interface code constitutes the bulk of program, i.e., 70-80%
At Google

Geeky engineers

First-time computer users

UI designers
We will talk about

- History of computer UI
  - Hardware, and software
- GUI design principles
A Brief History of UI

• 1963: Sketchpad (Ivan Sutherland)
  – First GUI (graphics user interface)
  – Buttons, keys, panning, zooming
A Brief History of UI

• 1968: NLS (Douglas Engelbart)
  – Mouse, tiled windows, video conferencing, email, hypertext
  – “Mother of all demos” (Dec. 9, 1968)
A Brief History of UI

- 1973: Alto (Xerox PARC)
  - The first personal work station
  - Raster display, Ethernet
  - WIMP GUI (window, icon, menu, pointing device)
  - WYSIWYG editor (Bravo, Gypsy)
A Brief History of UI

• 1984: Mac (Apple Computer)
  – Commercial graphics desktop computer
  – Overlapping windows (based on Xerox’s Star system)
A Brief History of UI

- 1985: Windows (Microsoft)
  - A Mac imitation with minor improvements
More recent examples

- Mac OS X Snow Leopard
- Windows 7
- Ubuntu 9.10
Today’s GUI
Variations of GUI

- **WIMP** (windows, icons, menu, pointers)
  - Zooming UI (2.5D)
  - 3D GUI
  - Mobile device UI
- **Web design**
  - HTML, CGI, java, Flash
  - Photoshop, Illustrator
- **Game UI**
  - Supporting UI screens
  - Heads-up display (HUD)
Today’s Input Devices

• 2D Input devices
  – Joysticks
  – Pen-based devices
    • Tablet computers, PalmOS
  – Optical trackers
  – Touch screens
Today’s Input Devices

• 3D Input devices
  – Haptic devices
    • Provides force feedback
Today’s Input Devices

• 3D Input devices
  – Haptic devices
    • Provides force feedback
  – Gloves
    • Position, orientation, joint-angle
Today’s Input Devices

- **3D Input devices**
  - Haptic devices
    - Provides force feedback
  - Gloves
    - Position, orientation, joint-angle
  - Markers for motion tracking
    - Acoustic, inertial, LED, magnetic, reflective
    - Records positions, angles, velocities, accelerations
    - Requires registration for accurate tracking
Today’s Input Devices

• 3D Input devices (low-cost)
  – Wii Remote (Nintendo)
    • Single-point, 3D location
  – Kinect (Microsoft)
    • 3D point cloud
    • Full body skeleton
  – Camera?
Crazy ones in Sci-Fi movies
Real Minority Report UI
Next generation UIs are coming!
Glove-less gesture control
Back to more realistic things…
Slides from Takeo Igarashi
Webpage design
UI design is difficult
Gestalt Laws of Perception

- **Proximity**: We organize nearby objects together. Thus, you should see columns because the dots in columns are closer than the dots in rows.

- **Similarity**: We organize together objects that are similar in shape. Thus, you should see rows instead of columns.

- **Good Continuation**: We organize lines to minimize abrupt changes. Thus, you should see the curved line as one, with a straight diagonal line cutting through it.

- **Closure**: We organize lines to create whole figures when possible. Thus, you should organize this figure as a square in spite of the gap.
Gestalt Laws of Perception
Affordance

- Button -> Push
- Knob -> Turn
- Slot -> Insert
- String -> Pull

Effective use of affordance minimizes explanations.
Natural correspondences (gas stove)
Car seat adjustment
Door handle
Feedback

- Visualize what is happening
Minimize damage

- A very bad design

Channel 1
Channel 2
Channel 3
Channel 4
Delete your settings!
Cultural differences

Japan

USA/Europe

- Red circle
- Blue cross
- Green check
- Red cross
Cultural differences
Confusing colors for some

4.5% of male Japanese
8% of male Caucasian
How to make a better UI?

- Evaluation without tests
  - Follow a certain guideline or a checklist
- User study (tests)
  - Tell that it is the fault of the product not you
  - Tell that you can quit at any time
  - Ask them to think-aloud
  - Tell them we will not help
  - …
Further Readings

• UI design

• Web design

• Conferences