IMGD 4000
Technical Game Development II
Interaction and Immersion

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What is Immersion?

- “Being There”
- Being in *Flow*
- Natural interaction that recedes into the background
- Tapping into personal experience
Being There: Virtual Environment

- Video game
- Immersive learning environment
  - Immersive chemistry
- Surgical simulation
- MMO
Being There: Real Environment

- Hand-held mobile device
  - iPhone/iPad/Android
  - DS/PSP

- In-vehicle system
  - Navigation
  - Traffic

- Augmented Reality (AR)
Being There:
Described Environment

- Books
- Movies
- Phone Sex
Being in Flow

- Introduced by Mihály Csíkszentmihályi
  - Heightened sense of perception
  - Highly focused on primary task
  - In the "sweet spot" between frustration and boredom

- Athletes often report this

- Video gamers too
Flow

- Getting the balance right is the key to success

M. Csikszentmihalyi, "Flow, The Psychology of Optimal Experience"

**FIGURE 2.1.8** A better flow.

Chapter 2.1, Introduction to Game Development
Flow: Sample Game

- **flOw**
- Game written by Jenova Chen
- Research into adaptive difficulty
  - How can we keep people in flow?
  - Player doing poorly, make it easier
  - Player doing well, make it harder

- Play Demo
- [http://www.jenovachchen.com/](http://www.jenovachchen.com/)
Characterizing Flow

- A challenge activity that requires skills
- The merging of action and awareness
- Clear goals
- Direct feedback
- Concentration on the task at hand
- The sense of control
- The loss of self-consciousness
- The transformation of time
Natural Interaction

- Recedes into the background
  - Low cognitive load for interaction techniques
  - Visual (and other) feedback can be easily digested
  - Low cumber
The Role of Personal Experience

- We all filter our senses
- Variations in sight, hearing, etc.
- My childhood versus yours
- My mood
- Can we harness this?
Motivation

- The mouse and keyboard are good for general desktop UI tasks
  - Text entry, selection, drag and drop, scrolling, rubber banding, ...
  - Fixed computing environment
  - 2D mouse for 2D windows

- How can we design effective techniques for 3D?
  - Use a 2D device?
  - Use multiple n-D devices?
  - Use new devices?
  - Use 2D interface widgets?
  - Need new interaction techniques!
Motivation (cont.)

- Gaming and Virtual Reality
  - Tight coupling between *action* and *reaction*
  - Need for precision

- VR can give *real* first-person experiences, not just views
  - Head-mounted Display
    - In order to look behind you, turn your head!
  - Selecting/manipulating an object
    - Reach your hand out and grab it!
  - Travel
    - Just walk (well, not quite)!

- Doing things that have no physical analog is more problematic
Common Input Devices

- Mouse
- Keyboard
- Joystick
- TrackBall
- TrackPoint
- TrackPad
- Tablet
- MightyMouse
- Multi-Touch TrackPad
Game Controllers

Atari 2600 (1977)

Intellivision (1980)

PlayStation2 (2000)

Xbox 360 (2005)

PlayStation3 (2008)
"Natural" Motion Controllers

- Microsoft Kinect (2010?)
- PlayStation Move (2010)
- WiiMote (2007)
- WiiMotionPlus (2009)
Multi-Touch Surfaces

- High resolution
- Co-located interaction

http://www.ted.com/talks/jeff_han_demos_his_breakthrough_touchscreen.html
Prototypes of Controllers

Nintendo “Revolution” Controller (prototype)

Nintendo Wii + Nunchuck (released)
Prototypes of Controllers (cont.)

PlayStation3 Controller (prototype)

PlayStation3 SIXAXIS (released)
Hand-Held Devices

- Becoming interesting!

Apple iPhone 4 (2010)

Apple iPad (2010)

Motorola DROID (2009)

Nintendo DS Lite (2006)

Sony PlayStation Portable (2004)
Classification Schemes

- Relative vs. Absolute movement
- Integrated vs. Separable degrees of freedom
- Digital vs. Analog devices
- Isometric vs. Isotonic devices
- Rate control vs. Position control
- Special-purpose vs. General-purpose devices
- Direct vs. Indirect manipulation
More on Classifications

- Relative vs. Absolute movement
  - Mouse vs. Tablet

- Integrated vs. Separable degrees of freedom
  - Mouse has integrated X, Y control
  - Etch-a-sketch has separate X, Y control
    - Motions that are easy with one are hard with the other

- Analog devices allow more sensitivity
  - For example, analog game controllers
Isometric vs. Isotonic Input Devices (Zhai)

- No motion vs. No resistance
- Actually a continuum of elasticity
  - TrackPoint (mostly isometric) vs. mouse (mostly isotonic)
  - Many devices are re-centering (e.g., joysticks)
Rate Control vs.
Position Control (Zhai)

- Mouse is normally used for position control
- Mouse scroll-wheel
  - Position control
  - Click-drag for rate controlled scrolling
- Trackballs typically use position control
- Joysticks: Control position (cross-hair), or
  Control velocity (aircraft)
- Rate control eliminates need for clutching/ratcheting
- **Isotonic-rate control and isometric-position control tend to produce poor performance** (Zhai)
Special-Purpose vs. General-Purpose Input Devices (Buxton)

- Game controllers are designed to support many types of games
  - Game developer decides on mapping
  - No "standard" mappings -> each game different

- Some special-purpose devices exist
  - Light guns
  - Steering wheels
  - RPG keyboard/joystick
  - Drum kits, dance pads, bongos, etc.
Direct vs. Indirect Manipulation

- **Direct**
  - Clutch and drag an icon with mouse or stylus
  - Touch screens, PDAs use direct manipulation
  - Works well for things that have a physical analog

- **Indirect**
  - Use some widget to indirectly change something

- **Problems with direct manipulation**
  - Some things do not have a physical analog
  - Precision may be lacking
  - Selection/de-selection may be messy
3D Input Devices

- SpaceBall
- SpaceMouse
- CyberGlove II
- Tracked Paddle for 2D Interaction
- PHANTOM Omni Haptic Device
- HMD with 3-DOF tracker
Think about...

Which of these ideas you could apply to your new game!
Embrace alternative controllers

[From Harmonix presentation]
Harmonix hasn’t made a joypad game since 2003

[From Harmonix presentation]
Guitar + Drums + Microphone!

We’ve noticed some big user benefits...

[From Harmonix presentation]
They look like what they do
It’s obvious how to use them

[From Harmonix presentation]
In Contrast... Joypads

- Generic by design
  - So can’t “look like what it does”
  - No mental model for how to use it

[From Harmonix presentation]
Today’s joypads are intimidating

[From Harmonix presentation]
These controllers are inviting

[From Harmonix presentation]
They also “level the playing field”
The design principle:
Ensure intuitive controls
Intuitive Controls

- It just works
- This is our responsibility
- Employ usability principles
Spatial relationship between control and result is consistent

[From Harmonix presentation]
Unnatural Mapping

[From Harmonix presentation]

R.W. Lindeman - WPI Dept. of Computer Science
Interactive Media & Game Development
Dance Pad
Inertial and IR Sensing

- Wiimote
  - finger tracking [video]
  - head tracking [video]
Wii Finger Tracking
Wii Head Tracking

Head Tracking for Desktop Virtual Reality Displays using the Wii Remote

Johnny Chung Lee
Human-Computer Interaction Institute
Carnegie Mellon University
Using Cameras and Computer Vision

- Kinect (for Microsoft XBox 360)
  - RGB camera
  - Infrared depth sensor (IR laser projector + sensor)
  - Microphone array
Augmented Reality

- Eye of Judgement  [video]

- Lab Demos  [2 videos]
Eye of Judgement
Augmented Reality
Virtual Reality

☐ Prof. Lindeman’s TactaVest [video]

part of the “Playstation 6”
Neural and Bio Feedback

- Heart rate and skin conductance
  - Wild Divine IOM [video]

- Neural activity (EEG)
  - EmotivEPOC
    - http://www.emotiv.com
Other Input Control Ideas

- **Speech**
  - cheap, easy to get
  - slow, unreliable (esp. in noisy env.)

- “Embodied Gaming”
  - e.g., robosoccer with Sony Aibos
Input Controls Summary

☐ What can you do with _____ that you couldn’t do before?

☐ What’s more fun with _____ than with previous technologies?

☐ Does _____ enhance game play, rather than replacing traditional controller?

[From Z. Drake, GDC’08]