IMGD 3100 – Novel Interfaces for Interactive Environments:
Introduction

Robert W. Lindeman
Associate Professor
Interactive Media & Game Development
Human Interaction in Virtual Environments (HIVE) Lab
Department of Computer Science
Worcester Polytechnic Institute
gogo@wpi.edu
Motivation

- Some interesting recent developments
  - Mobile computer systems are cheap, powerful, and everywhere
  - Wireless connections are everywhere
    - Cellular, WiFi, Bluetooth, ...
  - Sensors and actuators are cheap
  - Accessible robot systems are emerging
    - Roomba, MANY kits
  - Wild popularity of new games and platforms
    - Rockband, Kinect, Wii/U, iPhone/iPod/iPad, Android
Motivation (cont.)

- I've been working on 3D User Interfaces for Virtual Reality for a looooong time
  - About 20 years

- VR and gaming are very related
  - But games sell!

- Games have gotten a little stale
  - How many more FPSs can you make?

- Graphics are pretty good now!
- Sound is also pretty good!
- So, what's the next big thing?
Questions

□ Why are car navigation systems so popular?

□ Why are smartphones and tablets so popular?

□ What made the Wii different?
  ■ What was different about popular Wii games?

□ What did Sony and Microsoft do to catch up?

□ What can Nintendo do to stay ahead?

□ Where does this innovation come from?!
HCI in Real Environments

- Mobile devices
  - Car Navigation (useful during task)
  - Medical monitoring (people are aging)
  - Foursquare (we love collecting!)
  - Ingress (augmenting reality as a game)

- Multi-person coordination
  - Military operations
  - Search-and-Rescue
  - Fire fighting

- Stuff we don't know about yet!
HCI in Virtual Environments

- Layouts for user interfaces
  - Heads-Up Displays (HUDs)
  - Chat windows
  - Game state

- Spatialized audio/voice

- Haptic (touch) displays
  - Hit by weapons fire
  - Virtual surgery training
  - Steering wheels

- Smell?
- Taste?
- What about input?
HCI in Teleoperated Environments

- Teleoperated robot systems are used more and more
  - Disaster areas
  - Medical micro-robots
  - Space exploration
  - UXVs (UAV, UGV, UUV)

- Operator relies on remote sensors
  - Limited fidelity
  - Communication delays

- Remote actuators change the physical world
Common Problems

☐ All three environments require the user to:

1. Sense something (i.e., get input)
   - Perceive the environment
   - Limited fidelity (screen space, etc.)

2. Make a decision
   - Draw on new and existing knowledge
   - Limited knowledge

3. Carry out actions (i.e., produce output)
   - Make something happen
   - Limited expressiveness (mouse, gamepad, etc.)

☐ Errors can be made at each step

☐ In this course, we will focus on 1 & 3
What to Expect

☐ This course is about
  ■ How to build new interfaces for these environments
  ■ How to design applications (e.g., games) that take advantage of these devices

☐ This is really a **Chicken & Egg** proposition
  ■ Devices constrain the application
  ■ Application constrains the devices
  ■ User constrains both
  ■ Environment constrains both

☐ But, constraints are a good thing!!
What to Expect (cont.)

- The groundwork to do this stuff right requires
  - A good understanding of the human sensory systems
  - A good understanding of building devices
  - A good understanding of application domains

- The projects you do in this course will help you learn all of this
Summary of Syllabus

- Lectures and in-class work
  - Exercises designed to drive home concepts, or to get you thinking about projects

- 1 Application Design Report (33%)
  - Research a potential application (Real/Virtual/Tele)
  - Design (not build) a novel user interface for it

- ~4 "Smaller" Projects (33%)
  - Individual projects
  - Use the Arduino and Android to build stuff

- 1 Final Project (34%)
  - Team-based
  - Use Arduino/Android, plus other software you choose (Unity, Flash, C4, XNA, etc.)

- All material on class website (www.cs.wpi.edu/~gogo/courses/imgd3100/)
Readings for the Course

- There will be material from several eBooks:
  - eBooks can be accessed from any WPI computer
    - Check the course Web page for details.

- And also material from the Web:
  - Arduino/Android communities, Electrical engineering help, Project idea

- Excerpts from:
More About the Projects

- One of the goals of this course is for you to feel confident to build devices
  - Find sensors to measure what you want to measure
  - Find interesting ways of getting input to the system
  - And output to the real world (e.g., the user)
    - Pinwheels for network traffic

- You can find stuff easily these days
  - Sparkfun (www.sparkfun.com)
  - Digikey (www.digikey.com)
  - Jameco (www.jameco.com)
  - Allelectronics (www.allelectronics.com)
  - RadioShack (www.radioshack.com)
Engineering vs. Science

- **Scientific Method**
  - Define a hypothesis, test it, and make laws

- **Engineering Approach**
  - Come up with an idea, build it, refine

- Both of these require solid foundations!
  - You need to do your homework

- Software people are reluctant to mess with hardware
  - Might break something
  - Might burn your fingers
Arduino Development

☑ You should all have Arduino Development Kits for this course from SparkFun.

☑ The kits work in the lab
  ■ And you can work at home too

☑ Cross-platform
  ■ Mac, Linux, Windows

☑ LOTS of help on the Web:
  ■ http://www.arduino.cc/

☑ We’ll be using this Arduino Kit
  ■ https://www.sparkfun.com/products/11930
Android Development

- Google gave us phones!
- The Android development environment is eclipse based
  - Java is main language
  - Emulator for testing
- Eclipse has been configured in the lab
  - And you can work at home too
- Cross-platform
  - Mac, Linux, Windows
- LOTS of help on the Web:
  - http://developer.android.com/
Final Project

- Two- or three-person teams
- Choose an application area
- Define a set of interface devices and techniques that support the app
- Interim status demos in class
- Presentations will be done the last week of this course, where you will show your stuff
- Let’s see some from previous years!
Flipping the Class

- Some of the lectures for this course will be delivered by video+testing
- Classes will be used to dig much deeper
- It will be assumed you have watched the assigned video(s) prior to class
- This is called “Flipping the Classroom”
- More on this real soon (for Tuesday!)
Course Support

- There is a GDC Forum for this course
  - [http://forums.gdc.wpi.edu/](http://forums.gdc.wpi.edu/)
  - All project discussions should be posted there
  - You are encouraged to post screen-shots of your progress

- Contact me if you need to meet for office hours
  - I’ll post some real soon…
Expected Outcomes

- Think beyond the gamepad
  - Alternative I/O to support a particular application

- Feel comfortable building new things

- Know how best to provide output to humans
  - All the senses

- Build up your portfolio
Final Thoughts

☐ I don't know which parts of this course will give you problems
  ■ We need to work together to tweak the content, presentation, etc.

☐ I welcome any and all feedback and suggestions on how to make the course better

☐ We have some flexibility to re-order/change topics

☐ Be playful!

☐ Be ambitious!