3D User Interfaces for Games and Virtual Reality

Lecture #1: Introduction
Spring 2013
Joseph J. LaViola Jr.

Instructor

Professor - **Joseph J. LaViola Jr.**
Email - [jjl@eecs.ucf.edu](mailto:jjl@eecs.ucf.edu)
Office Hours - Tues. 4:00pm - 5:30pm
Wed. 6:00pm - 7:00pm
Office is Harris 321

Website will have all required info
[www.eecs.ucf.edu/courses/cap6121/spr13](http://www.eecs.ucf.edu/courses/cap6121/spr13)
Class Goals

- Provide in-depth introduction to spatial 3D user interfaces
- Focus on 3D games
- Speaking and presentation skills
- Start of master's projects and PhD dissertations
- Possible publications
  - Virtual Reality 2014
  - 3D User Interfaces 2014
  - Foundations of Digital Games 2014
  - SIGGRAPH Asia 2013

Required Books

- 3D User Interfaces: Theory and Practice
- Unity 3D Game Development by Example: A seat-of-your-pants manual for building ten, groovy little games today

Grading

Assignment 1 (group) 15%
Assignment 2 (group) 15%
Survey Paper (individual) 15%
Paper presentation (individual) 5%
Final Project (group) 50%

Final Projects

- 2-3 person teams
- Must have research component
  - related to games
  - innovative 3D UI
- Everyone must write and get approved a project proposal
- DEMO DAY!!!! – April 25, 2013
Class Structure (see syllabus for details)

- Lectures
  - Fundamentals of 3D user interfaces
    - hardware
    - common interaction tasks
    - user evaluation
- Student paper presentation
  - 20 minute presentation
- Final project update sessions
- Work done in ISUE Lab – Harris 208 (laptops also)
  - code access required

Spring 2013

Course Topics

- Unity 3D
- 3D Hardware
  - perception
  - input and output devices
- Common 3D Interaction Tasks
  - travel (e.g., navigation and wayfinding)
  - selection and manipulation
  - system control
- 3D UI Design
- 3D UI Evaluation
- 3D UI and Augmented/Mixed Reality
Collaboration and Late Policy

- Collaboration encouraged
  - do your own work on assignments
  - cheating = BAD!!
- All assignments must be handed in on time
  - Assignments - by 11:59pm on due date

Tools – Hardware

- Wii Sensor Bar
- Samsung 50" 3D DLP HDTV
- TriDef Stereo Emitter
- PC with Intel Quad Core processor
- 8GB RAM
- NVIDIA Quadro 5600 (others)
- 5.1 Speaker System
- TriDef Shutter Glasses
- Wii controllers
Tools – More Hardware

- NVIDIA 3D Vision Kit
- Wii Balance Board
- Novint Falcon
- 3rd Space Gaming Vest
- IZ3D Monitor

Tools – Even More Hardware

- PlayStation Move
- Wii U
- Wii Balance Board
- HTC Vive
- Microsoft Kinect

Spring 2013
Tools - Software

- Visual Studio 2010, C#
- Unity 3D
  - game engine
  - audio support, graphics support
  - physics engine
  - development UI
  - Scripting in C#, Javascript
  - Supports 3D stereo
- Microsoft Research Kinect SDK
- Sony Move.Me
- Razer Hydra API
- Leap Motion API
- Custom Client/Server code
- Google SketchUp Pro
  - nice model database

What are 3D UIs?

- 3D interaction: Human-computer interaction in which the user’s tasks are carried out in a 3D spatial context
  - 3D input devices
  - 2D input devices with direct mappings to 3D
- 3D user interface (3D UI): A UI that involves 3D interaction
- 3D interaction technique: A method (hardware and software) allowing a user to accomplish a task in a 3D UI
Why 3D Interfaces?

- 3D applications should be useful
  - immersion
  - natural skills
  - immediacy of visualization
- But, applications in common use have low complexity of interaction
- More complex applications have serious usability problems
- Technology alone is not the solution!

What makes 3D interaction difficult?

- Spatial input
- Lack of constraints
- Lack of standards
- Lack of tools
- Lack of precision
- Fatigue
- Layout more complex
- Perception
Interaction Goals

- Performance
  - efficiency
  - accuracy
  - productivity
- Usability
  - ease of use
  - ease of learning
  - user comfort
- Usefulness
  - interaction helps meet system goals
  - interface relatively transparent so users can focus on tasks

Universal 3D Interaction Tasks

- Navigation
  - travel: motor component
  - wayfinding: cognitive component
- Selection/Picking
- Manipulation
  - specification of object position & orientation
  - specification of scale, shape, other attributes
- System Control
  - changing the system state or interaction mode
  - may be composed of other tasks
- Symbolic Input
3D UI Design Philosophies

- Artistic approach: Base design decisions on
  - intuition about users, tasks, and environments
  - heuristics, metaphors, common Sense
  - aesthetics
  - adaptation/inversion of existing interfaces

- Scientific approach: Base design decisions on
  - formal characterization of users, tasks, and environments
  - quantitative evaluation results
  - performance requirements
  - examples: taxonomies, formal experimentation

Applications

- Architecture / CAD
- Education
- Manufacturing
- Medicine
- Simulation / Training
- Entertainment – *Games!!!*
- Design / Prototyping
- Information / Scientific Visualization
- Collaboration / Communication
### Next Class

- **Games and 3DUIs**
- **Readings**
  - Bowman - Chapters 1 and 2