Outline

1. Introductions
2. Overview of class
3. Logistics
4. Topics covered
5. HW0
Us...

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Research

Our group works on computer vision, machine learning, and computer graphics, with a focus on images and video. Our research tends to explore theoretical issues (such as knowledge representation) and is firmly grounded in concrete applications (such as visual search and video surveillance).
Us...

My research is in computational vision, in particular how to combine bottom-up processing, such as image segmentation with top-down information, such as recognition of familiar shapes. I'm interested in how measuring the predictive power of different visual cues can provide general information-theoretic constraints on human visual processing. I also work on developing tools for biological image analysis in order to measure morphology and spatial patterns of gene expression in developing animals.
My own limited exposure to games....

Halo (2001)
And you....?

Majors
Years

Experience with games (...)?
Engines (Ogre, Unity, ...)?
Modeling tools (Blender, Maya, ...)?
Overview of class

160 Game Engines and Hardware. Principles of computer architecture emphasizing hardware used with a general purpose processor to support high-performance computer games and graphics engines. Design of game engines and abstraction layers for this hardware.

161 Game Engine Lab. The use of an industry standard game engine in the design and implementation of a new computer game. Principles of game engine design. Students work on a team to design, implement, and evaluate a new computer game based on an engine.

162 Modeling and World Building. Use of 3D modeling software and related tools to design and create animated, textured models and expansive virtual worlds incorporating objects, scenes, and venues for activity within game worlds and online environments. Prerequisite: ICS 160.

163 Mobile and Ubiquitous Games. Design and technology of mobile games, including mixed reality gaming, urban games, and locative media. Case studies of significant systems. Uses and limitations of location-based technologies. Infrastructures and their relationships to gameplay and design.

167 Multiplayer Game Systems. Foundations and technologies that enable multiuser, networked, and persistent virtual environments. Emphasis on database design and management, network protocols, and concurrency control to accommodate large numbers of simultaneous users.
Worlds in computer games

Second life

Diablo 3
What “things” populate these worlds?
What “things” populate these worlds?

Characters
Objects / structures
Level of detail
Terrains

Geometry
What “things” populate these worlds?

- Characters
- Objects / structures
- Level of detail
- Terrains
- Geometry
- Moving characters
- Rigid body simulations
- Physical effects (fire, water, ...)
- Animation
What “things” populate these worlds?

Characters
Objects / structures
Level of detail
Terrains

Moving characters
Rigid body simulations
Physical effects (fire, water,...)

Geometry
Animation
World Design

Level design
Spatial layout
Game flow
The tools we will use

Modeling Package
Maya

Game Engine
Unity

Virtual World
Cloud Party

(but we may modify as we go along....)
Games vs production animation

How does modeling / world-building for games differ from “film production” animation?
Games vs production animation

How does modeling / world-building for games differ from “film production” animation?

real time

offline
Games vs production animation

How does modeling / world-building for games differ from “film production” animation?

- Level of detail
  - Polygons approx. 60,000, 6,000, 600, 60
  - Distance to camera: very close, DISTANCE TO CAMERA, very far away

- Real-time shaders

- Real time physical simulations
Games vs production animation

How does modeling / world-building for games differ from “film production” animation?

World / level design

Gameplay

Player directing (tools / hidden features)

We’ll discuss a bit of this in class...
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Logistics

https://eee.uci.edu/12f/36720

I&C SCI 162 LEC A: MODELNG & WORLD BLDG (36720)

Class Information
I&C SCI 162
MODELNG & WORLD BLDG
Course Code: 36720
Term: Fall Qtr 2012

Meeting Information
Room: SH 174
Day & time: T T 11:00am to 12:20pm

Instructor Information
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Deva Kannan RAMANAN
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Office Hours: Monday 11:00 -12:00
Pre-reqs

ICS 160

In future, we will require CS 112: Introduction to computer graphics

Linear algebra
Textbooks

No official textbooks

We’ll piece together resources from existing texts and tutorials

Optional computer graphics references:

Optional Maya tutorials:
http://www.learning-maya.com/

Optional Unity reference:
http://wiki.etc.cmu.edu/unity3d/index.php/Main_Page
YouTube tutorials

Surprisingly good resource for Maya/Unity tutorials
Grading

There will be 5 projects/homeworks, each worth 20% of your final grade.

The class workload will be similar to a project class.
Lab resources

(but we strongly recommend that you install Maya / Unity locally)
Project 1

Creating geometry

Concepts:

Constructive Solid Geometry (CSG)
Subdivision / NURBS surfaces
Exposure to MAYA
Project 2

Procedural content generation

Concepts:
L-systems / grammars
MEL scripting
Maya
Project 3

Character rigging and animation

Concepts:
Warping
Splines
Inverse/forward kinematics
Project 4

Particle simulations

Concepts:

Fluid simulations
Rigid body dynamics
Maya/Unity
Project 5

World design

Concepts:

Level design
Single vs multi-player worlds

Unity / Cloud-Party
# Outline of syllabus

https://eee.uci.edu/12f/36720/home/schedule.html

## Lectures

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Items Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>9/27</td>
<td>Introduction, HW0 (Maya-install) (DR)</td>
<td>-</td>
</tr>
<tr>
<td>10/2</td>
<td>Geometry, Maya, HW1 out (CF)</td>
<td>HW0</td>
</tr>
<tr>
<td>10/4</td>
<td>Transformations/projections (DR)</td>
<td>-</td>
</tr>
<tr>
<td>10/9</td>
<td>Surfaces/shapes (GM)</td>
<td>-</td>
</tr>
<tr>
<td>10/11</td>
<td>No class</td>
<td>HW1 due</td>
</tr>
<tr>
<td>10/16</td>
<td>Procedural models, HW2 out (CF)</td>
<td>-</td>
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<tr>
<td>10/18</td>
<td>Mesh simplification 1 (DR)</td>
<td>-</td>
</tr>
<tr>
<td>10/23</td>
<td>Mesh simplification 2 (DR)</td>
<td>-</td>
</tr>
<tr>
<td>10/25</td>
<td>Character rigging (DR)</td>
<td>HW2 due</td>
</tr>
<tr>
<td>10/30</td>
<td>Character animation (DR), HW3 out</td>
<td>-</td>
</tr>
<tr>
<td>11/1</td>
<td>Intro physics (CF)</td>
<td>-</td>
</tr>
<tr>
<td>11/6</td>
<td>Particle animation (CF)</td>
<td>-</td>
</tr>
<tr>
<td>11/8</td>
<td>Texture synthesis, HW4 out (CF)</td>
<td>HW3 due</td>
</tr>
</tbody>
</table>
Homework submission instructions

Due dates/late policy

Homeworks will only be accepted electronically through the EEE dropbox. The dropbox will have an automatic deadline of 11 am (the start of class) on the given due date. **No homeworks will be accepted after that time.** I know this is a tough requirement, but in return, I'll award extra credit for early-submitted homeworks as described below. If you are working down to the last minute, **please** make sure something is uploaded 10 minutes prior to the deadline to ensure you won't get zero credit.

Extra-credit

Any homework that is handed in 24 hours early will get 10% extra-credit - e.g., 5 points for a 50-point assignment.

Homework Submission Instructions

Submit a zip or tar archive containing your code and and screen-grabs of output into the appropriate directory in the EEE Dropbox. Use the following directory structure:

```
lastname_firstname/lastname_firstname_project1.ma,
lastname_firstname/lastname_firstname_screenshot.jpg,
```

Zip the `YourName` directory and upload `YourName.zip` to the EEE dropbox under the folder for the given project. You can create a zip archive of the `YourName` directory in various ways:

- Right-click on the folder and select "Create archive". Select either "zip" or "tar.gz" to create the archive, or
- In a terminal, cd to the directory containing `YourName` and type `zip -r YourName YourName` to create `YourName.zip`

You can list the contents of a zip archive with the command `unzip -l YourName`
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Maya is freely downloadable for educational purposes (normally 2K$!)
Setup the Mouse

The Maya interface makes heavy use of three-buttons. If possible, we recommend acquiring one. If you are using a computer without a three-button mouse, you will likely need to experiment with settings to emulate this behaviour. For example, on a Mac, open up System Preferences. Select Mouse and Keyboard. Select Mouse in the top menu. Set the right-click button to Secondary. Also change the middle mouse button from "Off" to "Button 3". You may need to change this setting twice for it to stick.
Enable Infinite Undo

When learning Maya, you're going to make mistakes (no matter how good you are). Pressing Z will undo your last move in Maya. By default, Maya only lets you undo a certain number of moves. To enable infinite undo, Select Windows → Settings/Preferences → Preferences. Select the Undo menu from the side bar and change the Queue to Infinite.
Exercises

These exercises are designed to introduce you to the basics of interacting with Maya. While these exercises are not graded, the assignments will assume that you know the material presented here. It will be the most beneficial for you to walk through each exercise with a Maya file open, but merely reading through each exercise will help you a great deal.

There are numerous screenshots sprinkled throughout the exercises. In the exercises they are presented in a smaller format, however they can be expanded if you need a better view. Simply right click the image and select "View Image" (Assumes Firefox).

Some of the assignments will be using a simple Maya file called block guy (Right click the link and select "Save Link As..." to save the file instead of opening the file as text in the browser). The exercises here are listed in order, with later exercises assuming you have finished earlier ones.

General

- [A Short Tour of Maya's UI](http://phoenix.ics.uci.edu/teaching/ics162_fall12/exercises/exercises.html)
- Camera Controls
- Basic Selection
- Basic Manipulation
- Hierarchy

http://phoenix.ics.uci.edu/teaching/ics162_fall12/exercises/exercises.html
Maya tutorials

Surprisingly good resource for Maya/Unity tutorials
Exercises
Notes

- Global menu depends on main drop-down box
- Use [] to execute menu item with options
- Click different tabs to access different shelves
- Toolbar on the left
- 4 vs 5 controls wireframe versus shaded
- Consider camera views
- Bottom text allows for MEL scripting input and reports output
- Camera setup for laptop with trackpad

Go to Maya -> preferences -> interface
set in Devices: mouse tracking : 2 buttons

alt + click -----> rotates grid
2 fingers -------> zoom in/out
alt + cmd + click----> moves horizontally

- Press ‘f’ to focus on a selected object
Notes - Camera

-Camera setup for laptop with trackpad

Go to Maya - > preferences - > interface
set in Devices: mouse tracking : 1 buttons

alt + click -----> rotates grid
2 fingers --------> zoom in/out
alt + cmd + click----> moves horizontally
control + click   ----> context menu

-Press ‘f’ to focus on a selected object
-Press spacebar to flip between 4-view and a single-view (useful)
Notes - selection

- Use shift and control to add/subtract current selection from working set

- Use outliner to get hierarchal view of objects
Notes - manipulation

- Use insert (function + left on mac) to move manipulation point

- Use w,e,r, to move, rotate, and scale

- Use outliner (group + control g) to create intuitive hierarchies
Demo