CPSC 314
Computer Graphics
Dinesh K. Pai
Lecture 1: Introduction

Course website:
http://www.ugrad.cs.ubc.ca/~cs314/Vjan2015/

People

- Instructor: Dinesh K. Pai, pai@cs.ubc.ca
  Office X853. Office hours  W3-4pm.
- TAs: Shailen Agrawal, Joao Cardoso, Ben Janzen
- For fastest response to general course-related questions, use the discussion board.
  - You can also meet with TAs during scheduled lab times.
About me…

- Professor and Canada Research Chair

Sensorimotor Computation in Graphics

- (2000s-present)
Course Communication

- Lectures: MWF 1-2pm Dempster 301
- Labs: In ICICS 005. Labs start next week. Attendance is not mandatory but highly recommended.
- Course website: Assignments and materials will be posted here http://www.ugrad.cs.ubc.ca/~cs314/Vjan2015
- Grades will be posted on Connect.
- Discussions: We will use Piazza. You will need an access code. Instructions on Connect.

Required Textbook

- Available online from UBC library, free to UBC students.
Prerequisites

- All of MATH 200, MATH 221 and either
  (a) CPSC 221 or
  (b) all of CPSC 260, EECE 320.
- The following are essential for success
  - good grasp of linear algebra
  - exposure to calculus; “mathematical maturity”
  - programming maturity
- This is not an easy course!

Grading

<table>
<thead>
<tr>
<th>marks %</th>
<th>work</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>programming assignments (4)</td>
</tr>
<tr>
<td>27</td>
<td>final exam</td>
</tr>
<tr>
<td>33</td>
<td>quizzes (3)</td>
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</tbody>
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First assignment will be available next week
Important change this year

- The assignments will use the WebGL API, which is closely related to the OpenGL API used in previous years.
- A huge advantage is that your code will run on any modern browser, without any special compilation.
- But this requires JavaScript, which you will have to learn yourself.
- We will also use the Three.js library to simplify some aspects.

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Computer Graphics

Dinesh K. Pai

What is Computer Graphics?

Many slides courtesy of Min Hyuk Kim, KAIST
What is Computer Graphics?
What is Computer Graphics?

- All of them are purely computer graphics images, created by the latest *graphics* techniques.
What is Computer Graphics?

- The Study of Algorithms and Systems for Generating Images with Computers
- Includes the study of:
  - Representation
  - Manipulation
  - Interaction
  - Applications

What is Computer Graphics?

- Imaging = representing 2D images
- Modeling = representing 3D objects
- Rendering = constructing 2D images from 3D models
- Animation = simulating changes over time
Areas of Computer Graphics

- 2D imaging
  - Digital imaging/filtering
  - Color transformations
  - Display technology
  - Compositing and layering
- 2D drawing
  - Sketching, illustration
  - User interface

Areas of Computer Graphics

- 3D modeling
  - Scanning 3D shapes
  - 2D texture mapping
  - Polygons, curved surfaces
  - Procedural modeling
- More in CPSC 424
Areas of Computer Graphics

- 3D rendering
  - 2D views of 3D geometry
  - Projection and perspective
  - Removing hidden surfaces
  - Lighting simulation

Areas of Computer Graphics

- User Interaction
  - 2D graphical user interfaces
  - 3D modeling interfaces
Areas of Computer Graphics

- Animation
  - Physical simulation
  - Key-frame animation
- Check out CPSC 426 this term!

Allowing artists complete controls over animation

Thin Skin Elastodynamics

Duo Li, Shinjiro Sueda*, Debanga R. Neog, and Dinesh K. Pai

University of British Columbia

*Now at Disney Research Boston / MIT
Human Head Movements

Normal map is used to represent wrinkles and veins

Note: mesh vertices do not move
BD-Tree
Output-Sensitive Collision Detection for Reduced Deformable Models
Doug L. James
Dinesh K. Pai
SIGGRAPH 2004
Applications of Computer Graphics

Movies

Information Visualization

Cultural Heritage

Medical Imaging

User Interface

Simulation Training

Computer-Aided Design

Computer-Aided Analysis

Pixar - Ratatouille (2007)
Applications of Computer Graphics

WETA Digital – King Kong (2005)

Applications of Computer Graphics

SEGA - Iron Man 2, 2010
In this course you will learn how to

- Represent 3D shapes
- Transform 3D shapes
- Render 2D images from 3D shapes
- Model shading and lighting
- Create details of appearance using textures
- Program all of the above using the Three.js library, WebGL API and the GL Shading Language

For next class

- Review Chapter 1 of textbook
- Review Math 200 and Math 221. We’ll start off by reviewing some essential mathematics for 3D graphics
- This week: review/learn JavaScript. See “Resources” tab on course web page. Will need it for next week’s assignment.