3D in-browser graphics using WebGL

People

- Instructor: Michiel van de Panne
  Office hours: to be determined, ICCS x865
- TAs: Farzad Abdolhosseni, Silver Burla, Fan Wu, Zhaoming Xie, Lotus Zhang, Cindy Zhang
- guest lectures
- you!
  - “mathematical maturity”: linear algebra
  - “CS maturity”: programming experience
Course Communication

- Lectures: MWF 10-11am Dempster 310
- Labs: ICCS 005
  - labs begin next week
  - attendance recommended; face-to-face grading
- Website: http://www.ugrad.cs.ubc.ca/~cs314
  - lectures, assignments, other…
- Discussions & announcements: Piazza
- Grades: Canvas
- Textbook: none required
Grading

- Assignments (42%)  theory + coding
- Midterms (2 x 12%)
- Participation (8%)
- Exam (26%)

- You have 3 late days for use during the term. Most assignments will have face-to-face grading.
What is Computer Graphics?

- CG or real? https://area.autodesk.com/fakeorfoto/
- Lion http://zivadynamics.com/lion-project
- Non-photorealistic rendering
  http://www.cebas.com/images/target_finder.gif

Google maps
What is Computer Graphics?

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

[source: Pai]
What is Computer Graphics?

- **Imaging**: representing 2D images
- **Modeling**: representing 3D objects
- **Rendering**: producing 2D images from 3D models
- **Animation**: simulating changes over time
- **Interaction**: interfaces for immersive applications

[source: Pai]
Imaging

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

- 3D modeling
  - Scanning 3D shapes
  - 2D texture mapping
  - Polygons, curved surfaces
  - Procedural modeling

- More in CPSC 424
Rendering

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

Tracing ray transport

4 rays per pixel 1024 rays per pixel
Animation

- Animation
  - Physical simulation
  - Key-frame animation
- More in CPSC 426 + grad courses
Interaction

- Virtual Reality / Augmented Reality
- User Interaction
  - 2D graphical user interfaces
  - 3D modeling interfaces
Applications of Computer Graphics

- Movies
- Games
- Computer-Aided Design
- Computer-Aided Analysis
- Cultural Heritage
- User Interface
- Information Visualization
- Medical Imaging
- Simulation Training
Other Topics

- colour perception
- computational photography
- computational design & fabrication
- reinforcement learning for “smart” characters
- sound simulation
- drone cinematography
- crowd simulation
- …
Applications, APIs, and Theory

- focus is on theory + some API knowledge
- many tools and APIs exist (not covered):

![Logos of various software tools and APIs]
WebGL

- runs in your browser! (= OpenGL ES)
- this is a graphics course that uses WebGL
  – not a course about WebGL

representations, math, algorithms

yourApp.js
three.js
WebGL
javascript
three.js
Next class

- Math review

- Homework
  - Piazza account
  - play with three.js examples

- Questions ??