3D in-browser graphics using WebGL


People

- **Instructor:** Michiel van de Panne
  Office hours: Wed 3:30-4:30, ICCS x865
- **TAs:** Wu Fan, Zhaoming Xie, Jinfan Yang, Yuan Yao
- guest lectures
- you!
  - “mathematical maturity”: linear algebra
  - “CS maturity”: programming experience

Course Communication

- **Lectures:** MWF 10-11am Dempster 110
- **Labs:** ICCS 005
  - labs begin next week
  - attendance recommended; face-to-face grading
- **Website:** [http://www.ugrad.cs.ubc.ca/~cs314](http://www.ugrad.cs.ubc.ca/~cs314)
  - lectures, assignments, other...
- **Discussions & announcements:** Piazza
- **Grades:** handback
- **Textbook:** none required

Grading

- **Assignments (42%)** ~6 assmts; theory + coding
- **Midterms (2 x 11%)**
- **Participation (8%)**
- **Exam (28%)**

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/
- 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

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

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

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):

  - Maya
  - Unity
  - OpenGL
  - WebGL
  - Blender
  - Pixar RenderMan
  - Unreal Engine
  - DirectX
  - AutoCAD
  - three.js
  - Vulkan
### WebGL

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

### Next class

- Math review

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

- Questions ??