CSC 433/533
Computer Graphics

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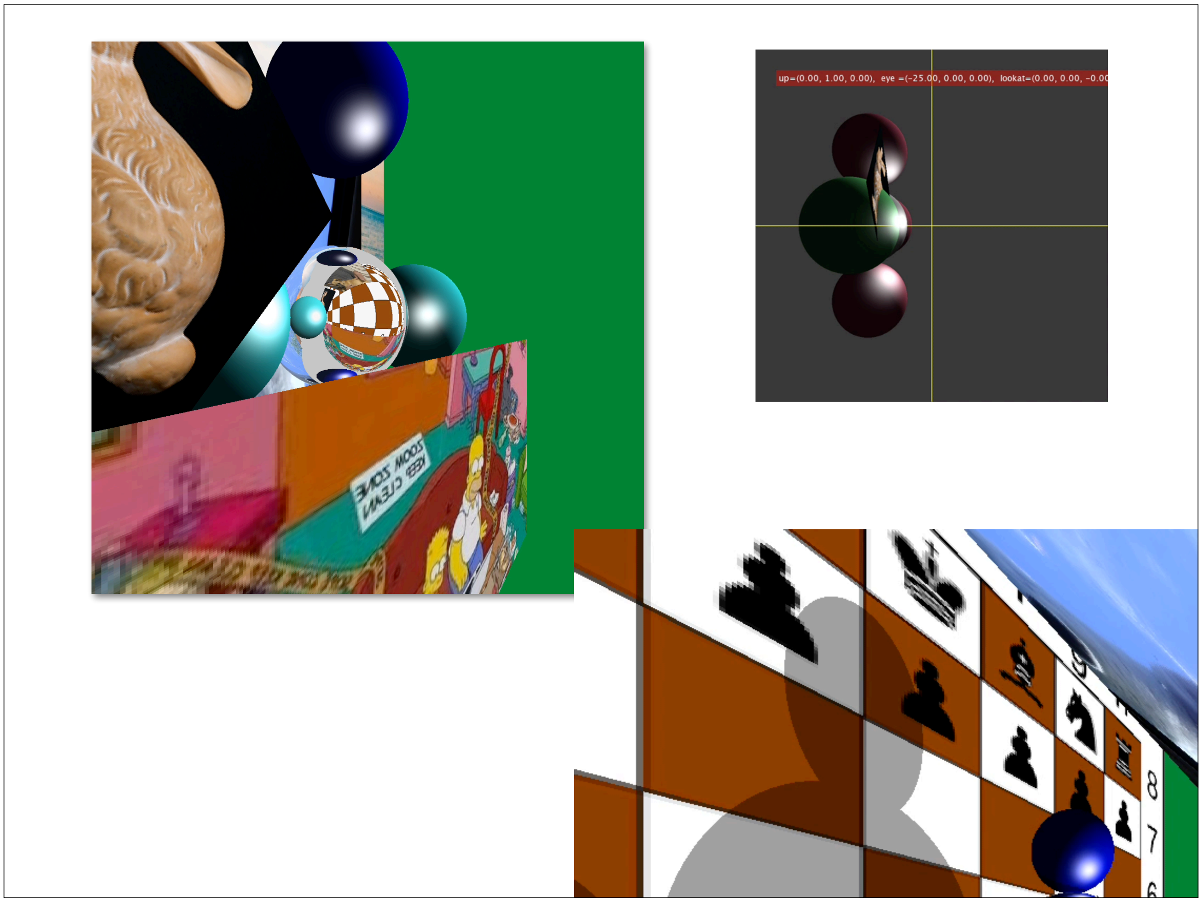
Lecture 01
Introduction

Course Material Source Credits

- Joshua Levine
- Cem Yuksel (@cem_yuksel)
- Vladlen Koltun
- Steve Marschner
- Justin Solomon
- Wojciech Matusik
- Adam Bargteil
- Many others...

Today's Agenda

- Registration Issues? See me after class.
- Course webpage: here
- Go over syllabus and introduce the course



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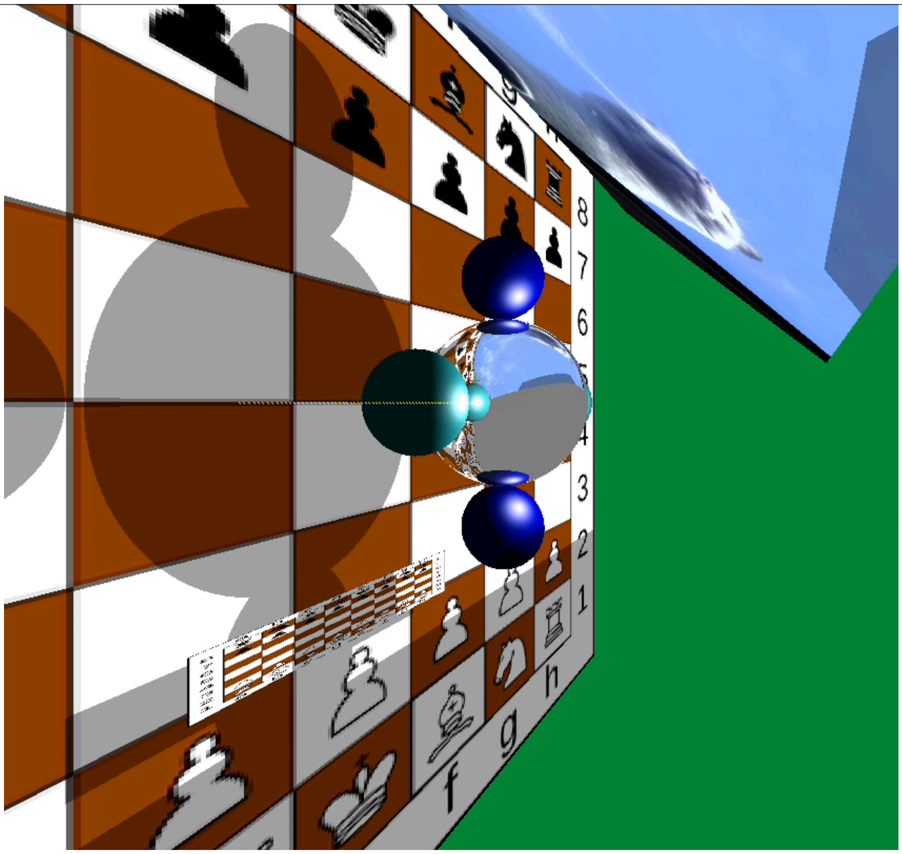
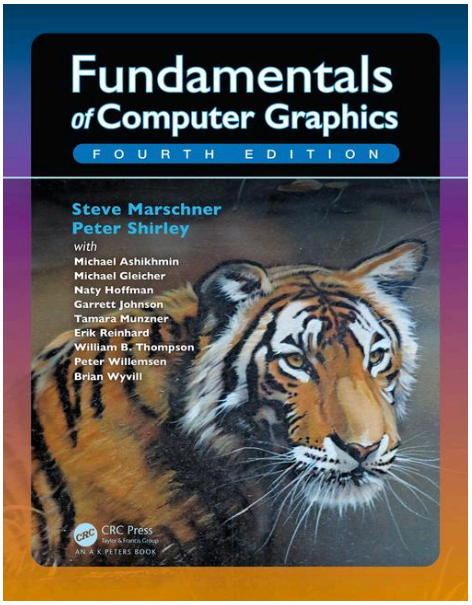


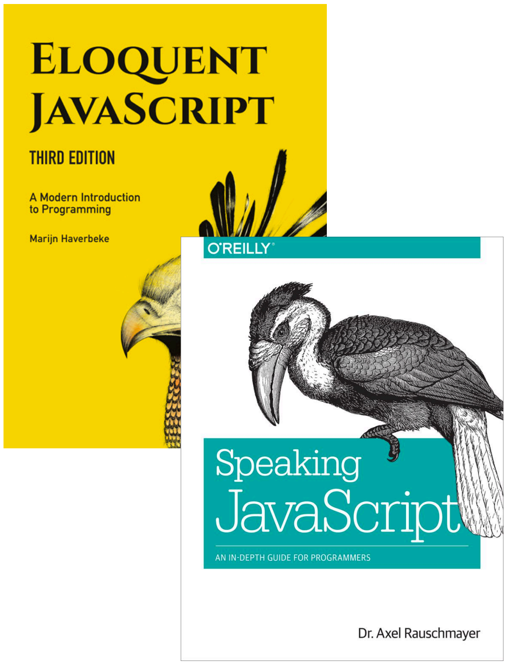
Required Course Materials

- Fundamentals of Computer Graphics, 4th Edition by Marschner and Shirley
- ISBN 978-1482229394
- Book is available electronically through the library
- A number of other materials distributed through the webpage



Required Course Materials

- If you do not know Javascript, you will need a reference!
- Two electronic references:
  - https://eloquentjavascript.net/
  - http://speakingjs.com/



Course Grading

1. Assignments (6 total): 46%. Lowest one is dropped.
   - Includes both a written and programming component
2. Midterm Exam: 21%
3. Final Exam: 21%
4. Max(Midterm,Final): 12%

Prerequisites

- Programming skills are necessary! We will develop assignments in Javascript and WebGL (but will be willing to accept other submissions (processing.org, C++/OpenGL, Matlab, Java/python)
- Linear algebra is essential, but we will review many of the concepts throughout (so the course is self contained)
    - Mostly we will use very basics concepts from Linear Algebra: Vectors, Vectors additions, Dot product, Matrix Multiplication
- Previous experience in HCI, graphics, or visualization useful, but not required.

Course Policies

- **Do**:
  - Do your best to class prepared and ready to participate
  - Write clean, correct, documented, and tested code
  - Contact me if you have any special needs
  - Be considerate of others and respectful of them and their time.
  - Discuss problems with classmates before coding.
- **Don't**:
  - Steal code, share answers (from both others in the class and outside of it)
  - Steal copyrighted materials
  - Be dishonest
  - Criticize people. Instead, critique ideas
  - Violate department/university policies (academic integrity, title IX, etc.)

Administrative Updates

- CAPS: Counseling & Psych Services: https://health.arizona.edu/
- Reminder from Academic Services:
  Be respectful of your TA!

Coding Policies

- Unless otherwise noted, you **must write your own code**. Collaborating with or sharing code with other people in this course is sometimes **permitted**, but sometimes **plagiarism.** Feel free to share code that does not address the algorithmic challanges. For example, GUI functionalities, sliders, reading/writing files - all legit to share.
  - You are allowed to **discuss** assignments with other students at the **conceptual** level.
  - You must **cite sources** for code snippets or ideas taken from **external sources**.
- OK to: get ideas from the book, from the web
- NOT OK to: share or distribute code, use ideas without attribution.

Computer Graphics

What is it? Why do we study it? Who does it?

CG Areas

- Imaging: Representing and manipulating 2D images
- Modeling: Specifying and Storing 3D objects
- Rendering: Creating 2D images from 3D
- Animation: Creating the illusion of motion through sequences of images.

Many Applications of CG!

- Entertainment: Video Games, Cartoons, Films
- CAD/CAM/CAE: Computer-aided design/modeling/ engineering
- Visualization
- Medical Imaging
- Education / Training / Simulation
- Art

Course Expectations

What will you accomplish?

Course Objectives

- Describe and apply the foundations of computer graphics, including hardware systems, mathematics for computer graphics, light, and color;
- Understand and write programs that implement key concepts from two-dimensional graphics, including raster image formats, **image and signal processing**, **image deformation**, and rasterization;
- Understand and write programs that implement key concepts for rendering complex three-dimensional scenes, including **projections and view transformations**, **visibility algorithms, ray tracing**, **scene descriptions**, and **spatial data structures**;
- Become familiar with and implement partial prototypes for a variety of advanced topics in computer graphics; including **texturing**, t**exture mapping animation**, **physically-based modeling**, procedural modeling, curves and surfaces, global illumination, implicit modeling, and/or interaction; and
- Understand Hardware-Accelerated techniques (Z-buffer, Shaders, GPU)

Assignments

- Six assignments expected
- We will use Javascript for at least the first few assignments (will discuss in class options for the rest)
- Submissions will be made using git and GitHub classroom (more details in the first assignment). At least for the first two assignment
- While the majority of grade-points (45%) will be devoted to the programming component of the assignment, but most assignments will also include a few written exercises.

Exams

- Will cover all material taught prior to the exam, but more specs to come.
- Written portions of assignments will be good practices for the exams
- Refer to the course calendar

Class Participation

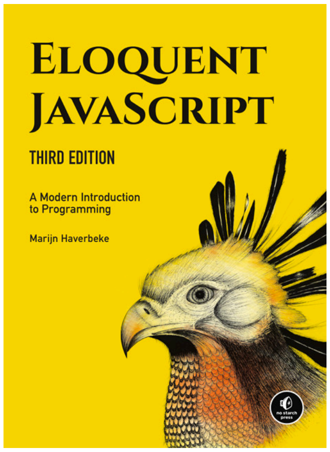
- Attendance is not mandatory, and will not be collected but…
- I expect you to make your best effort to attend, on time, **and** a participating member of the audience.
- Discussions during lecture will be frequent.
- Have your webcam on will make the discussions more effective and enjoyable.
- Discussions on piazza will are encouraged.

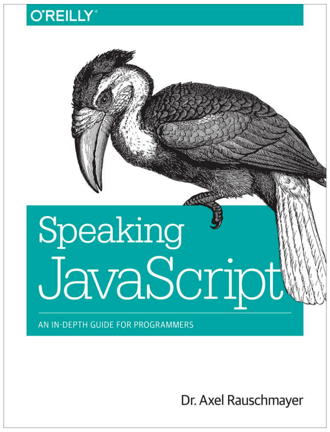
Lec01 Reading

- The course syllabus
- FOCG, Ch. 1

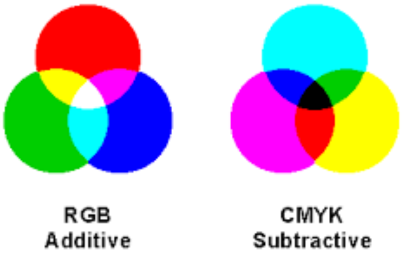
Lec02 Recommanded Reading

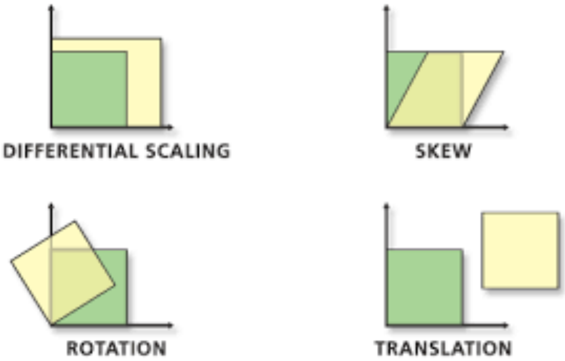
- See https://alonefrat.github.io/csc433-533/index.html#L02 for links on learning Javascript





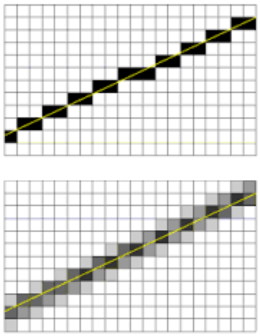
Sample of course's topics





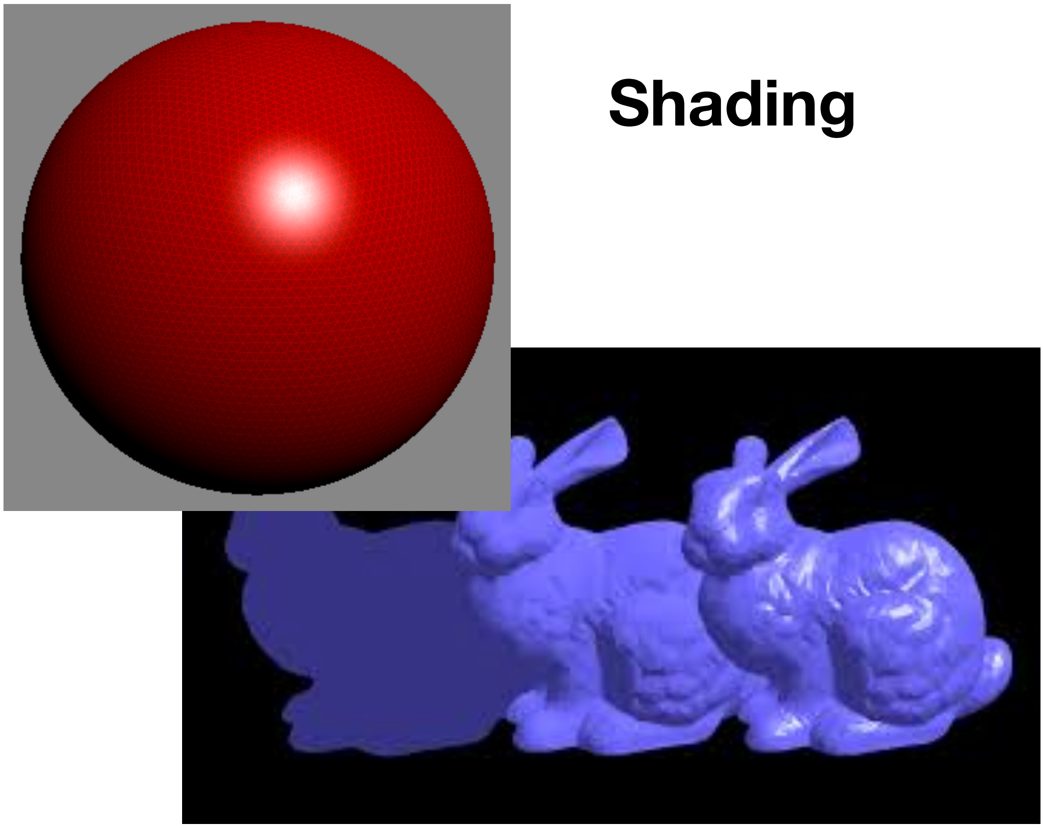
Aliasing and anti-aliasing

Temporal Aliasing: The Wagon Wheel Effect



http://youtu.be/0k2lhYk6Lfs

Shading



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