

CSC 433/533

Computer Graphics

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Credit for much of the material
Joshua Levine and Vladlen Koltun

Lecture 01

Introduction

Course Material Source Credits

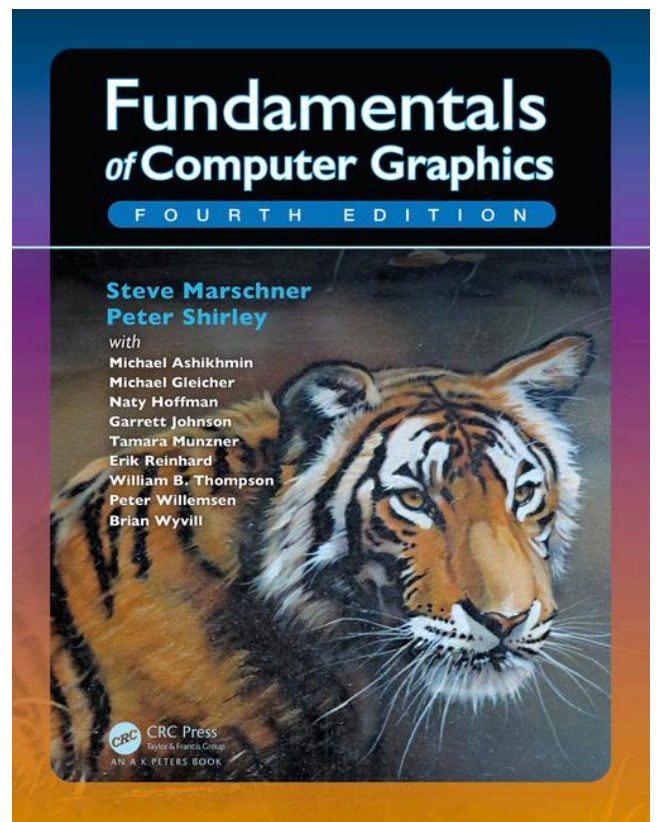
- Joshua Levine
- Vladlen Koltun
- Steve Marschner
- Justin Solomon
- Wojciech Matusik
- Adam Bargteil
- Many others...

Today's Agenda

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

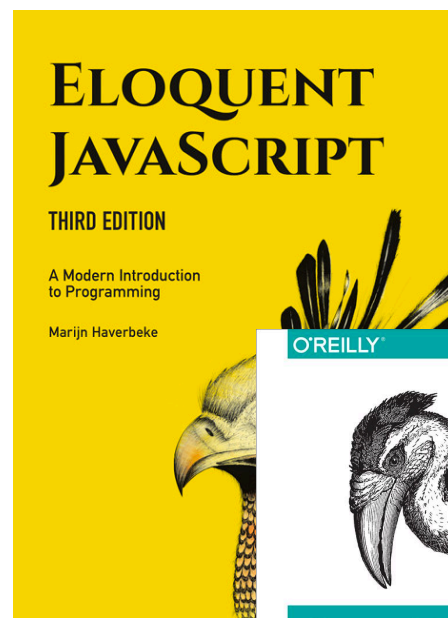
Required Course Materials

- 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): 58%. Lowest one is dropped.
 - Includes both a written (13%) and programming (45%) component
 - A late penalty of 5% per day will apply.
2. Midterm Exam: 14%
3. Final Exam: 18%
4. $\text{Max}(\text{Midterm}, \text{Final})$: 10%

Prerequisites

- Programming skills are necessary! We will develop assignments in Javascript and WebGL
- 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

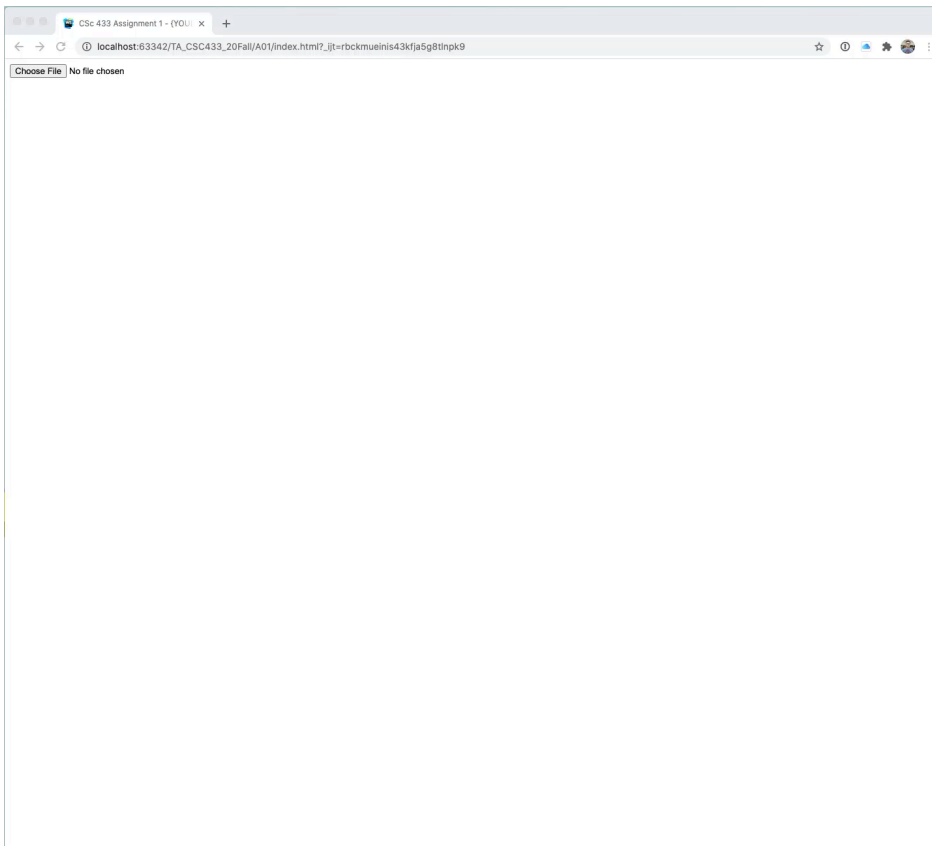
- **Do:**

- 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.)

- **Ps - talking about Assignment 1 - here is a promo of what you'd be asked to implement**



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 plagiarism and if caught will be reported to academic dishonesty.
 - 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**, **texture 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)

Course Grading

1. Assignments (6 total): 58%
 - Includes both a written and programming component
 - A late penalty of 5% per day will apply to programs. Maximum 7 days late.
2. Midterm Exam: 14%
3. Final Exam: 18%
4. Class Participation: 10%

Assignments

- Six assignments expected (58% of total grade)
- We will use Javascript
- Submissions will be made using git and GitHub classroom (more details in the first assignment)
- While the majority of 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
- Midterm: Oct 27, (tentatively, based on your preferences)
- Final: Wed., Dec 16, 3pm-5pm

Class Participation

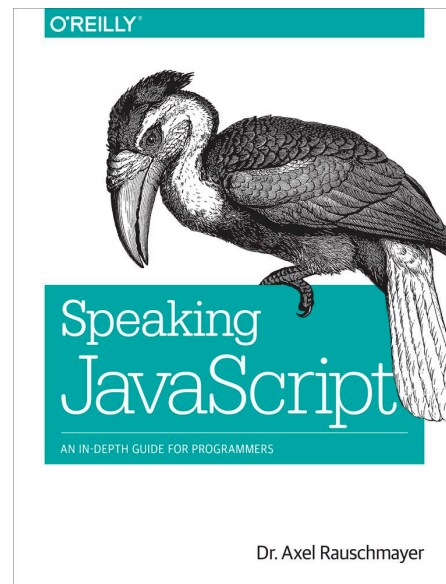
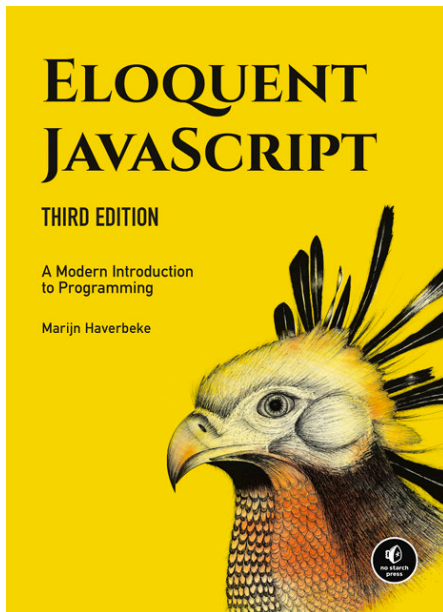
- Attendance is not mandatory, and will not be collected but...
- I expect you to make your best effort to attend, on time, **and** a participating member of the audience.
- Discussions during lecture will be frequent.
- Have your webcam on will make the discussions more effective and enjoyable.
- Discussions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

Lec01 Reading

- The course syllabus
- FOCG, Ch. 1

Lec02 Recommended Reading

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



Piazza

- Sign up immediately if you are not already enrolled!
- <https://piazza.com/configure-classes/fall2020/csc433533>

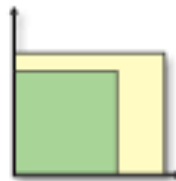
Sample of course's topics



RGB
Additive



CMYK
Subtractive



DIFFERENTIAL SCALING



SKEW



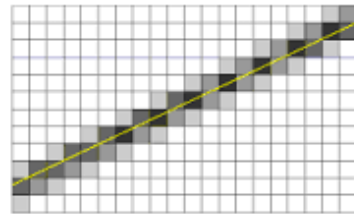
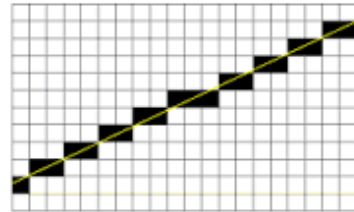
ROTATION



TRANSLATION

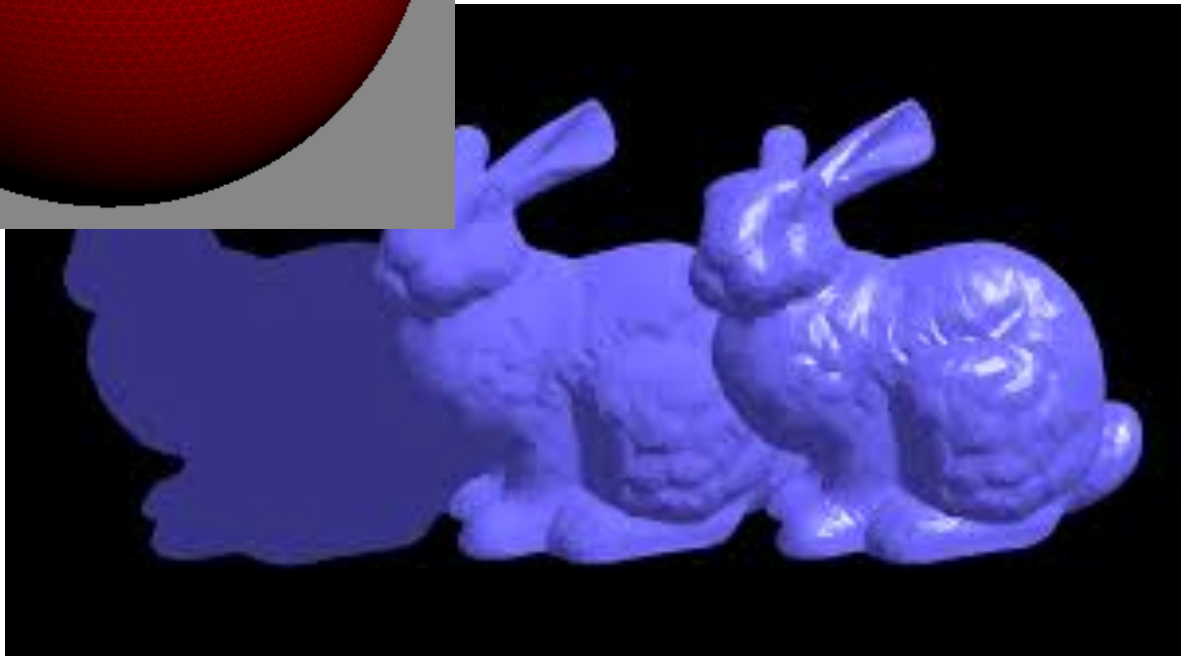
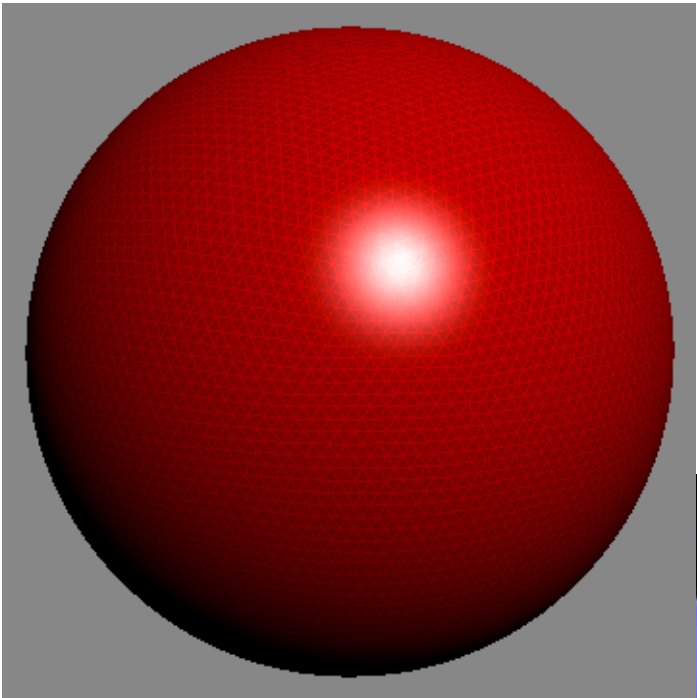
Aliasing and anti-aliasing

Temporal Aliasing: The Wagon Wheel Effect



<http://youtu.be/0k2lhYk6Lfs>

Shading



[slides1](#)