



THE UNIVERSITY of
NEW MEXICO

CS/ECE 491 Topics in Vector Graphics

Spring 2019

Instructor:

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Office Hours: Wednesday: 11:00 to noon and by appointment

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Course Web site: <http://cs.unm.edu/~joel/cs413>

Textbook:

Ray Tracing from the Ground Up by Kevin Suffern

ISBN-13: 978-1568812724, A K Peters/CRC Press (September 6, 2007)

Description:

Topics include ray-geometry intersections, viewing, lenses, local/global illumination, procedural textures/models, spline curves and surfaces, and statistical integration for realistic image synthesis. Students will write a raytracing renderer from scratch, exploring high performance implementations and realistic rendering.

Grading:

- 70% Programming Projects.
- 30% Class Participation (show & tell, code reviews, analysis of algorithms and designs, and discussions of assigned readings, presentation of assigned questions, exercises and quizzes).

Projects:

Students will build multiple coding projects that will all be parts of a single large project. Projects may be done individually or in a group of two. If you want to work in a group, this needs to be arranged near the start of the project and, of course, group specifications will be more extensive than what would be expected of a single person.



Syllabus:

Week 1 & 2

- General Concepts of Ray Tracing
- Some Essential Mathematics
- Bare-Bones Ray Tracing Application
- Antialiasing
- Sampling Techniques

Week 3 & 4

- Mapping Samples to a Disk & Hemisphere
- Perspective Viewing
- A Practical Viewing System

Week 5 & 6

- Depth of Field
- Nonlinear Projections
- Stereoscopy

Week 7 & 8

- Theoretical Foundations
- Lights and Materials
- Specular Reflection
- Shadows
- Ambient Occlusion

Week 9 & 10

- Area Lights
- Ray-Object Intersections
- Affine Transformations
- Transforming Objects
- Regular Grids
- Triangle Meshes

Week 11 & 12

- Mirror Reflection
- Glossy Reflection
- Global Illumination
- Simple Transparency
- Realistic Transparency

Week 13

- Fluid Simulation for Computer Graphics

Week 14 & 15

- Texture Mapping



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- Procedural Textures
- Noise-Based Textures