

Course Overview

Welcome!

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Department of Computer Science and Software Engineering
University of Canterbury, New Zealand.



People

- Lecturer and Course Supervisor

Ramakrishnan Mukundan

mukundan@canterbury.ac.nz

Erskine 311

- Tutors

Gordon Beintmann (Mon, Thu)

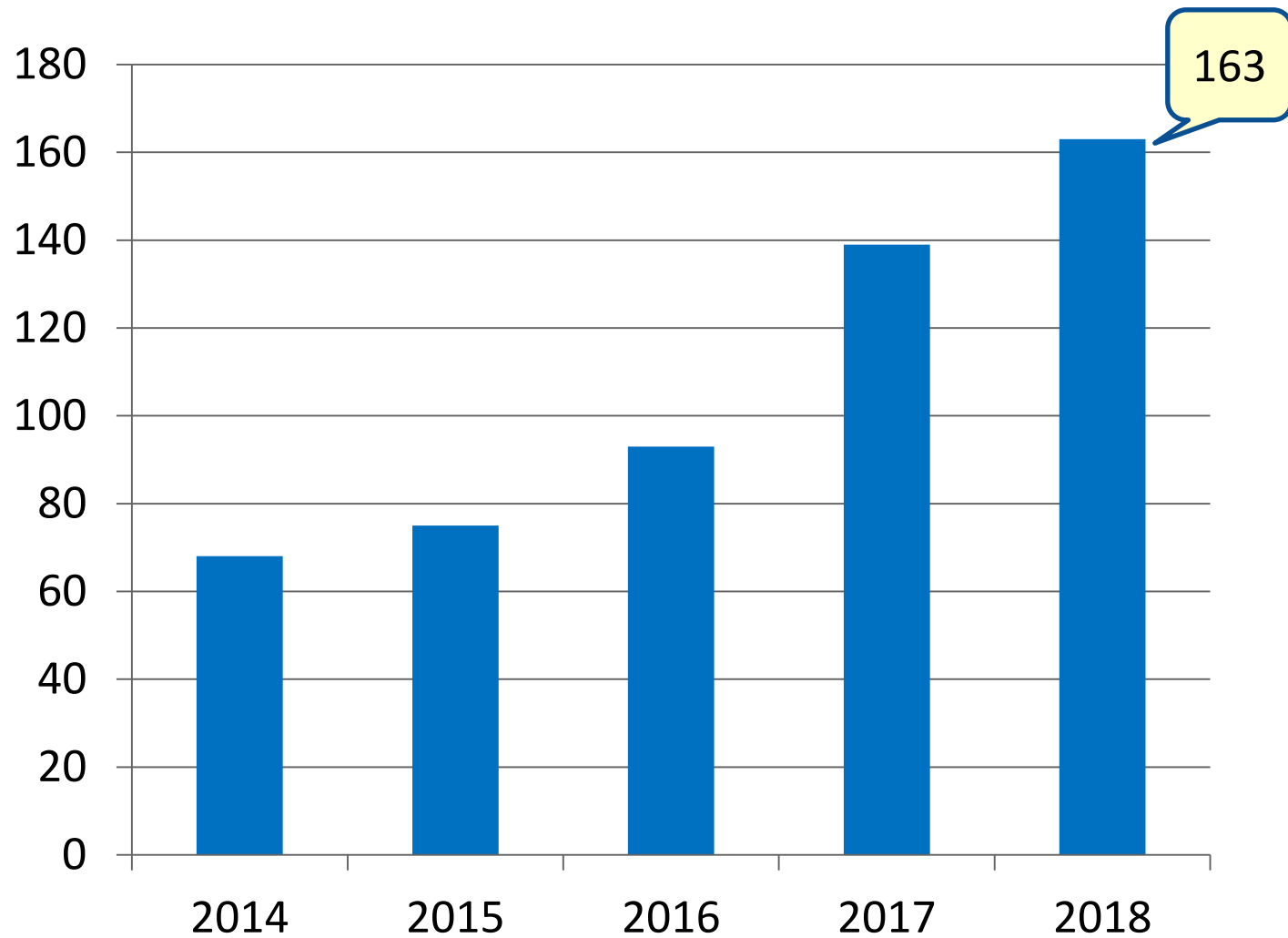
gkb18@uclive.ac.nz

Ke He (Tue, Fri)

khe60@uclive.ac.nz

First lab session on Monday, 26th Feb.

Enrolments in COSC363 over 5 years



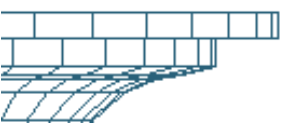
Prerequisites

COSC363

Program
development in
C/C++ language
(ENCE260)

Math!
Vectors
Matrices
Linear Algebra
(Required
material covered
in the course)

Interest
Motivation
Imagination
...



Course Menu

COSC363

- Lecture material
- Lab material (incl. quizzes)

Show all

- Participants
- Gradebook

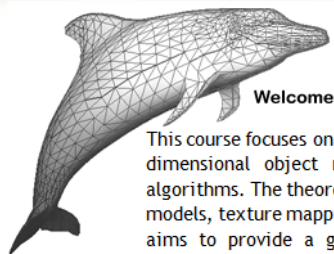
Activities

- Forums
- Resources

My courses

- COSC122S2 - Introduction to Computer Science
- COSC262S1 - Algorithms
- COSC363S1 - Computer Graphics
- COSC366SU2 - Research Project
- CSSE Notices
- Echo360 Solution Space
- Learn How To
- Learn Help
- COSC416S2 - Mobile 3D Graphics
- COSC422S2 - Advanced Computer Graphics
- Personal Academic Advisor Scheme

All courses ...



Welcome!

COSC 363 Computer Graphics

This course focuses on all aspects of fundamental computer graphics, including three-dimensional object representations, transformations, projections and rendering algorithms. The theoretical basis and implementations of illumination and reflection models, texture mapping techniques and ray tracing are also covered. The course also aims to provide a good foundation of OpenGL programming, which is a widely accepted standard for developing graphics applications.



Course Supervisor / Lecturer

Dr. R. Mukundan

mukundan@canterbury.ac.nz

Associate Professor, Dept. of Computer Science & Software Engineering.

Phone Extn: 7770, Office: 311, Level 3, Erskine Bldg.

Tutors

Class Representative

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@uactive.ac.nz

Course Outline and Timetable

COSC363-1651 Computer Graphics

Other Useful Information

- Programming for Fun
- Health and Safety Briefing (College of Engineering)
- ...



Upcoming events

There are no upcoming events

[Go to calendar...](#)

[New event...](#)

Recent activity

Activity since Wednesday, 24 February 2016,
12:13 PM

[Full report of recent activity...](#)

No recent activity

Calendar

February 2016						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29					

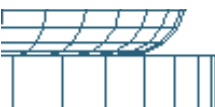
EVENTS KEY

- Hide global events
- Hide course events
- Hide group events
- Hide user events

Search forums

Go

[Advanced search ?](#)



COSC363

R. Mukundan, CSSE, University of Canterbury

Course Assessment, Grading

Assessment Item	Worth	Due Date
Assignment -1	20%	Wed, 28 Mar 2018
Assignment-2	20%	Thu, 31 May 2018
Quizzes	10%	Week 2 - Week 11 (10 quizzes)
Final Exam	50%	TBA

Grading policy: In order to pass this course, you must achieve a minimum of

- 50% of the overall maximum marks including all assessment components. This corresponds to a C– grade.
- 45% of the overall maximum marks in the invigilated assessment item (final exam).
- Marks are sometimes scaled to achieve consistency between courses from year to year.

Quizzes

- Every week (from week-2 to week-11), a new quiz will be added at 9am on Monday to the course page on Learn. The quiz will close at 5pm on Friday of the following week.
- Each quiz will remain open only for **2 weeks** (Strictly no extensions!)
- There will be a total of 10 quizzes in this course.
- Each quiz can be attempted only once. However,
 - A question within a quiz may be attempted multiple times.
 - A fraction of the marks (25%) will be deducted for each incorrect answer.
- Total contribution to the final grade: 10% (i.e., each quiz carries 1 mark)

Course Objectives

The course aims to provide a good understanding of

- Graphics Theory:

Transformations, Lighting, Projections, Texture mapping, Clipping, Shadow generation etc.

- Graphics Programming

OpenGL API: v2 and v4 (Traditional and Modern)

Application development

Designing models, scenes and animations

- Geometric Algorithms

Ray tracing

Surface design

Learning Outcomes

By the end of the course, you should be able to demonstrate knowledge and understanding of fundamental principles in computer graphics, and apply them to

- the design of algorithms for 3D modelling, rendering and animation in various application domains.
- the design and analysis of programs using OpenGL and similar API (WebGL, OpenGL-ES etc).
- the development of GPU based implementations.
- the study of advanced concepts and techniques in the field of Computer Graphics.
- the development of skills necessary for large-scale software projects involving 3D graphics methods.

Advanced Concepts and Applications

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graph LR; COSC363[COSC363] --> ACG[COSC422]; COSC363 --> GR[Graphics Research]; COSC363 --> GP[Graphics Projects];
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COSC363

Advanced Computer Graphics
COSC422

Graphics Research
CGIP, CV, HITLab

Graphics Projects
3D Visualization,
Rendering and Animation

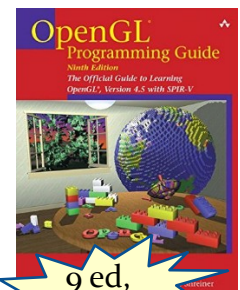
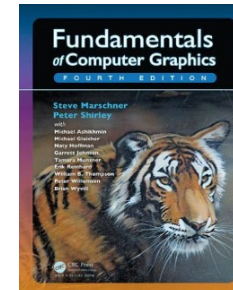
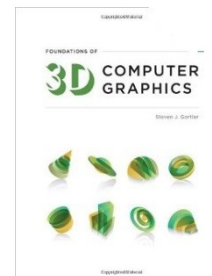
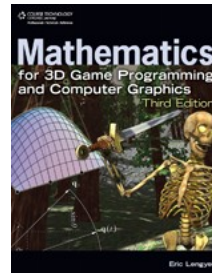
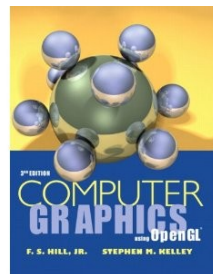
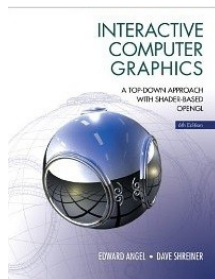
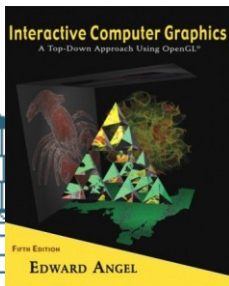
Tentative Topics, Lecture Plan

Lectures		
Wk	Monday	Wednesday
1	Introduction	OpenGL Basics
2	Transformations	Transformation Stack
3	Illumination	Texture Mapping
4	Sweep Surfaces	Surface Design
5	Mathematical Preliminaries	Mathematics of Lighting
6	Viewing and Projection	Ray Tracing
Term Break		
7	Ray Tracing	Ray Tracing
8	OpenGL 4 Shaders	OpenGL 4 Shaders
9	Bezier Surfaces	Tessellation Shader
10	Terrain Rendering	Geometry Shader
11	Shader Applications	Advanced techniques
12	Summary	Summary

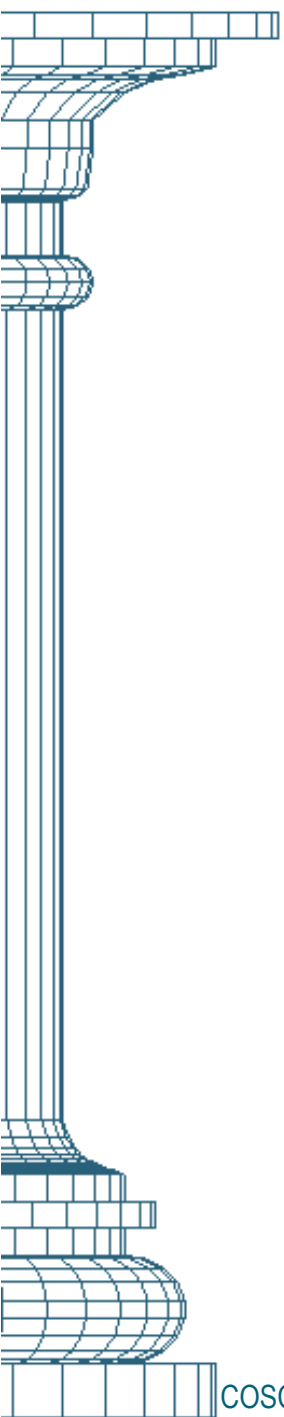
Labs	
Mon, Tue, Thu, Fri	
OpenGL Basics	
Transformations	
Texture Mapping	
Sweep Surfaces	
Assignment Help	
Ray Tracing	
Ray Tracing	
OpenGL 4	
OpenGL 4	
Terrains	
Assignment help	

Recommended Texts

- Edward Angel, Interactive Computer Graphics, Addison Wesley, (5e: 2008), (6e: 2011).
- F.S. Hill, S.M. Kelley, Computer Graphics Using OpenGL , Prentice Hall 2006.
- Eric Lengyel, Mathematics for 3D Game Programming and Computer Graphics, Cengage Learning, 2011.
- Steven Gortler, Foundations of 3D Computer Graphics, MIT Press, 2012.
- S. Marschner, P. Shirley, Fundamentals of Computer Graphics, A. K. Peters/CRC Press, 4th ed. 2015.

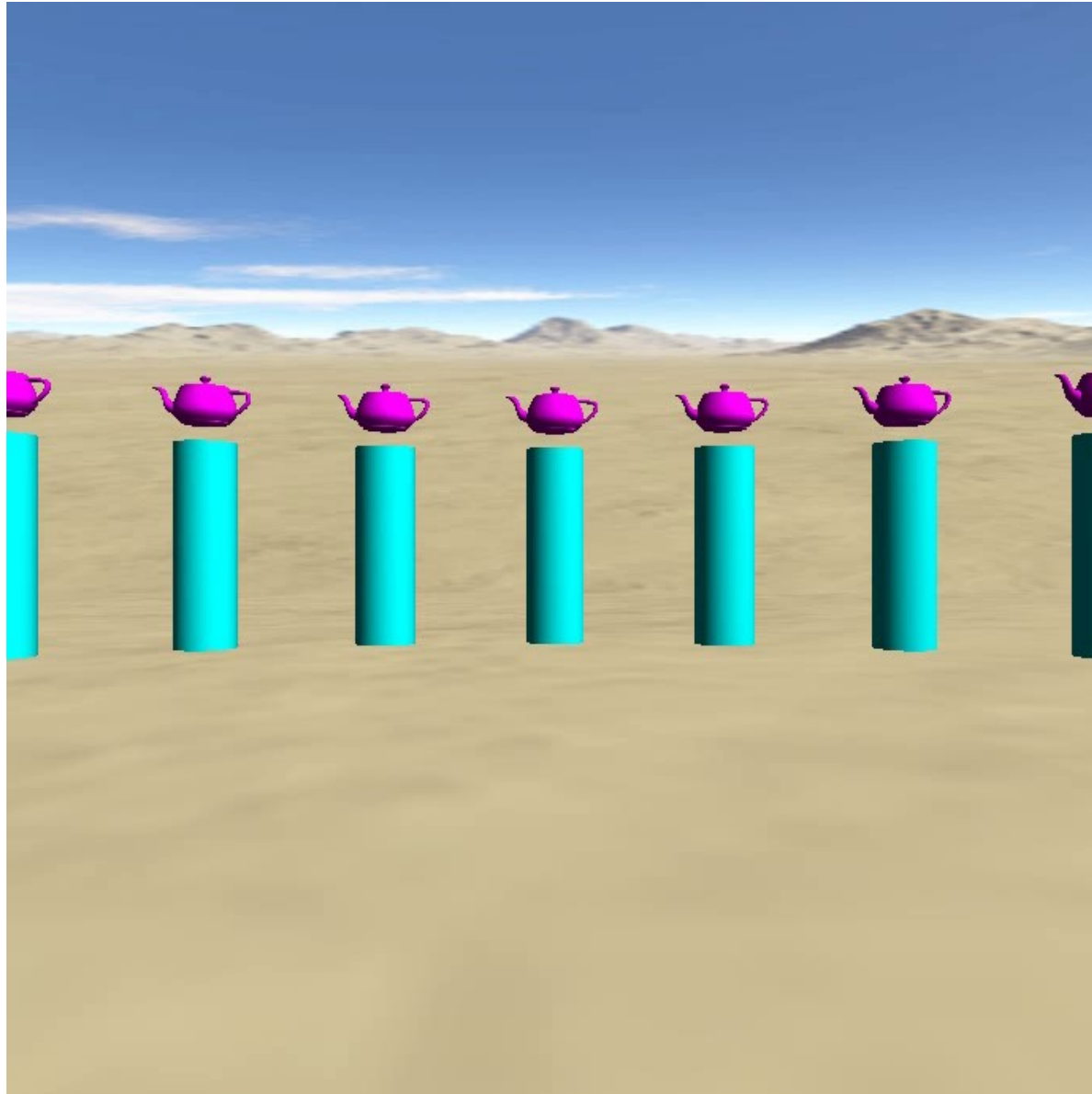


9 ed,
2016

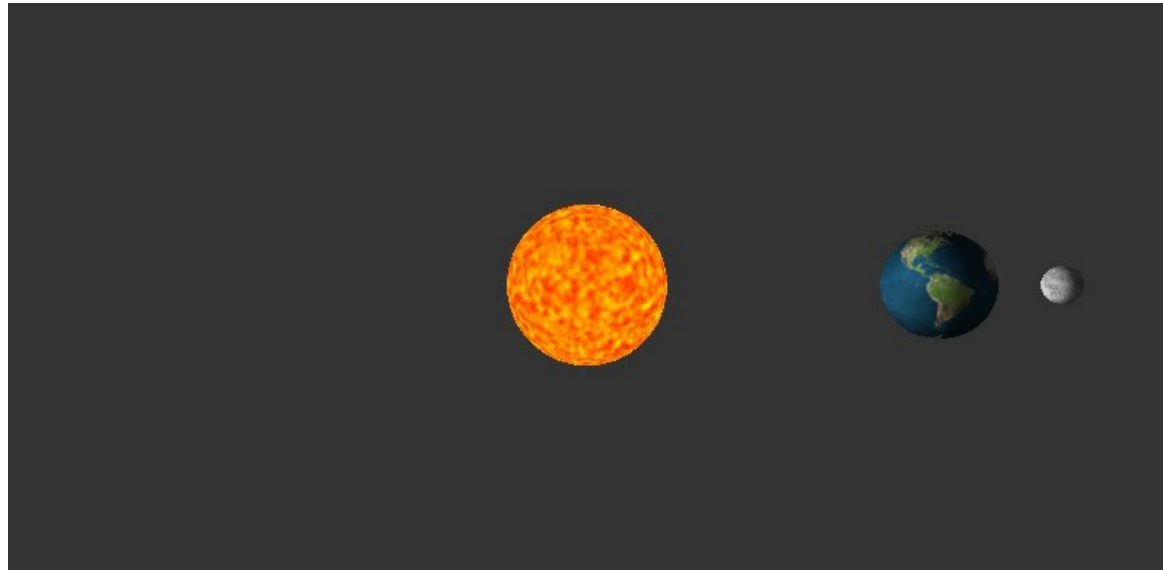
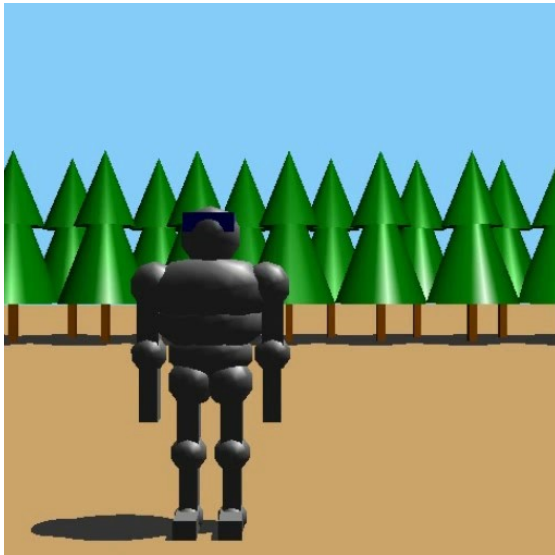


A Quick Tour

Simple Transformations

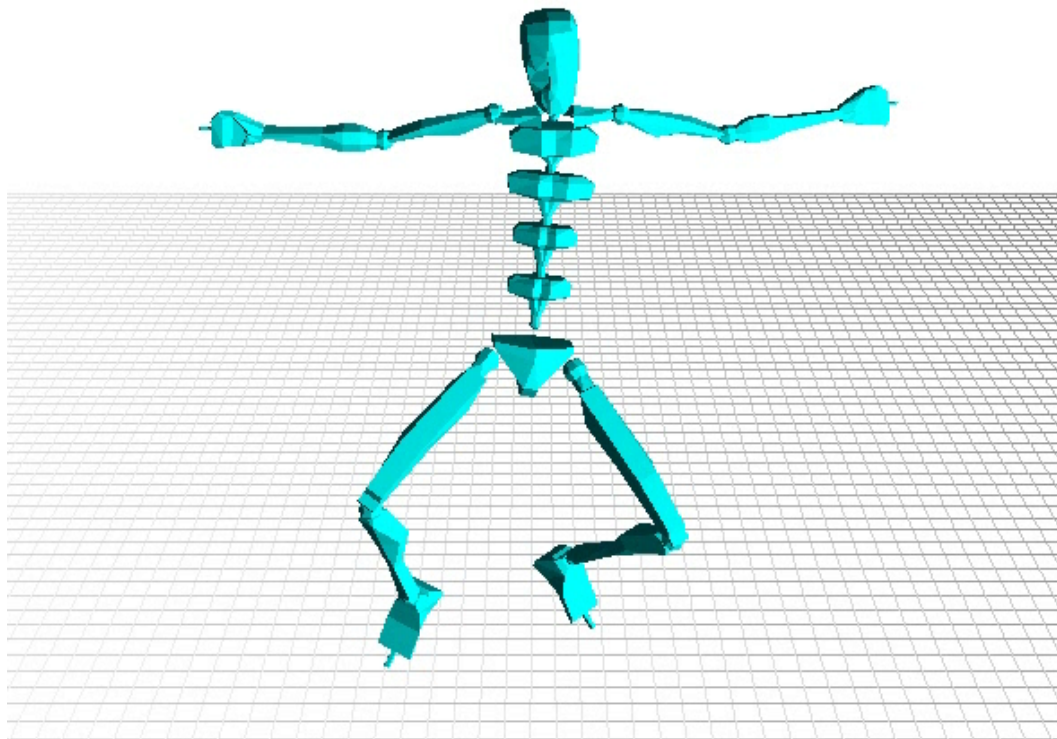


Complex Transformations

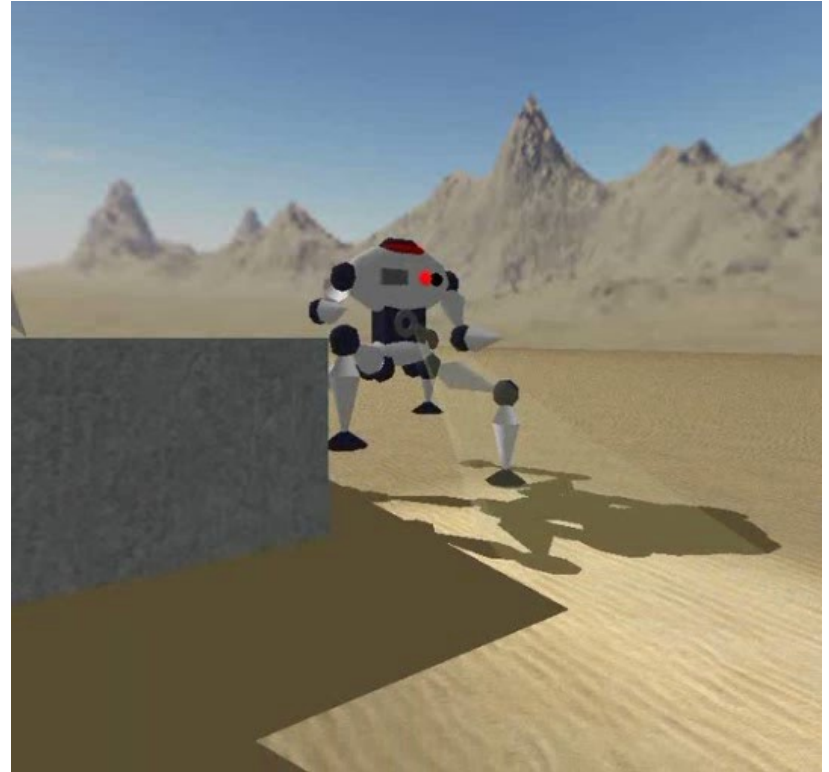
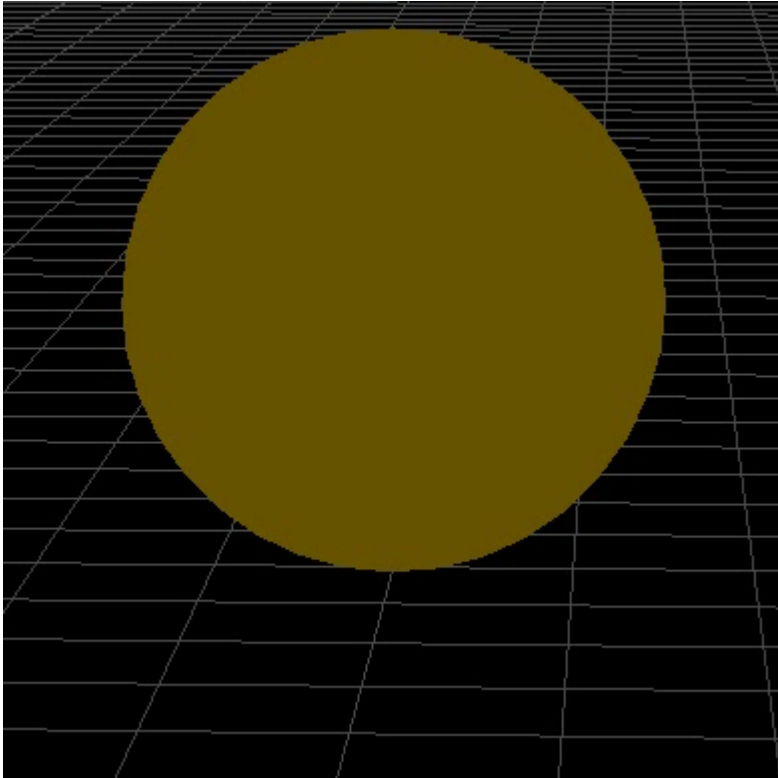


More Complex Transformations

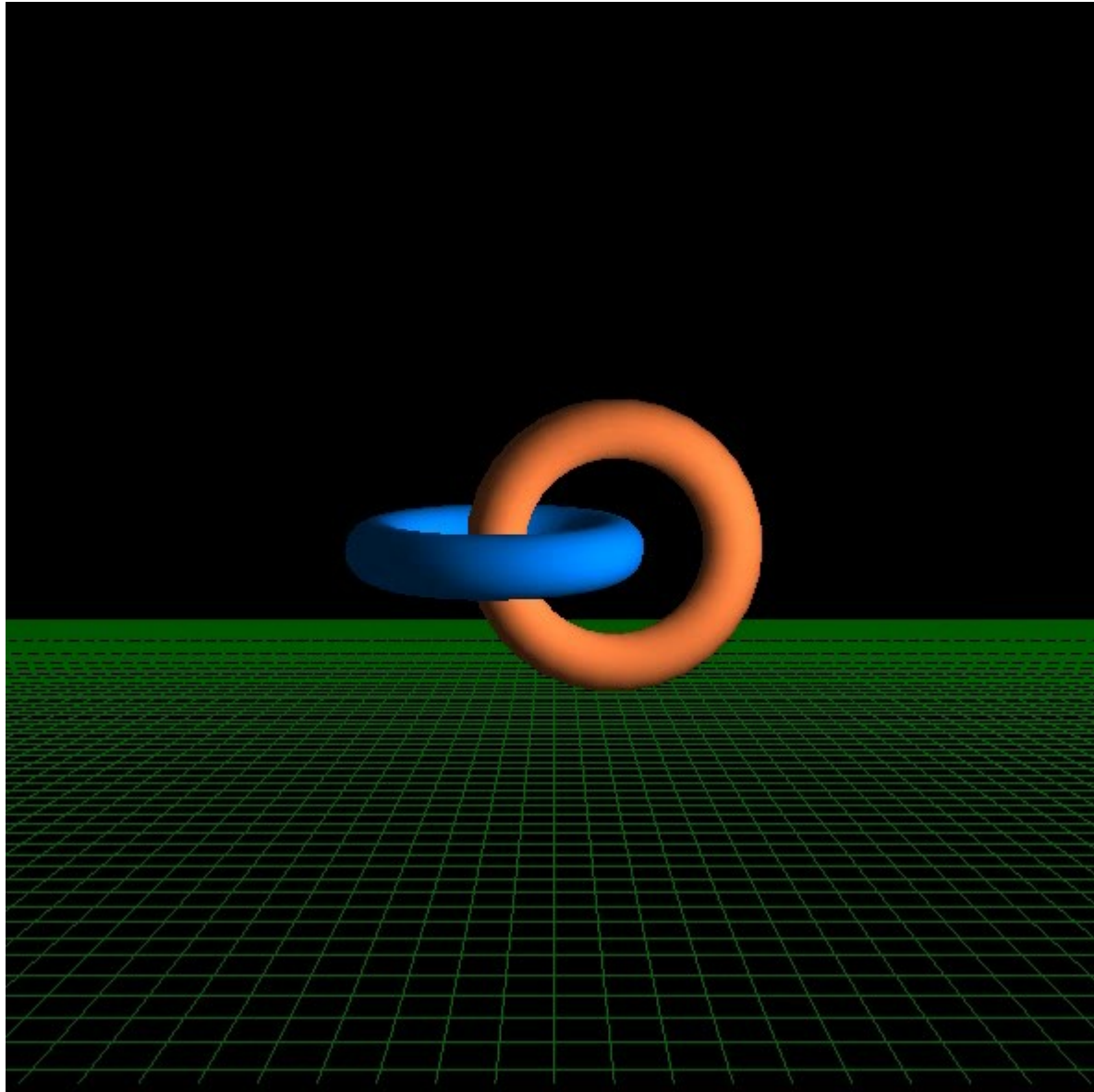
(Skeletal Animation is not covered in this course)



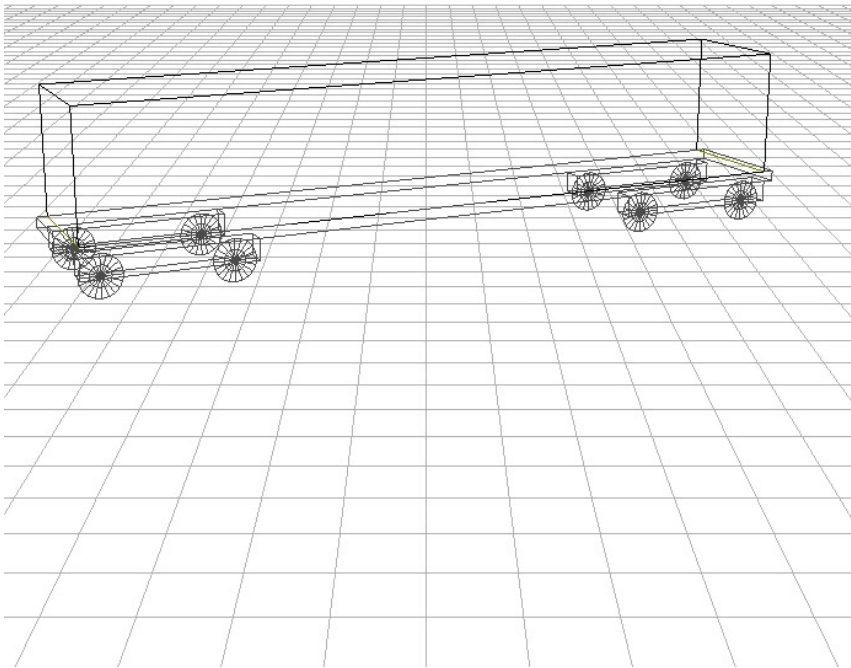
Illumination



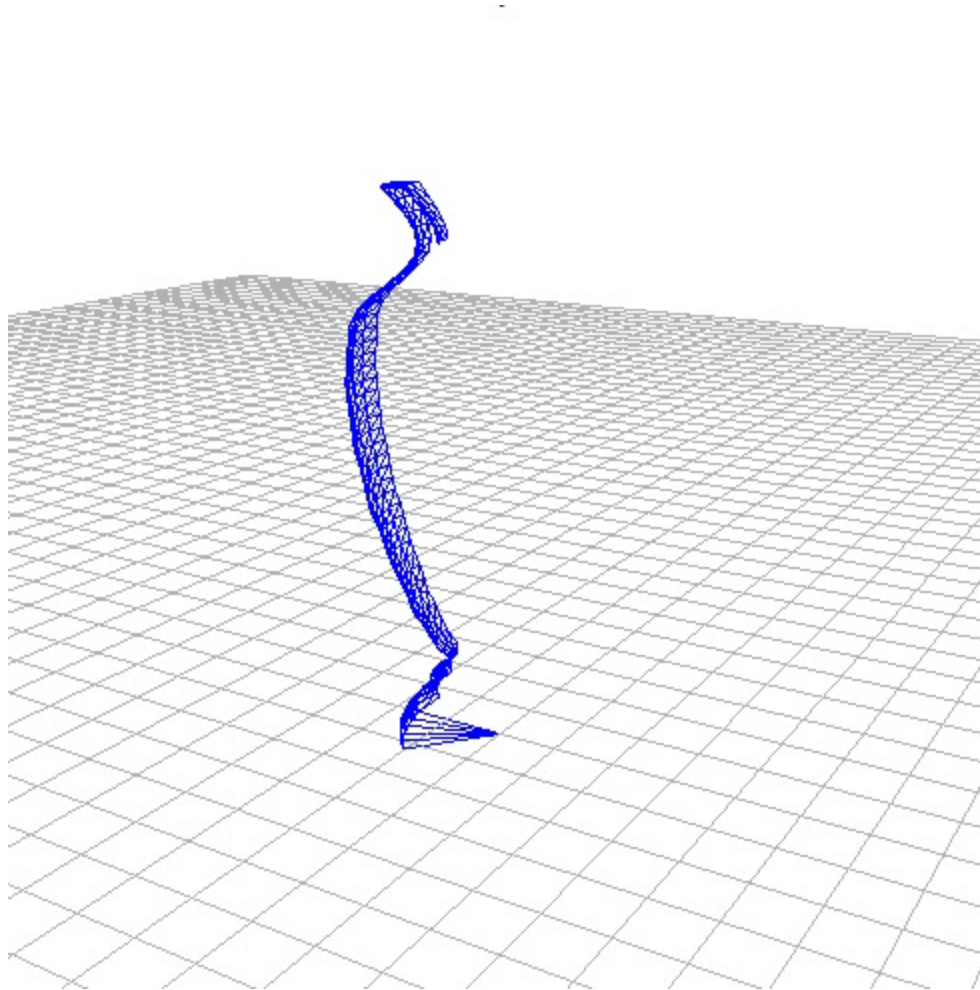
Viewing and Projection



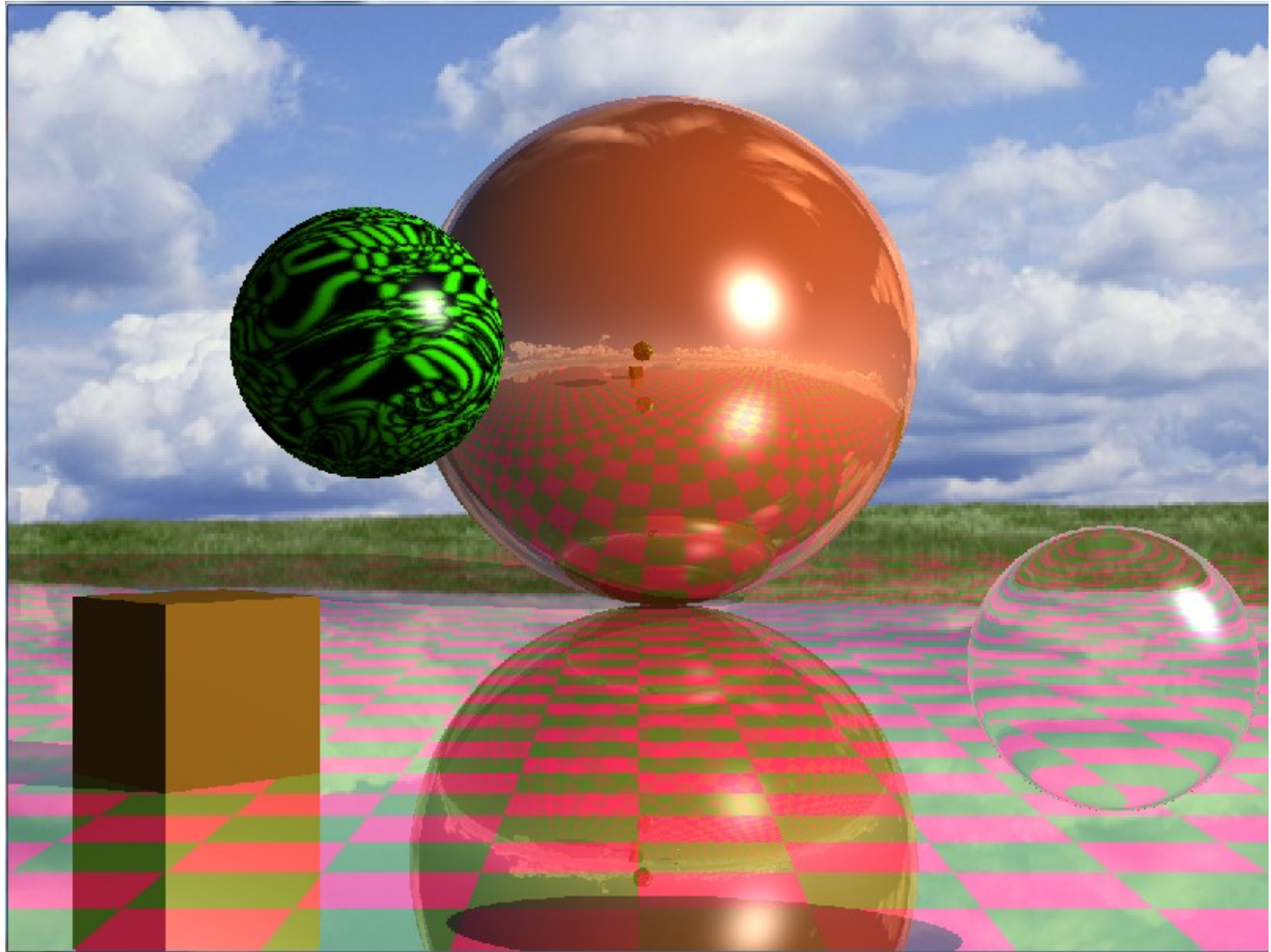
Texture Mapping



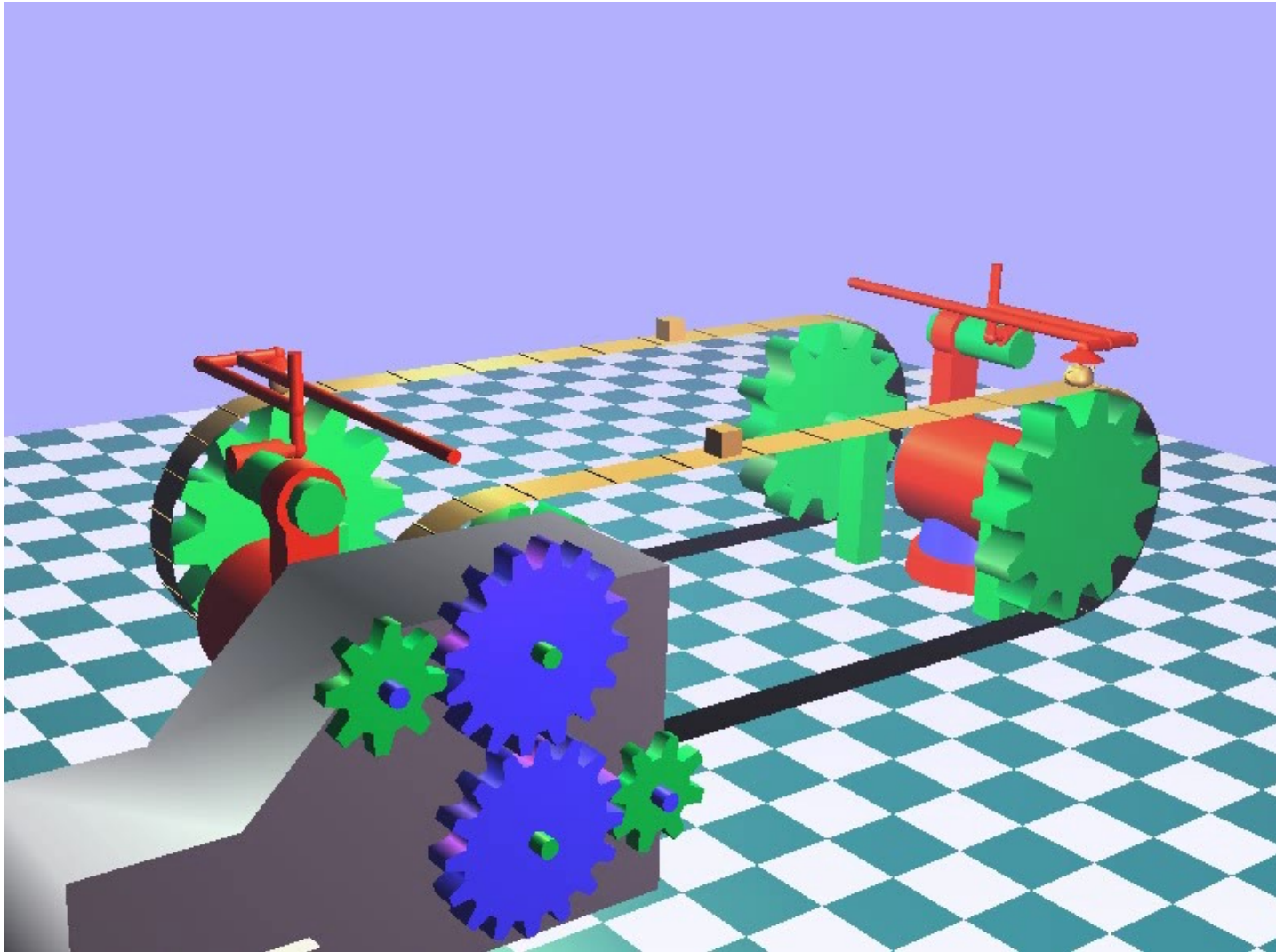
Surface Design



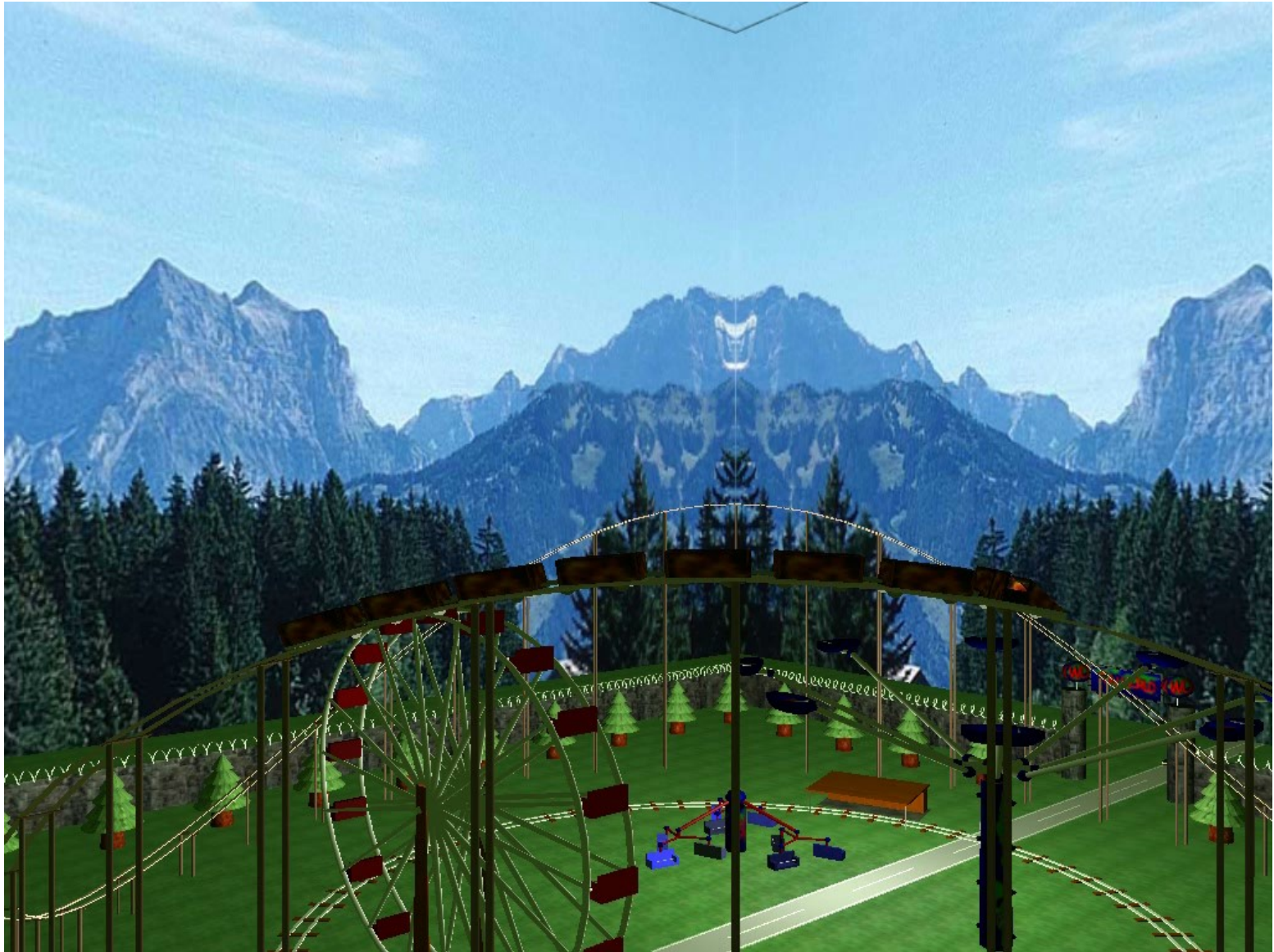
Ray Tracing



Student's Work: Graphics Factory (1)



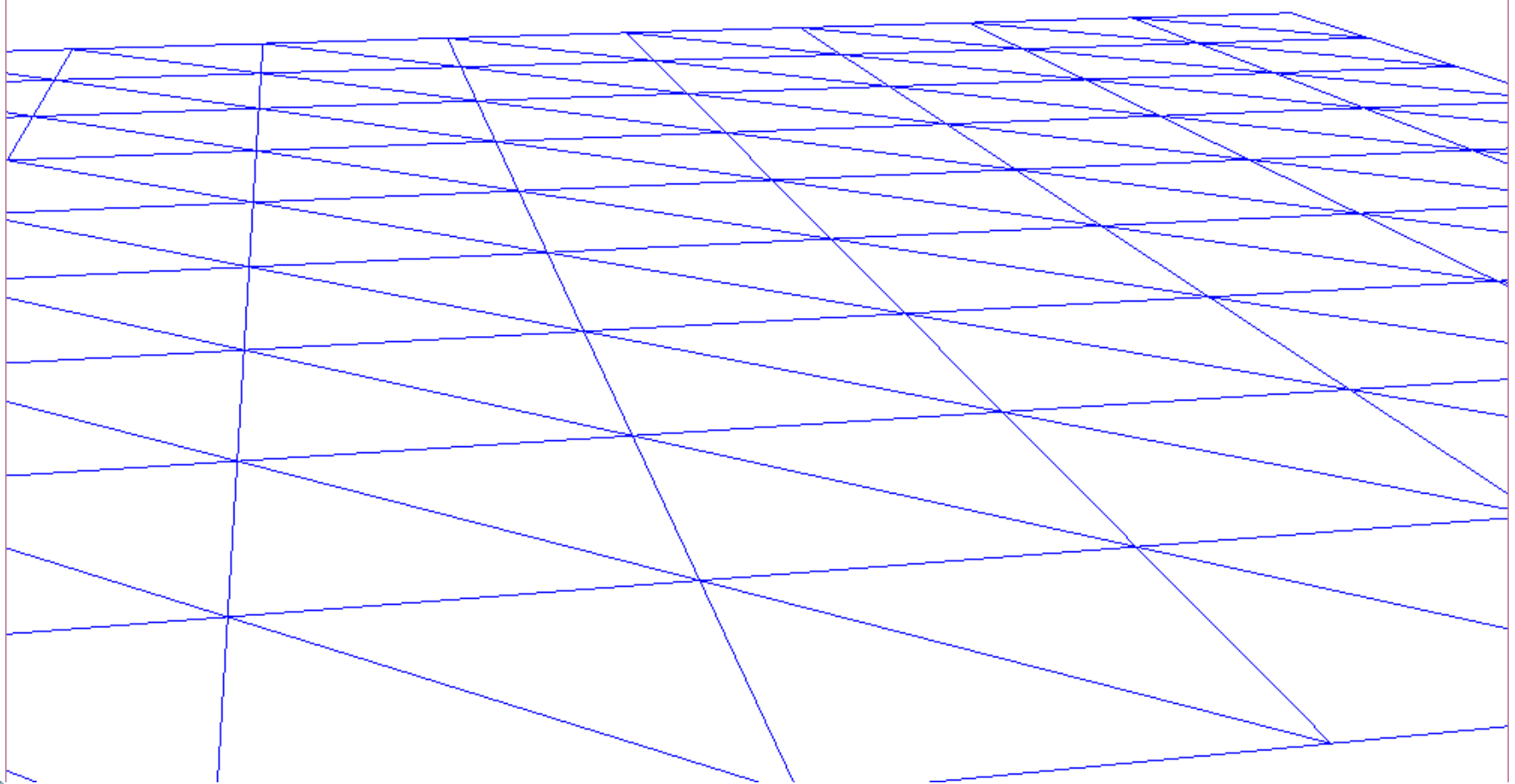
Student's Work: A Theme Park



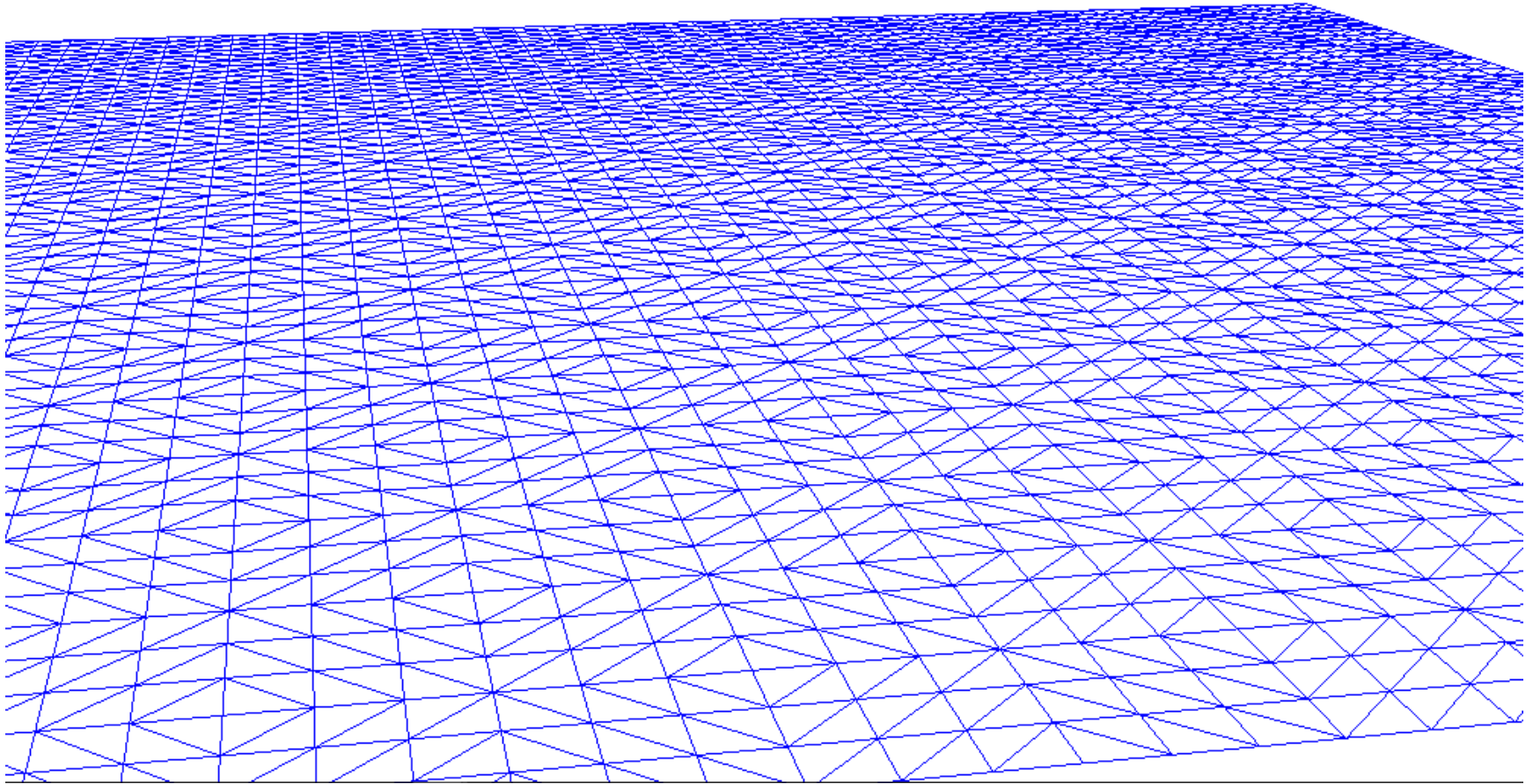
Student's Work: SpaceStation (by Gordon)



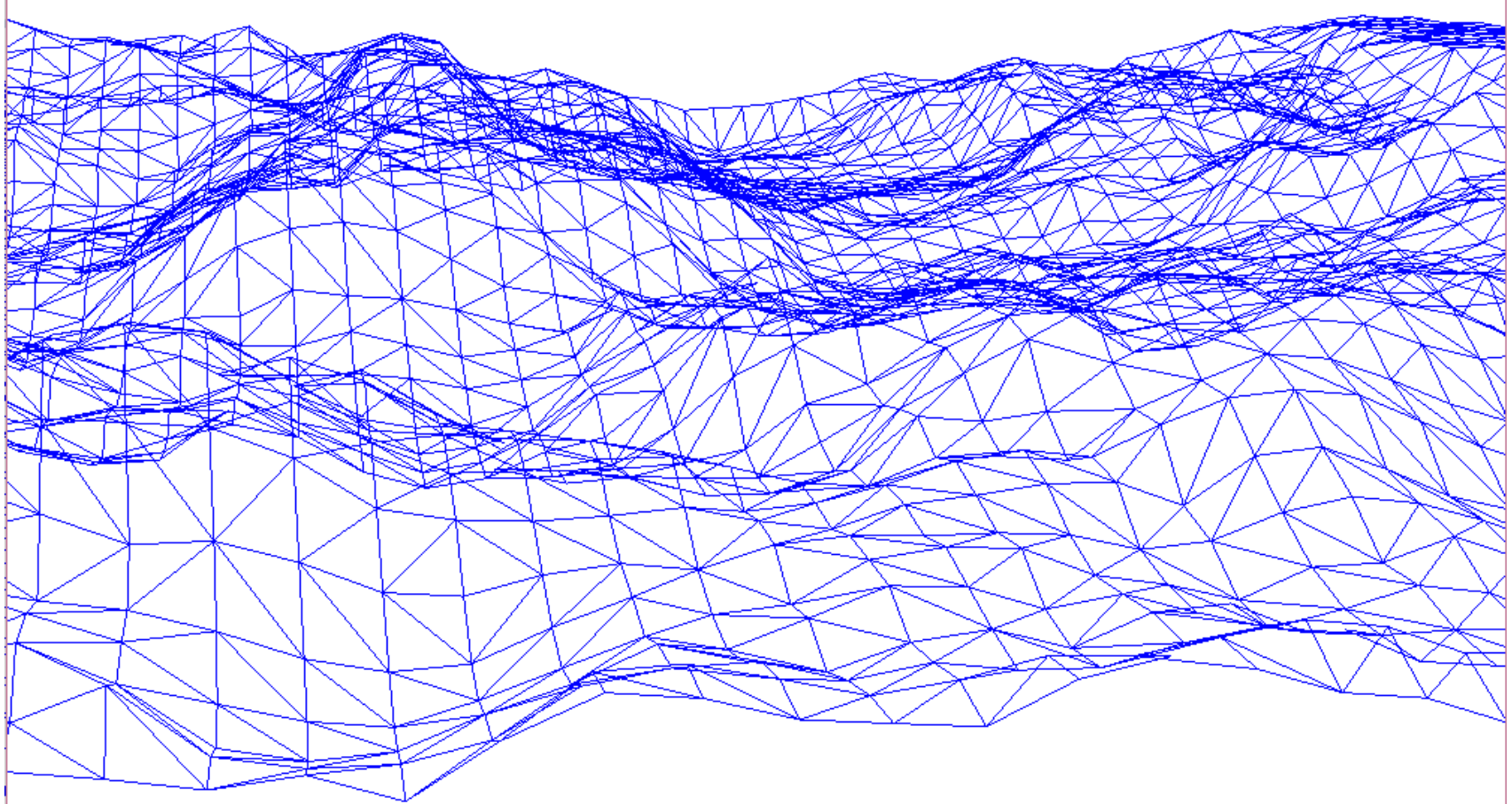
Advanced Application Examples: Terrains



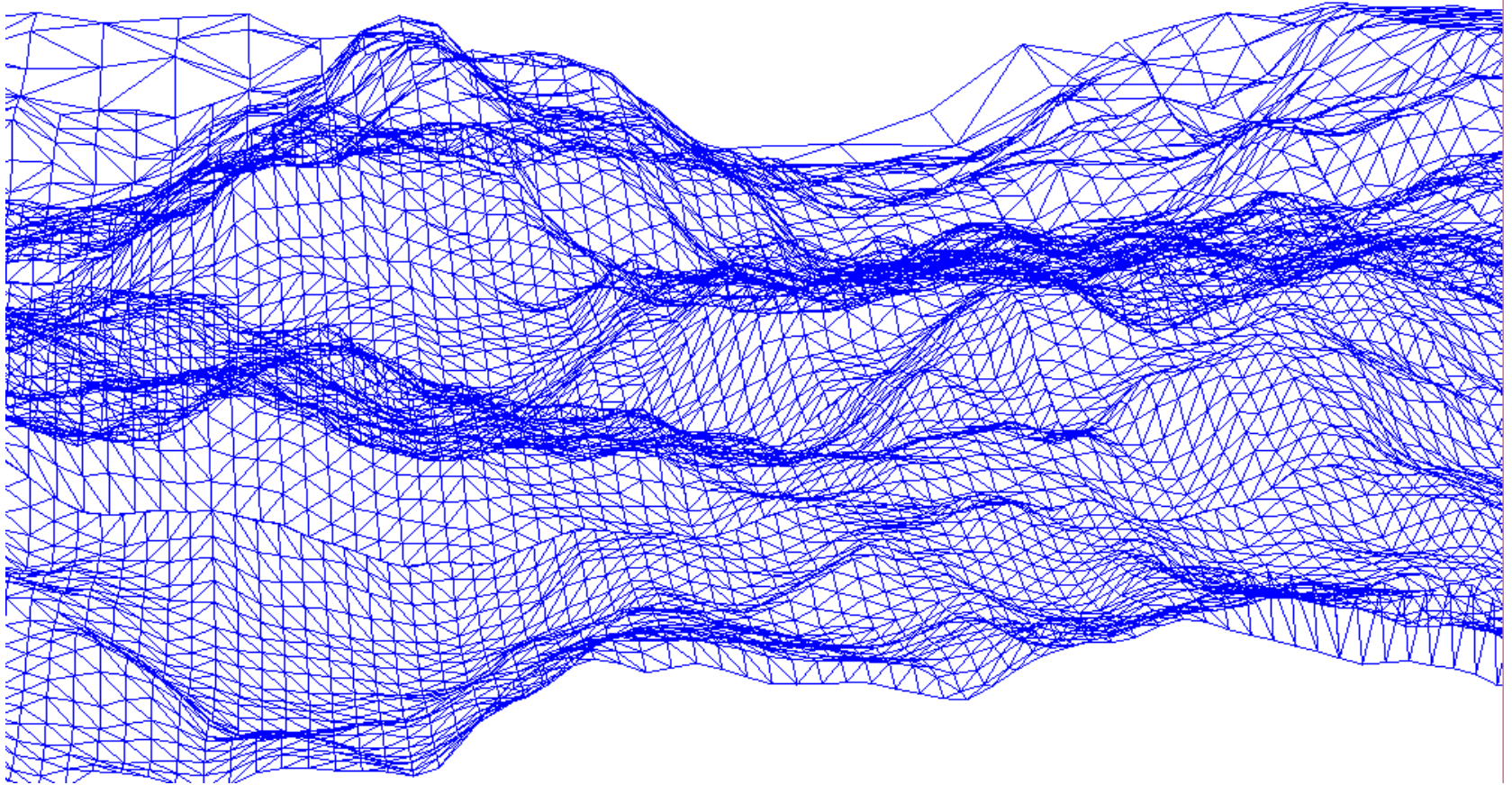
Advanced Application Examples: Terrains



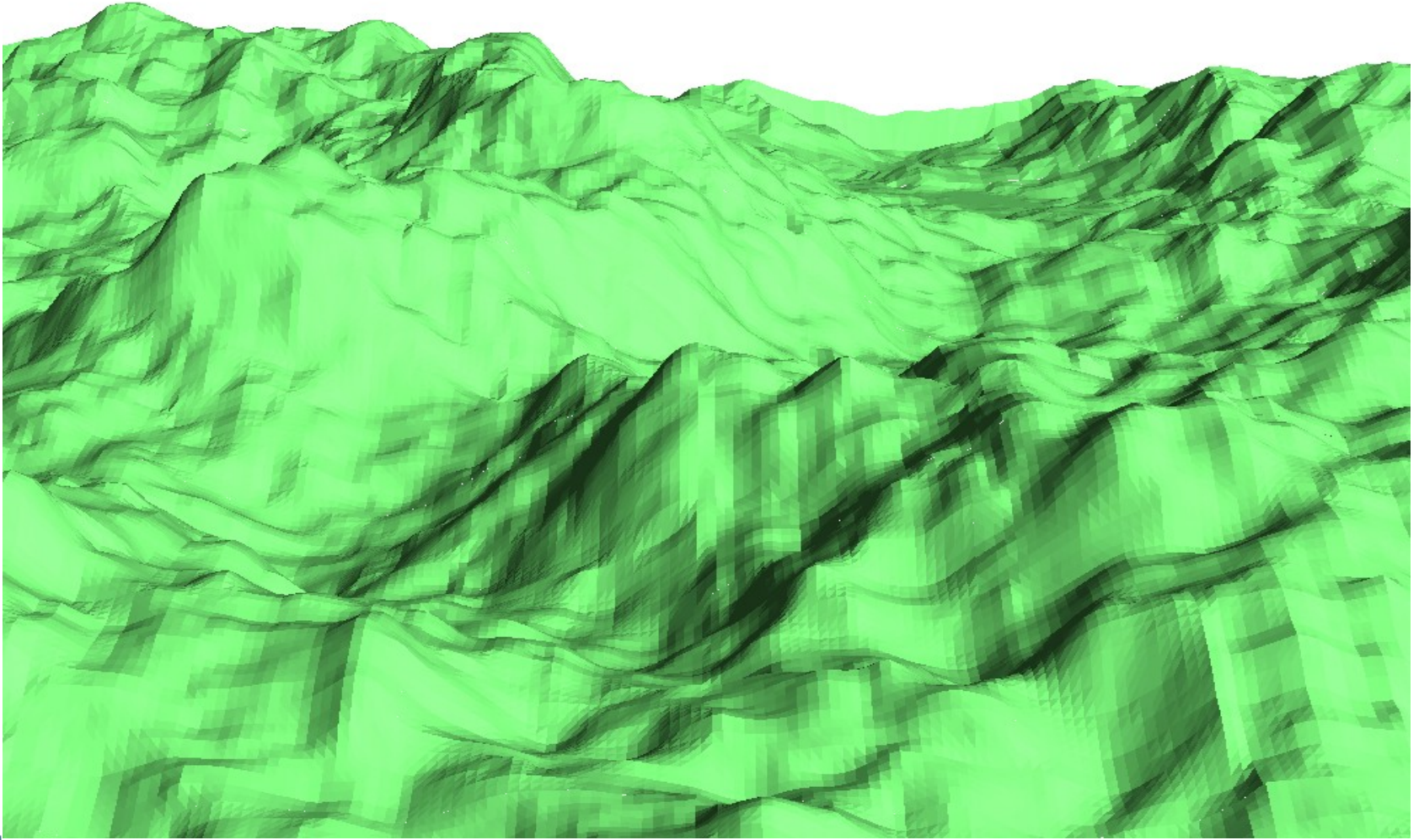
Advanced Application Examples: Terrains



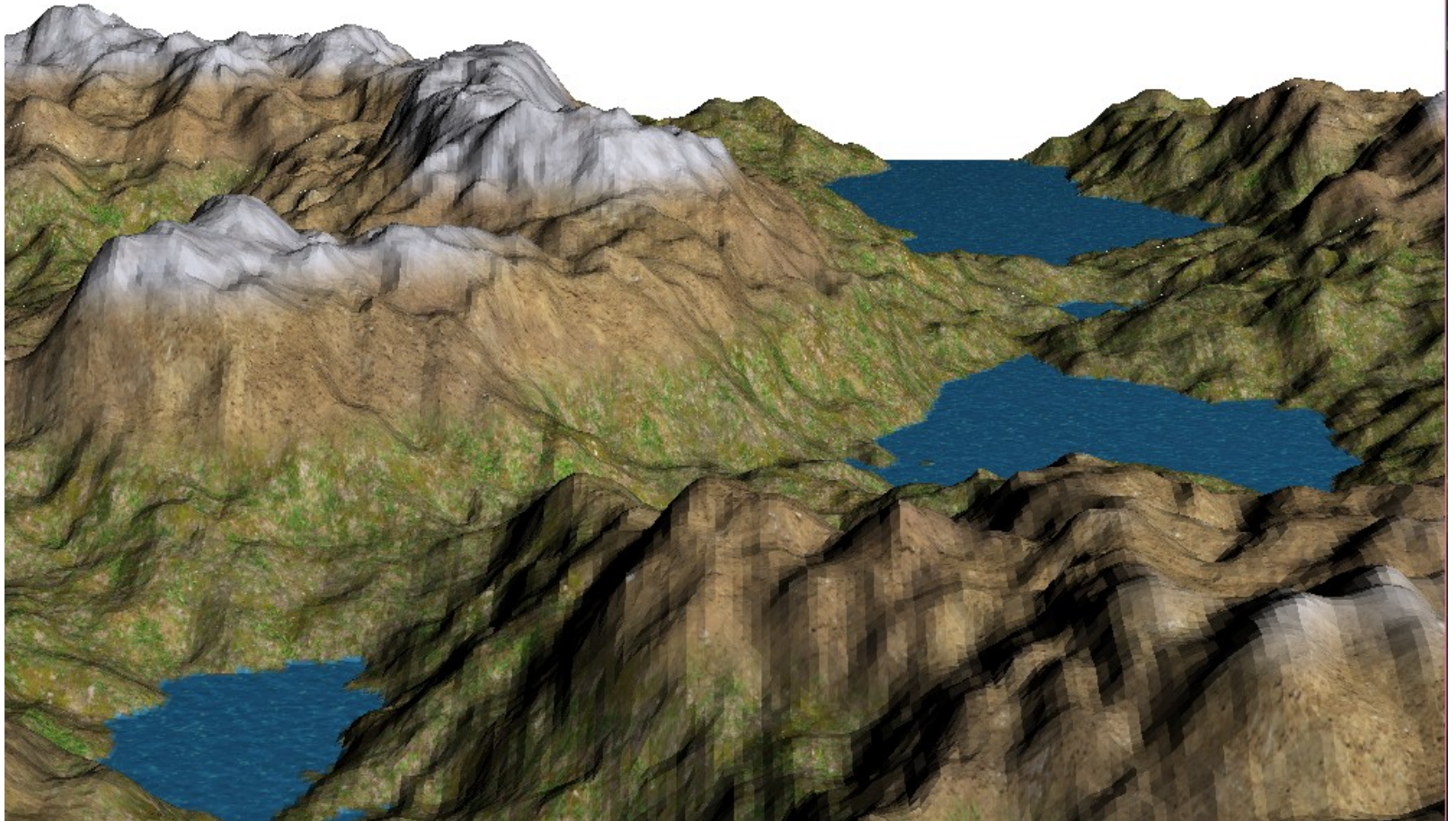
Advanced Application Examples: Terrains



Advanced Application Examples: Terrains



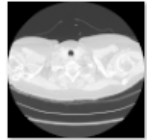
Advanced Application Examples: Terrains



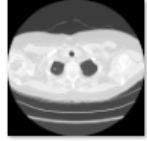
Number of triangles $\approx 15,000$

Advanced Application Examples

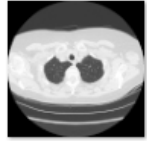
Medical Data Visualization



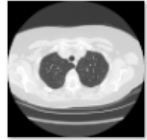
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IMS01_022.png



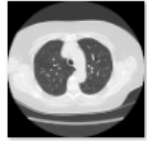
IMS01_033.png



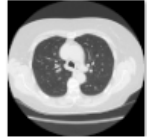
IMS01_044.png



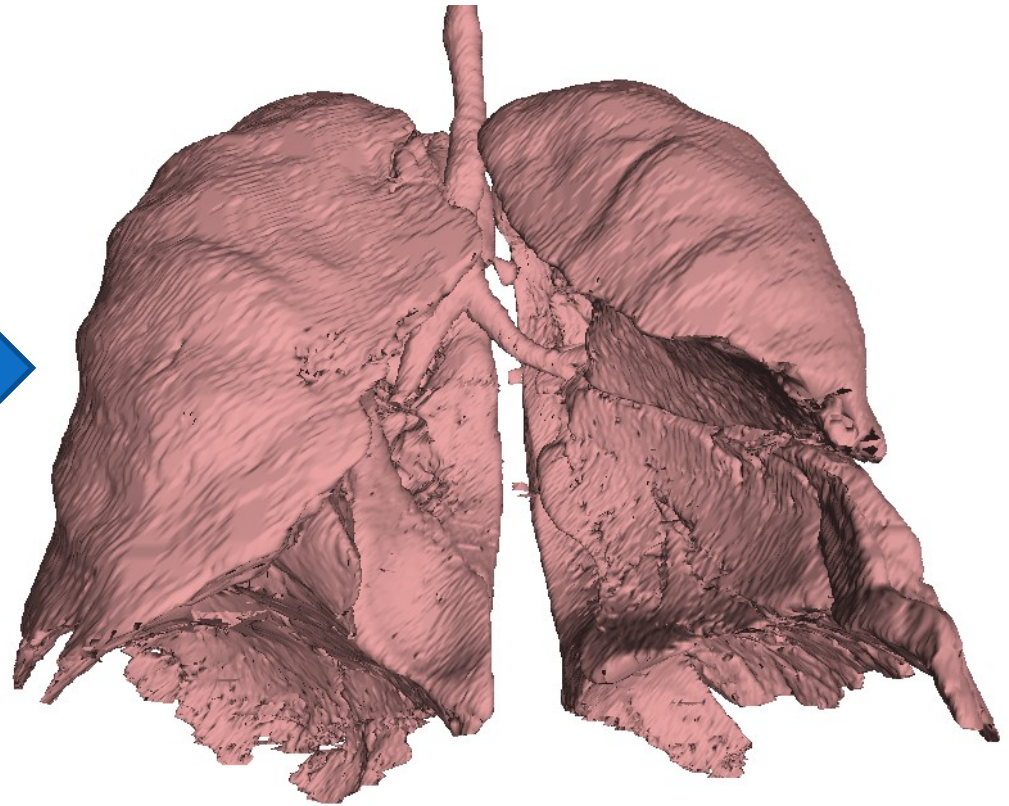
IMS01_055.png



IMS01_066.png



210 Axial
HRCT Scans



Number of triangles $\approx 1.8\text{M}$