

CSE 167:
Introduction to Computer Graphics

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University of California, San Diego
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CALPIRG

- ▶ Announcement by Ron

TA and Tutors

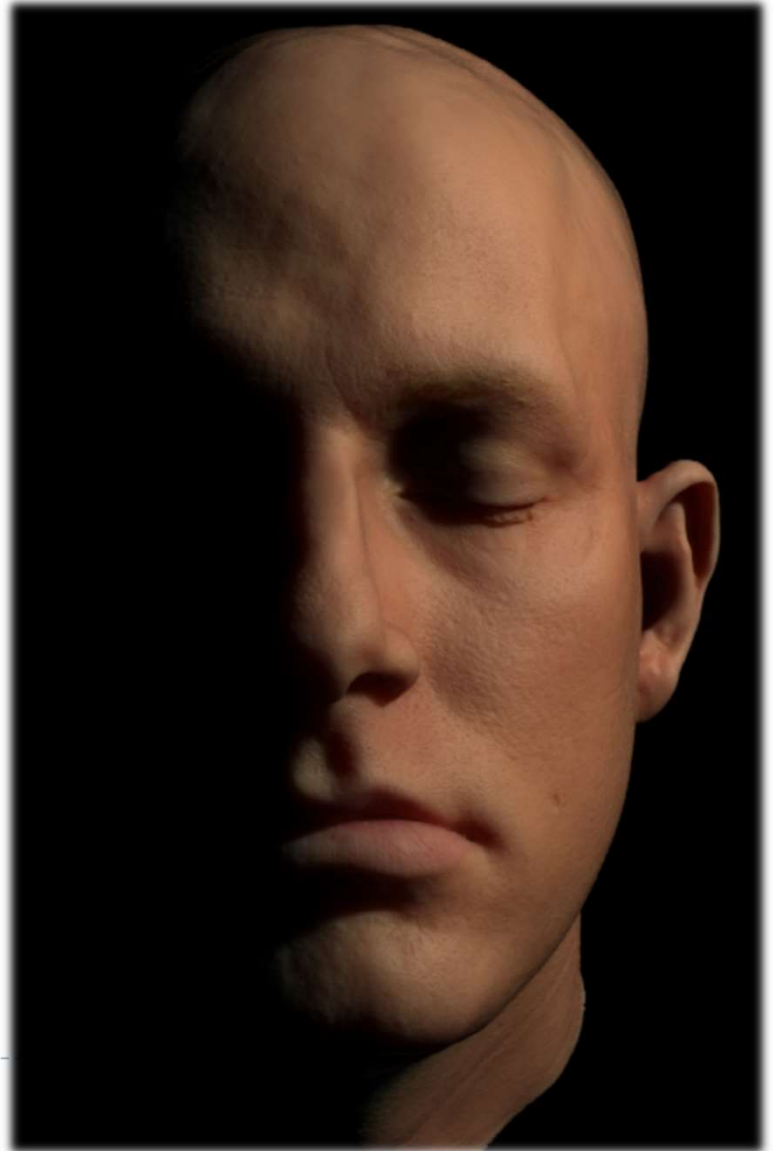
- ▶ **Teaching Assistant:**
 - ▶ Jimmy Ye
- ▶ **Tutors:**
 - ▶ Kevin Huang
 - ▶ Andy Hwang
 - ▶ Weichen “Richard” Liu
 - ▶ Wanze “Russell” Xie
 - ▶ Jianhan “Joanna” Xu
 - ▶ Chenlin Ye

Course Overview

Rendering

- ▶ **Synthesis of a 2D image from a 3D scene description**
 - ▶ Rendering algorithm interprets data structures that represent the scene in terms of geometric primitives, textures, and lights
- ▶ **2D image is an array of pixels**
 - ▶ Red, green, blue values for each pixel
- ▶ **Objectives**
 - ▶ Photorealistic
 - ▶ Interactive

Photorealistic rendering



Photorealistic rendering

- ▶ Physically-based simulation of light, camera
- ▶ Shadows, global illumination, multiple bounces of light
- ▶ Slow, can take minutes or hours to render an image
- ▶ Used in movies, animation
- ▶ Covered in CSE 168: Rendering Algorithms

Interactive rendering



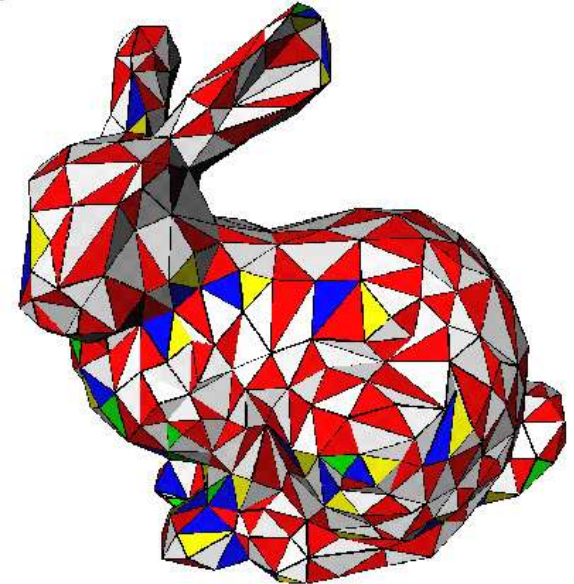
Interactive rendering

- ▶ Produce images within milliseconds
- ▶ Using specialized hardware, graphics processing units (GPUs)
- ▶ Standardized APIs (OpenGL, DirectX)
- ▶ Often “as photorealistic as possible”
- ▶ Hard shadows, only single bounce of light
- ▶ Used in games, technical design, etc.
- ▶ Covered in this course

What to render?

- ▶ 3D models
- ▶ Basic 3D models consist of array of triangles

- ▶ 3D model sources:
 - ▶ Created with 3D modeling tool
 - ▶ Loaded from files
 - ▶ Procedurally generated: by code you write
 - ▶ Created by scanning real-world objects

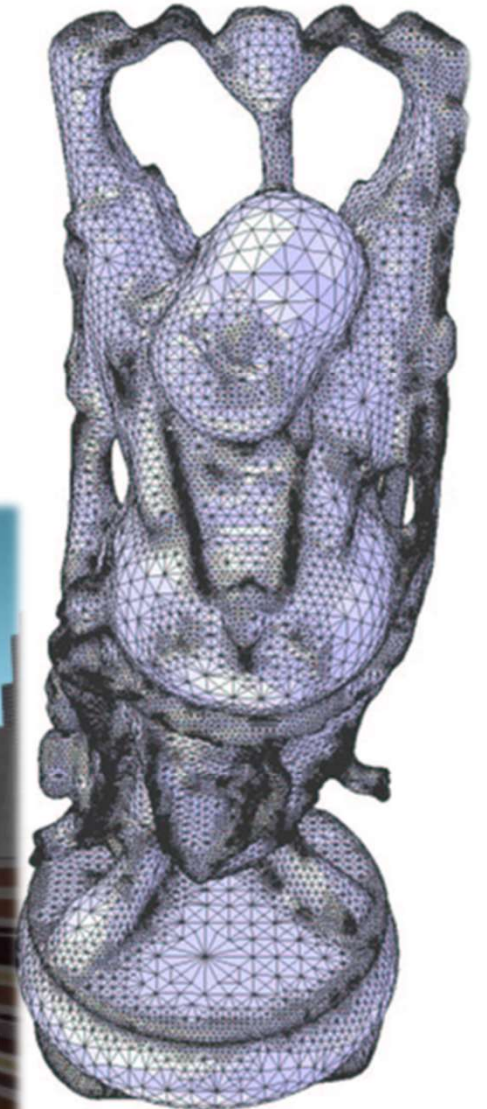


Modeling

Procedural tree

Scanned statue

Procedural city



Prerequisites

Expected is familiarity with:

- ▶ C++
- ▶ Object oriented programming concepts
- ▶ CSE 100:Advanced Data Structures
 - ▶ Advanced data structures in C++, e.g., graphs
 - ▶ Data structure analysis
 - ▶ Reason about appropriate data structures to solve problems
 - ▶ C++ with STL
 - ▶ Version control systems (GIT, etc)

Topics Covered

- ▶ **Basic skills:**
 - ▶ Vector and matrix mathematics
 - ▶ Coordinate system transformations
 - ▶ 3D to 2D projection
 - ▶ Rasterization

Topics Covered

- ▶ **OpenGL:**
 - ▶ Lighting
 - ▶ Texturing
 - ▶ Shading
 - ▶ GL Shading Language (GLSL)

Topics Covered

- ▶ **High Level Concepts:**
 - ▶ Scene Graph
 - ▶ Culling
 - ▶ Parametric Curves and Surfaces
 - ▶ Procedural Modeling

Topics Covered

- ▶ **Visual Effects:**
 - ▶ Environment Mapping
 - ▶ Shadows
 - ▶ Deferred Rendering

Course Organization

Information on Web Site

URL: <http://ivl.calit2.net/wiki/index.php/CSE167F2018>

- ▶ Course Staff
- ▶ Office Hours
- ▶ Weekly Schedule
- ▶ Textbooks
- ▶ Homework Assignments
- ▶ Grading Information
- ▶ Course Schedule

TritonEd

- ▶ **For homework and exam grades**
 - ▶ Check your grades regularly
 - ▶ Let us know if a grade is missing or incorrect
 - ▶ Allow a few days for grades to be entered
- ▶ **Upload source code**
 - ▶ Only ASCII (text) files

Programming Projects

- ▶ 5 programming assignments
 - ▶ First four projects are individual projects, final project is team project
- ▶ Find assignments and due dates on home page
 - ▶ Due dates every other week
- ▶ Starter code is on home page
- ▶ Use CSE basement labs or your own PC/laptop
- ▶ Individual assistance by TAs/tutors during office hours
- ▶ Turn in by demonstration to course staff during homework grading hours on Fridays
 - ▶ Demonstration can be done on lab PC or personal laptop
 - ▶ Grading from 2pm until at least 3:15pm
 - ▶ Required: submit source code by 2pm
- ▶ All programming projects have extra credit option for extra 10% score

If you can't come to grading

- ▶ Submit source code by 2pm on due date as usual
- ▶ Email instructor:
 - ▶ Reason of absence
 - ▶ When you can demo project instead (in TA/tutor office hours)

Waitlisted Students

- ▶ Includes Extension School and Concurrent Enrollment
- ▶ Recommended to work on homework project even if not yet enrolled
- ▶ Email instructor to be added to Piazza
- ▶ TritonEd has to wait until enrolled

Homework Project 1

- ▶ Will go on-line by tomorrow evening
- ▶ In the meantime: get starter code working

Announcements

- ▶ **First homework discussion**
 - ▶ Wednesday at 3pm
 - ▶ Center Hall 109

Final Projects from Fall 2017

▶ Domino in “Ourscraft”

▶ Yiming Cai, Yue Pan, Ke Che

▶ <https://www.youtube.com/watch?v=6WzA6nAiVBA&list=PLINx2DKpKpTvFEnpwyLmtmZK5LXIBP5x&index=23&t=0s>

▶ Star Date 700

▶ Chris Crutchfield, Jake Sutton, Alex Lui

▶ <https://www.youtube.com/watch?v=87pFNy-YAzI&list=PLINx2DKpKpTvFEnpwyLmtmZK5LXIBP5x&index=44&t=0s>

▶ Western town ft. pig

▶ Joel Andersson Pablo Canas Castellanos

▶ <https://www.youtube.com/watch?v=Q6wrhBo337k&list=PLINx2DKpKpTvFEnpwyLmtmZK5LXIBP5x&index=13&t=0s>