Computer Graphics, CSCI 480

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Outline

- ▶ Introduction to fundamental algorithms of computer graphics.
- ▶ Study implementations in general purpose language (python).
- ▶ Study both raytracing and direct rendering.
- ▶ See how important algorithms have been built into hardware and accessed by a special purpose library, OpenGL.

Grading

- 25%: Homework assignments. Pencil and paper, math work.
- 25%: Programming assignments. Turn in on Canvas.
- 20%: Midterm. Wednesday, October 28
- 30%: Final. Tuesday, December 8, 8:00am.

Extra Credit

- Up to 10 extra credit points can be earned by doing a project.
- Project must be proposed, in writing, to the instructor three weeks before the last day of class.
- Project must be approved by the instructor, possibly with modifications, within 72 hours.
- Must include a substantial programming component.
- Must include a writeup.
- Must include well annotated source code.
- Must be complete and turned in before the last day of class.

Academic Dishonesty

- ▶ Read Appendix D of the University Catalog.
- ▶ Do not share code.
- ▶ Follow the **Simpson's Rule**

Python, pygame, numpy, pyopengl

- Programming language for the course: **python**
- **Pygame**: a python package to facilitate game programming
- **Numpy**: a python package for numerical operations, including linear algebra
- **Pyopengl**: a python package wrapping the OpenGL language

Why python?

- It is easy.
- It is easy to do hard things; many data structures and programming styles out of the box.
- It is OS neutral.
- It has easy access to numerical libraries.
- It has easier interface to OpenGL.
- It has pygame, so 3D applications can be given game-like controls.

Learning python and pygame

- ▶ Work through a python tutorial, *e.g.*:
  http://interactivepython.org/courselib/static/
  thinkcspy/index.html
- ▶ Work through some of the pygame examples (installed with download), especially:
  https://www.pygame.org/docs/tut/chimp/
  ChimpLineByLine.html
- ▶ Structure of `pygamecolors.py`

Schedule

- ▶ Week 1: Introduction, python, pygame
- ▶ Week 2: noise, linear algebra
- ▶ Week 3-4: raytracing: intersection tests, Phong reflection model, normals, Whitted raytracing, texture coordinates, implicit surfaces, parametric surfaces, derivatives,
- ▶ Week 5: transforms, direct rendering, line rendering, polygon filling, Phong shading
- ▶ Wednesday, October 28: Midterm
- ▶ Weeks 6-10: OpenGL
- ▶ Tuesday, Dec 8: Final exam, 8:00am.