This course is about the programming of 3D computer graphics. During the first half of this course, we will focus on the high-level programming of 3D graphics applications using the OpenGL API. (This approach, as the author of the textbook describes it, is like leaning to drive a car without having to know what's under the hood.) Then, during the second half of this course, we will study the whole process of a 3D renderer, which we will implement as a three-part assignment. There is also a final project. If time allows, we will also cover advanced topics such as texture mapping, curve surfaces, global illumination...etc.

Note that this course requires intensive programming in C or C++ (possibly 5,000 to 15,000 lines of code).

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Textbooks: None (You’re recommended to have at least one of references #1 to #4.)

References:

Grading: OpenGL Assignments: 25%, 3D Pipeline Implementation: 30%, Final Project: 35%, Class Participation: 10%

Topics and Schedule: (subject to change)
Part I: Leaning to Drive -- Writing 3D Applications
- Overview (1 week)
- OpenGL Programming (2 weeks)
- Transformations (1 week)
- Viewing (1 week)
- Shading (1 week)

Part II: Under the Hood: Implementation of a Renderer
- Geometric Processing (1 week)
- Clipping (1 week)
- Hidden Surface Removal (1 week)
- Scan Conversion (2 weeks)
- Texture Mapping (1 week)

Part III: Advanced Topics
- Culling techniques, Programmable shading, Curves and Surfaces, global illuminations, and Image-Based Rendering,...etc. (3-4 weeks)