COMP 371 - Owen Hellum - Project Proposal

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Motivation

As someone who uses 3D modelling software such as Blender, advanced graphics and rendering tools as indispensable. Often, key functionalities are built upon simple concepts derived from the study of computer graphics and computer science. One such method/tool is Constructive Solid Geometry (CSG), or 3D Boolean Operations. The ability to perform union, intersection, etc. operations upon “primitive” shapes is fundamental to may 3D creation pipelines. I aim to simulate CSG in OpenGL for my project.

Description

Given a series of primitive objects and relevant boolean operations, my project should be able to perform the given operation upon them and display the result. This process should be quick and invokable from the command line with sufficient parameters. Whether for 3D modelling or purely generative art purposes, the images should be rendered clearly.

Objectives

1. Allow the loading and editing of primitive and arbitrary obj files
2. Implement union, subtraction, difference, and intersection boolean operations of structures
3. Properly handle custom shading/texturing of resulting geometry from the above operations
4. Generate obj files of resulting geometry
5. Allow for primitives and operations to be invoked via the command line

Resources found

- Libraries/projects
  - CSB library for OpenGL (looks complex, but maybe I can use it as inspiration)
  - CSG student project using the Stencil Buffer (could be useful as its probably on the same ambition-level as my project)
  - Video doing CSG with the Stencil Buffer (Stencil Buffer seems to be the way to go)
- Forum comments
  - Forum comment with OpenGL CSG code (probably pretty old)
  - Forum comment with succinct description of two different CSG methods
  - Forum comment finding the intersection of two 2D rectangles (code is in Python, but could be useful)
  - Forum comment that mentions a clipping method (perhaps unrelated)