Homework #3 (100 pts total; due Mon 4/19 @ 11:59pm)
CSCI 3353 - Hibbs

Instructions: For this assignment, you may work on your own, or with another student. In either case, you must complete the "Main Assignment" portion below, which is worth a maximum grade of a D (60%). In order to receive full credit for this assignment, you must also complete additional extensions. Students working individually should complete 2 extensions for full credit; students working in pairs should complete 4 extensions to receive full credit. Assignments will be graded based on:

- Accurate completion of the main assignment, including 1-page write up (50%)
- Accurate completion of two (four for pairs) extensions (40%)
- My own subjective aesthetics (10%)

Again, we will use google classroom to turn in homework by uploading a Processing archive with your results. To create an archive, from within Processing select "Tools/Archive Sketch," then specify the filename/location for the archive. This assignment should follow the convention hw3_username.zip where "username" is replaced with your username. If you are working in a pair, include both usernames (separated by an "_"). For example, if I was working with Dr. Myers on this assignment, our archive would be hw3_mhibbs_pmyers.zip. Once you have created this archive, on the classroom assignment page select "Add or Create" and upload your archive before turning in your assignment.

Main Assignment

Write a Processing sketch displaying a 3D model within a "glass ball" (also called an "arcball") interface. When the user left-clicks and drags, the model should rotate in a way that "follows" the mouse movements. (*HINT*: There are two main possible approaches to this problem: 1) make updates to the transformation matrix that rotate the model in world space; or 2) move the camera around the model by changing the eye and up vectors and leaving the center vector in the model.) Your grade is partially determined by the complexity of the model you display. At a minimum (C-grade level) the model you display should be more complicated than the box, sphere, planes, or pyramids discussed in class. You are *NOT* permitted to load or utilize a pre-existing 3D model for this assignment. ***ALSO***, include a brief write-up (less than 1 page) describing your model, how you approached the "glass ball" interface, ***and which extensions you implemented***.
An example of a glass ball interface can be found at the Protein Data Bank to visualize the 3D structure of molecules. Here's a link to a glass ball interface showing human deoxyhemoglobin protein:
https://www.rcsb.org/3d-view/4hhb/1

Possible Extensions

1. Include right-click and drag to implement "roll" (this would rotate the model around an axis from the center of the model to the camera).
2. Include texture mapping on your non-trivial model.
3. Use per-vertex surface normals on your non-trivial model and include specular lights in your scene.
4. Utilize constructive solid geometry to construct your 3D model (utilize at least 2 of the union, subtraction, and intersection operations -- e.g. using just union is not enough).
5. Some other extension that you propose and have confirmed with me.