Homework #4 (60 pts total; due F 5/7 @ 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 an A (60 out of 60) for students working alone. Students working in pairs should complete 1 extension to receive full credit. Assignments will be graded based on:

- Accurate completion of the main assignment, including 1-page write up (55 pts)
    - NOTE: An extension is required for students working in pairs
- My own subjective aesthetics (5 pts)

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 hw4_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 hw4_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 allowing the user to explore a 3D world, such as a space simulation or underwater simulation. The WASD keys should move the user forward/back (WS) and turn (or strafe, your choice) the user left/right (AD). (Note that the "`keyPressed()`" callback function is called just once every time a key is initially pressed down; however, there is also a "`keyPressed`" global Boolean variable that will be true so long as the key is down, which could be used within the `draw()` function to make updates every frame.) Mouse movements should allow the user to control pitch, yaw, and roll (likely with a mouse button down for roll). Your scene should include at least 3 types of 3D objects/models (e.g. planets, space stations, gas clouds, animals, plants, coral, etc). One of these objects should be some form of textured "skybox" or "ground plane." For example, for a space simulation, you could include a large texture mapped sphere as a starfield; for an underwater simulation, you could include a very large texture mapped floor plane. Of the remaining 2 objects, only 1 may be a "simple" 3D object discussed in class, such as a sphere or cube. ***ALSO***, include a brief write-up (less than 1 page) describing your scene, how you approached the user interface, which 3 types of 3D models you included, and which extensions you implemented. *Be sure to address each of these 4 points in your write-up.* Your grade will be based, in part, on the complexity of the models included in your scene and the quality of movement achieved through the mouse/keyboard.

HINT: A good way to achieve this is to keep track of the location and orientation of the camera, and alter those as the user moves around, making a call to camera() during draw. You will likely need to keep 3 PVectors/Vec3Ds for this: a camera location, a direction the camera is pointing, and a vector pointing up from the camera.

Possible Extensions (only required for students working in pairs)

1. Include a 3D L-system (made of geometry, not just lines) as one of your models.
2. Include texture mapping on a non-trivial model.
3. Include a custom set of vertex/fragment shaders (doing something more than what was covered in class).
4. Include music/sound in your sketch, doing something more than just playing a song.
5. Use constructive solid geometry to create at least one of your models.
6. Include a "cockpit" in your scene.
7. Include collision detection, such that your player cannot move to be "inside" any of your scene objects.

8. Some other extension that you propose and have confirmed with me.