




7. Computer Graphics and Animation

7.1 Getting Familiar with Graphics

[Processing] Processing provides handy APIs for creating 2D/3D objects and 2D/3D animations. To generate 3D graphics in Processing, it is helpful to know about the 2D transformations. Please go through this on-line tutorial on 2D transformation at <https://processing.org/tutorials/transform2d/>. To generate 3D graphics in Processing, please refer to the online tutorial at <https://processing.org/tutorials/p3d/>. After walking through the tutorials, please make sure that you are familiar with how to

1. Creating geometries with vertices
2. Applying light
3. Adjusting the positions of camera
4. Shifting and rotating the objects with transformations


[Python] The opengl link can be found at: <http://www.opengl-tutorial.org/beginners-tutorials/tutorial-1-opening-a-window/>

 Question: Why transformations are used in drawing 2D/3D objects?

7.2 Orbit Simulator

Make two spheres A (moon) and B (earth) rotate according to the Y axis at the same time. Ball A orbits around the ball B with a predefined radius. Two more things you can try for more fun:

- Orbiting trajectory with more complex math
- Adding more hierarchical layers of orbiting, e.g. the earth orbits around the sun and the sun orbits around a larger sun, etc.

[Processing]  loadImage can be used to load the texture of earth or moon.

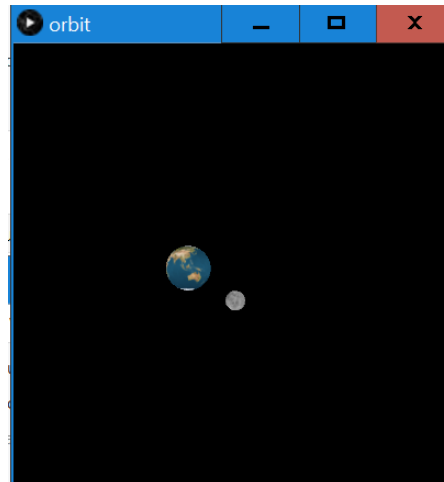




Figure 7.1: A visual example of tiny solar system.

[Processing]  Set the radius of the sphere with `createShape`.


[Processing]  `rotateY` and `rotateZ` can be used to control rotation speed.

[Python]  In terms of `pyopengl`, the syntax of `opengl` is similar to `pyopengl`. If you want to find examples of `pyopengl`, have a look at examples of `opengl` first.

[Python]  The syntax of `pyopengl` is also similar to Processing such as `glRotatef`, `glPushMatrix`, `glColor3f`, and `glPopMatrix`.

7.3 Rotating Cube

Draw a cube using 8 vertices and rotate at certain angle. Understand the drawing principles of using vertex function. In other words, how to create geometric using vertex function.

[Python]  The main framework of `pyopengl` usually consists of `glutInit`, `glutDisplayFunc`, `glutIdleFunc` and `glutMainLoop`.

7.4 Bouncing particles (Lab Submission 2 - Due Week 11)

Please refer to the LabSubmission2 specification released in week8.

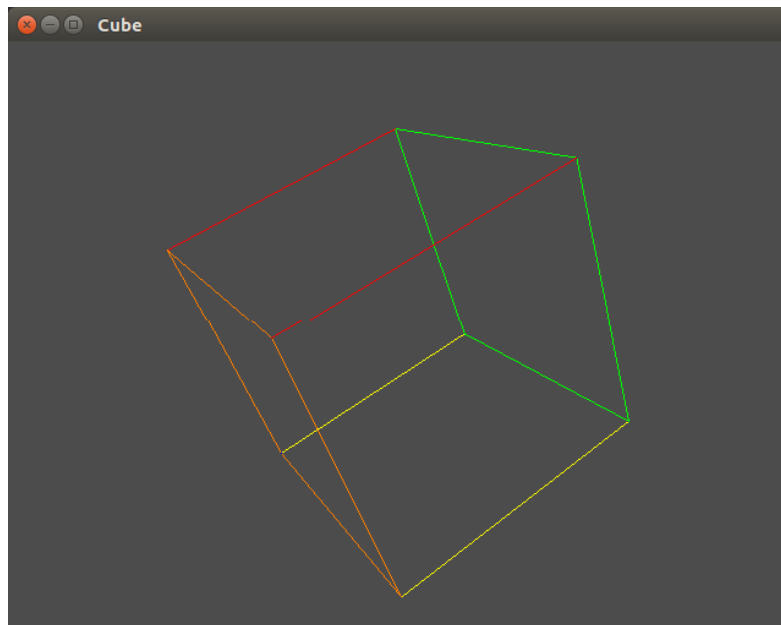


Figure 7.2: A visual example of rotating cube.