CMSC427 Fall 2017 Lab 2

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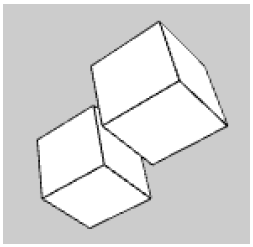
Part I

Playing with rotations and translations led me to the conclusion that the x axis of the canvas is a horizontal line pointing right, the Y axis is a vertical line point down, and the Z axis is pointing inward into the screen. Rotating a positive angle will rotate the objects counter-clockwise w.r.t. the chosen axis. Similarly, shearing a positive angle will shear the objects counter-clockwise w.r.t the chosen axis. In addition, objects are always sheared around their relative position to the origin.

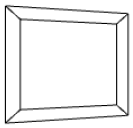
Switching the order of a sequence of transformations will give different viewings. For example, the smaller one of the two boxes below was achieved by first rotate then translate, the larger one was achieved by first translate then rotate.

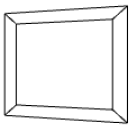


For the three boxes task I combined rotation, shearing and translation using different parameter values. I used pushMatrix()/popMatrix() for each box.

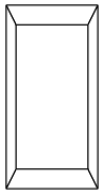
Part II

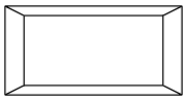
Moving the Eye position and/or the Center position allows the objects to be seen from different angles. For example, the two boxes below were viewed with the Center point at (width/4, height/2, 0) and (3*width/4, height/2, 0) respectively.





Different Up vectors give viewings of the objects in different orientations. The below two boxes use (1,0,0) and (0,1,0) as the Up vector respectively.





Part III

Changing FOV to a larger number makes the box look smaller on the screen; in contrast, changing FOV to a smaller number makes the box look larger.

Quite counter-intuitively, using a smaller width to height ratio make the box look wider. This is probably due to a smaller horizontal field-of-view zoomed to the width of the canvas results in elongation of the box in horizontal axis. Using a larger width to height effect has the opposite effect.

Changing the position of the front clipping plane changes not only when the box can be seen but also how large the box appears on the screen. Changing the position of the back clipping plane only changes when the box can be seen.

```
//Lab2: Part I
size(400,400,P3D);
translate(width/2,height/2,0);

//draw the box in the middle
pushMatrix();
rotateX(PI/4);
rotateY(PI/4);
box(50);
popMatrix();

//draw the box on the left
pushMatrix();
translate(-width/4, 0, 0);
rotateX(PI/6);
rotateZ(PI/3);
shearY(PI/6);
box(50);
popMatrix();

//draw the box on the right
pushMatrix();
translate(width/4, 0, 0);
rotateZ(PI/6);
rotateX(PI/3);
shearX(PI/6);
box(50);
popMatrix();
```