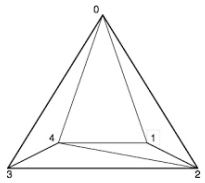
Lab03 Transformation

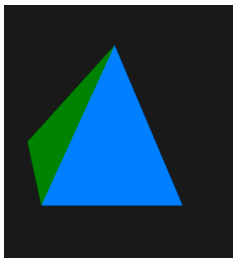
3/16/2021

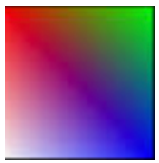
Drawing a pyramid

1. Draw a pyramid using multiple triangles
   - E.g. A pyramid has 5 faces
     - The bottom face is formed by 2 triangles

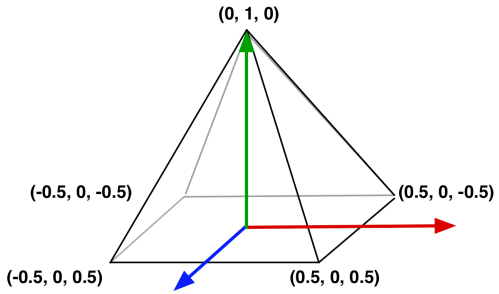


- Assign a single color for each face as shown below
  - Only the bottom face (rectangle face, formed by 2 triangles) is interpolated with multiple colors





Bottom face



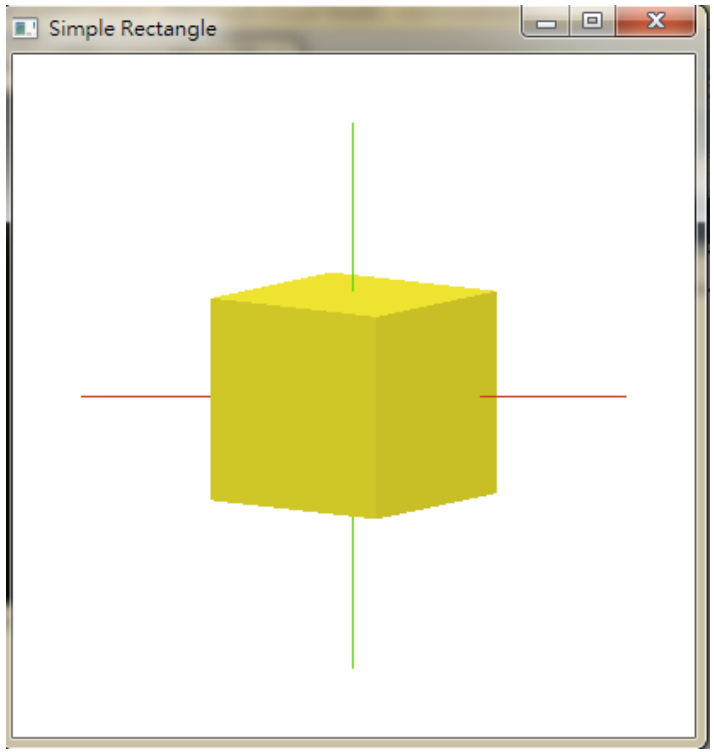
you can scale the coordination shown above

Exercise - Moving the pyramid

1. First, make sure your program draws a static pyramid
2. Draw 3 lines to represent x, y, z axis
3. Try to implement your code:
   - Keyboard control
     - Translate on x, y, z, respectively
     - Rotate the cube on x, y, z, respectively
     - Reset to the original status

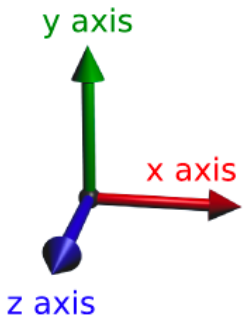
Hint: In this execrise, use the function gltranslate. glrotate

Exercise



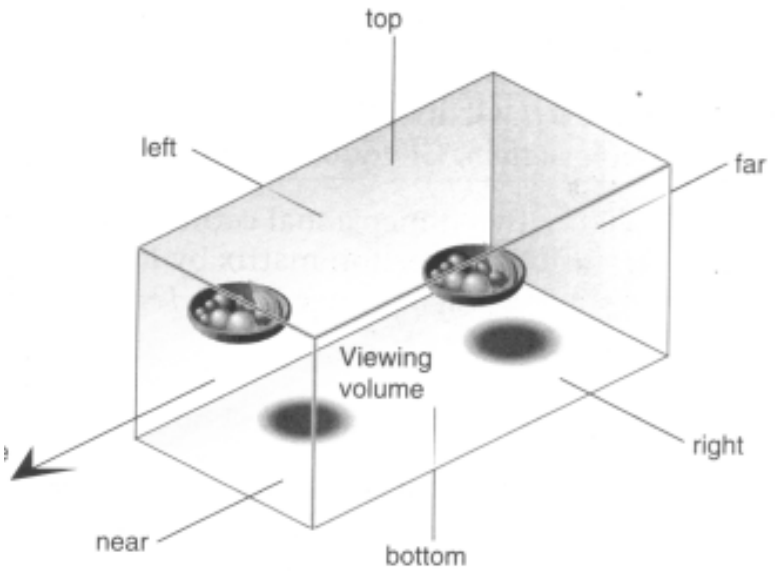
Draw a pyramid instead of Cube

glTranslatef(tx,ty,tz)



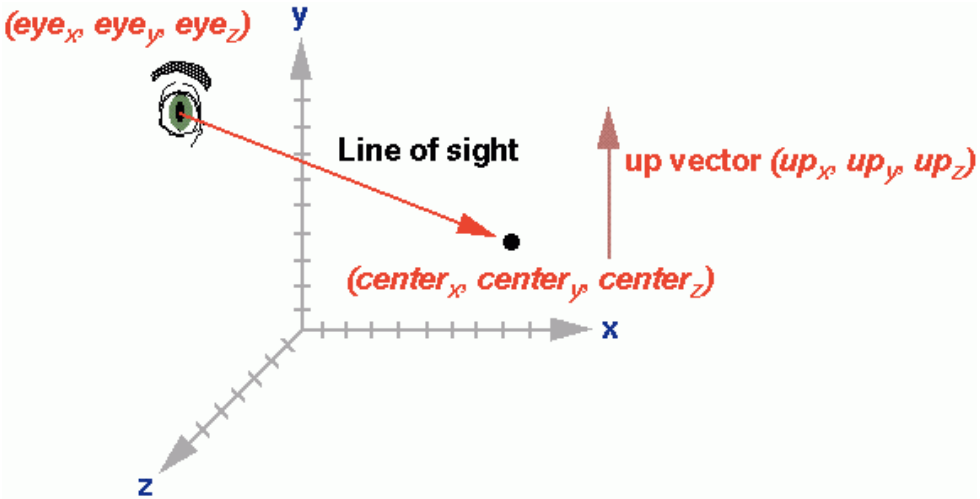
glOrtho

- glOrtho(-10,10,-10,10,-10,20);



gluLookAt

- gluLookAt(0,0,10.0f ,0,0,0, 0,1,0);



Main

```
int main(int argc, char** argv)
{
   //These are variable that you will need
   //to move your cube
   tx=0; ty=0; tz=0;
   thetaX=0; thetaY=0; thetaZ=0;
   //

   glutInit(&argc, argv);
   glutInitDisplayMode(GLUT_SINGLE | GLUT_RGB);
   glutInitWindowSize(400,400);
   glutInitWindowPosition(600,80);
   glutCreateWindow("Moving Cube");
   SetupRC();
   glutReshapeFunc(ChangeSize);
   glutDisplayFunc(RenderScene);
   glutKeyboardFunc(myKeyboard);
   glutSpecialFunc(mySpecialKey);

   glutMainLoop();
   return 0;
}
```

Reshape Function

```
void ChangeSize(int w, int h)
{
    glViewport(0, 0, w, h);
    glMatrixMode(GL_PROJECTION); // load the projection matrix
    glLoadIdentity();
    glOrtho(-10,10,-10,10,-10,20);
    glMatrixMode(GL_MODELVIEW);
    glLoadIdentity();
}
```

Display Function

```
void RenderScene(void)
{
   glClearColor(1.0, 1.0, 1.0, 1.0);
   glClear(GL_COLOR_BUFFER_BIT | GL_DEPTH_BUFFER_BIT);
   glMatrixMode(GL_MODELVIEW); // load the modelview matrix
   glLoadIdentity();
   gluLookAt(0,0,10.0f ,0,0,0, 0,1,0);

   //draw X-axis, Y-axis and Z-axis
   //use:
   //glColor3f( r, g, b);
   //glBegin(GL_LINE);
   //glVertex3f( -x, 0, 0);
   //glVertex3f( x, 0, 0);
   //glEnd();

   //perform transformation for the cube
   //use:
   //glRotatef(theta, x, y, z);
   //glTranslatef(tx,ty,tz)


   //cube
   glColor3f( 1, 1, 0);
   glutSolidCube(6);
   glutSwapBuffers();
}
```

Implement your code here

Set your transformation before you draw the pyramid

Draw a pyramid instead of Cube

keyboard Function

```
void myKeyboard(unsigned char key, int x, int y)
{
  switch (key)
  {
  case 'r':
      //reset translation & rotation
      break;
  case 'a':
      //change the rotation angle thetaX along x-axis
      break;
  case 'd':
      //change the rotation angle thetaX along x-axis
      break;
  case 'w':
      //change the rotation angle thetaY along y-axis
      break;
  case 's':
      //change the rotation angle thetaY along y-axis
      break;
  case 'z':
      //change the rotation angle thetaZ along z-axis
      break;
  case 'x':
      //change the rotation angle thetaZ along z-axis
      break;
  default:
      break;
  }
  glutPostRedisplay();

}
```

For example:

thetaX+=3;

In DisplayFunc:
glRotatef(thetaX, 1,0,0);

Special keyboard Function

```
void mySpecialKey(int key, int x, int y)
{
    switch (key)
  {

  case GLUT_KEY_LEFT:
      //change the translation along x-axis
      break;
  case GLUT_KEY_RIGHT:
      //change the translation along x-axis
      break;
  case GLUT_KEY_UP:
      //change the translation along y-axis
      break;
  case GLUT_KEY_DOWN:
      //change the translation along y-axis
      break;
  default:
      break;

  }
  glutPostRedisplay();

}
```

For example:

tx-=0.2;

In DisplayFunc:
glTranslatef(tx,ty,tz);