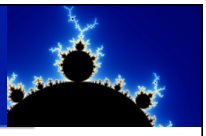
Computer Graphics



Forming 3D objects

Code for Example

- The code to draw each object is imbedded in a modelViewMatrix.push(), modelViewMatrix.pop() pair.
- To draw the *x*-axis, the *z*-axis is rotated 90° about the *y*-axis to form a rotated system, and the axis is redrawn in its new orientation.
- This axis is drawn without immersing it in a pair modelViewMatrix.push(), modelViewMatrix.pop() , so the rotation to produce the *y*-axis takes place in the already rotated coordinate system.

Demo
Solid 3D Drawing in OpenGL

- A solid object scene is rendered with shading.
- The scene contains two objects resting on a table in the corner of a room.
- The three walls are made by flattening a cube into a thin sheet and moving it into position.
- The jack is composed of three stretched spheres oriented at right angles plus six small spheres at their ends.

Solid 3D Drawing in OpenGL (3)

- The table consists of a table top and four legs.
- Each of the table's five pieces is a cube that has been scaled to the desired size and shape (next slide).
- The table is based on four parameters that characterize the size of its parts: topWidth, topThick, legLen, and legThick.

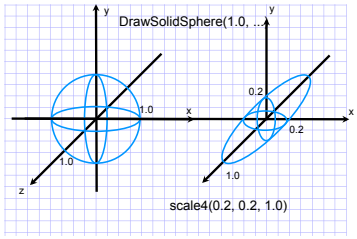
Solid 3D Drawing in OpenGL (4)

- A routine tableLeg() draws each leg and is called four times within the routine table() to draw the legs in the four different locations.
- The different parameters used produce different modeling transformations within tableLeg(). As always, a modelViewMatrix.push(), modelViewMatrix.pop() pair surrounds the modeling functions to isolate their effect.

Code for the Solid Example

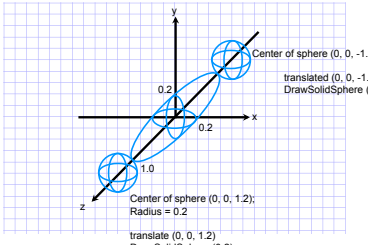
- The solid version of each shape, such as DrawSolidSphere(), is used.
- To create shaded images, the position and properties of a light source and certain properties of the objects' surfaces must be specified, in order to describe how they reflect light.
- We just present the various function calls here; using them as shown will generate shading.

Jack on Table Example



Solid sphere centered at origin

Jack on Table Example



Jack on Table Example

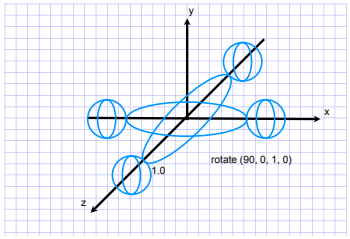
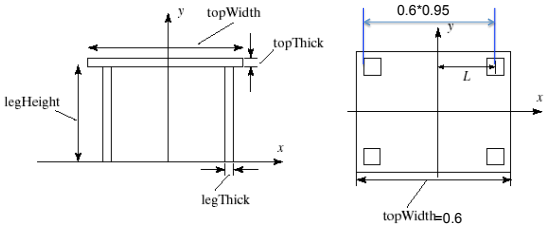
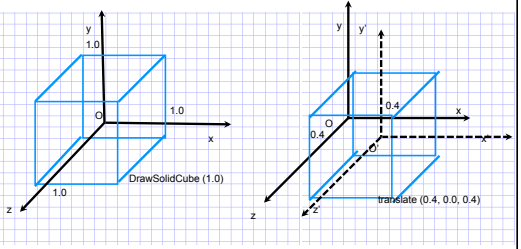


Table Construction



Jack on Table Example



Solid cube centered at origin

Draw Table Top

Jack on Table Example

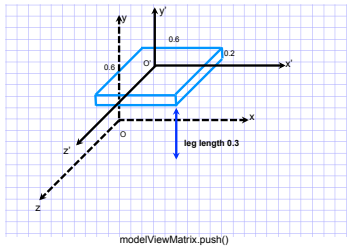


Table Width = 0.6
Table Thickness = 0.02

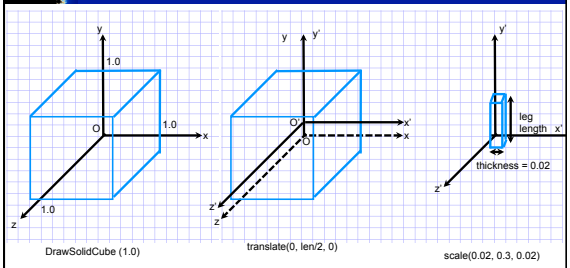
modelViewMatrix.push()

Table Top

translate (0, 0.3, 0) // O' raised 0.3 from 0 along y
scale(0.6, 0.02, 0.6) // O' (0.4, 0.3, 0.4)
DrawSolidCube (1.0)

modelviewMatrix.pop()

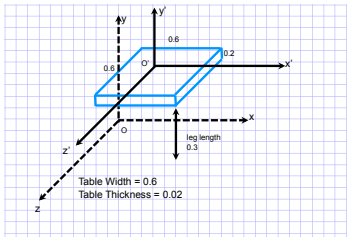
Jack on Table Example



Leg Thickness = 0.02
Leg Length = 0.3

Draw Table Leg

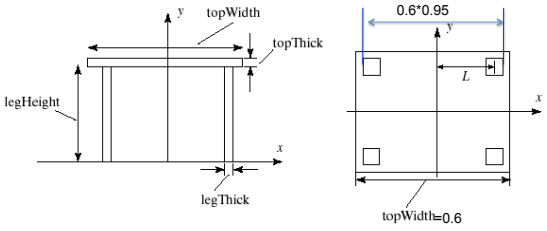
Jack on Table Example



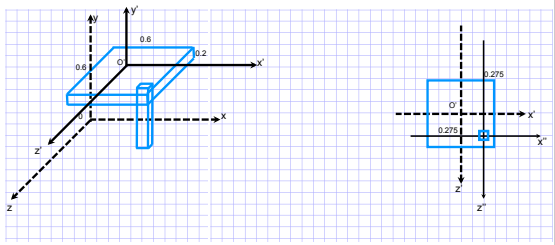

```
modelViewMatrix.push()
translate(0, 0.3, 0)
scale(0.6, 0.02, 0.6)
DrawSolidCube (1.0)
modelViewMatrix.pop()
```

Assemble The Table (draw table)

Table Construction



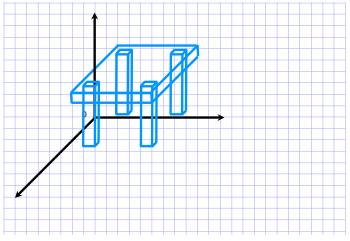
Jack on Table Example




```
modelViewMatrix.push()
dist = 0.6 * 0.95 / 2 - 0.02 / 2.0 = 0.275
translate(0.275, 0, 0.275)
DrawTableLeg(0.02, 0.3)
```

```
modelViewMatrix.push()
translate(0, len/2, 0)
scale(0.02, len, 0.02)
DrawSolidCube(1.0)
modelViewMatrix.pop()
```


Jack on Table Example



```
dist = 0.275

translate(0, 0, -2*dist)
DrawTableLeg(0.02, 0.3)

translate(-2*dist, 0, 2*dist)
DrawTableLeg(0.02, 0.3)

translate(0, 0, -2*dist)
DrawTableLeg(0.02, 0.3)
```

Assembled Table