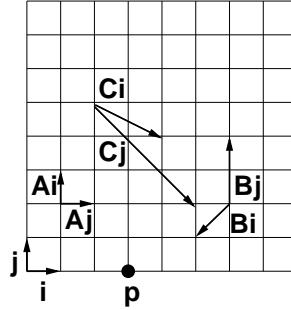


CPSC 314, Written Homework 1: Transformations

Out: Mon 21 Jan 2008
Due: Wed 6 Feb 2008 1pm sharp
Value: 4% of final grade
Total Points: 100

1. (21 pts) The point coordinate P can be expressed as $P = 3*i + 0*j$, where i and j are basis vectors of unit length along the x and y axes, respectively. Describe the point P in terms of the 3 other coordinate systems given below.



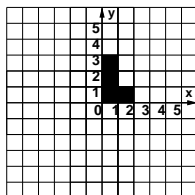
2. (3 pts) Write down the 4x4 matrix for scaling an object by 2 in y and 3 in z .
3. (10 pts) Give the OpenGL commands required to encode M . You may assume the matrix stack has been initialized with `glLoadIdentity()`.

$$\begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 2 & 1 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

4. (6 pts) Homogenize the point (2,10,8,4).
5. (20 pts) Give the 4x4 OpenGL modelview matrix at the four lines A, B, C, and D below.

```
glLoadIdentity();  
glTranslate(2,3,0);  
A  
glRotate(90, 0,1,0);  
B  
glPushMatrix();  
glScale(1,.5,1);  
glTranslate(1,1,0);  
C  
glPopMatrix();  
glScale(2,1,1);  
D
```

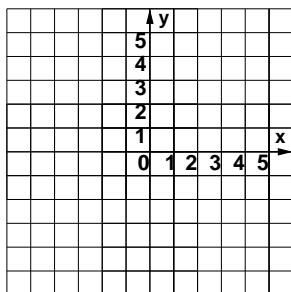
6. (40 pts) For each equation below, sketch the new location L' of the L shape on the grid and provide the OpenGL sequence needed to carry out those operations. Use the function `drawL()`, which draws an L shape with the lower left corner at the current origin as shown below. You may assume the matrix mode is `GL_MODELVIEW` and that the stack has been initialized with `glLoadIdentity()`. For reference, the OpenGL command syntax is `glRotatef(angle, x, y, z)`, `glTranslatef(x, y, z)`, `glScalef(x, y, z)`.



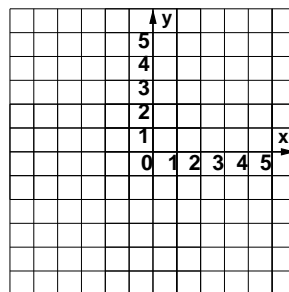
`drawL();`

$$A = \begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}, B = \begin{bmatrix} 0 & 1 & 0 & 0 \\ -1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}, C = \begin{bmatrix} 1 & 0 & 0 & -1 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}, D = \begin{bmatrix} 2 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

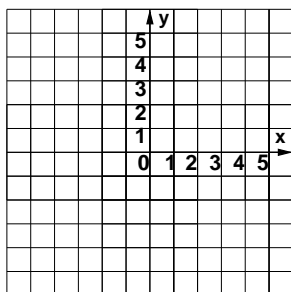
a) $L' = ABC L$



b) $L' = ACD L$



c) $L' = BAB L$



d) $L' = CBAD L$

