Written Problems for CS445 Project 2, Fall 12

3D Transformation: What are the 4x4 matrices (or product of matrices) in homogeneous coordinates that represent the following transformations. In each case, also give the inverse (if it exists). Note, you can leave answers as products of matrices and in terms of sin and cos:

a. Uniform scale by 5 around the origin.

b. Translation by (3,2,1).

c. Rotation by 50 degrees about the z-axis.

d. Reflection about the z axis.

e. Uniform scale by 2 around the point (2,-1,3).

f. Scale by 2 along y axis.

g. Scale by 2 along a direction defined by the points (0,0,0) and (1,1,0).

h. Rotation by 30 degrees along a direction defined by the points (0,0,0) and (1,0,1), and around the point (-3,10,6).

i. Projection onto the x-z plane.

j. Suppose you want to build a robot from transformed unit cubes (centered at origin) and cylinders (aligned with y axis, centered at origin, radius=.5, length=1). What is the scene graph? Suppose you wanted to rotate the arms and wheel. Label the rotations in the picture and add the transformations in the scene graph? Be as precise as possible.

width, height, depth = 3,3,3

width, height, depth = 5,8,4

radius = .5 length= 3

radius = 3 thickness =.2

y=0