Practice Transformation Problems
CS445

3D Transformation: Identify 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 through the z axis.

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

    f. Scale by 2 along the 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 about an axis which i) goes through the point (-3,10,6) and ii) is parallel to the line defined by the points (0,0,0) and (1,0,1).

    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.) You want to be able to rotate the arms by Θ (as shown). The wheel rotates by ϕ as it moves back and forth along the z axis. Except for the rotate by ϕ, the body follows the wheel as it moves. Draw the scene graph?