



CS402: Computer Graphics, Spring 22

Assignment 2 on Geometric Transformations

Multiple Choice Questions

1. If direction of rotation is Z-axis, then direction of position of positive rotation is:
(a) x to z (b) z to x (c) y to x (d) x to y
2. Expressing positions in homogeneous co-ordinate is advantageous because:
(a) It represents all geometric transformation equations as matrix multiplication
(b) 2D and 3D representations of transformations become identical
(c) Both (a) & (b)
(d) None of these.
3. In homogenous coordinate representation $[4, 2, 0]$ represents a point:
(a) Lying at infinity (b) at $(4, 2)$ (c) At $(4, 2)$ and at $(2, 1)$
(d) None of these.
4. Dragging in computer graphics is achieved through which of the following transformation?
(a) Translation (b) Scaling (c) Rotation (d) None of these.

Short answer Questions:

1. What is shearing? Explain with example.
2. Prove that the Inverse of the rotation matrix is its transpose.
3. Obtain the transformed co-ordinates of vertices of triangle ABC, with A(0, 0), B(1, 1) and C(5, 2) after rotation about the point (-1, -1).
4. What is Homogeneous Co-ordinate System? How is it used for composite transformation?
5. Show how shear transformation may be expressed in terms of rotation and scaling.
6. Magnify the triangle with vertices a(0, 0), b(1, 1), c(5, 2) to twice its size while keeping c(5, 2) fixed
7. Draw the points P1 = (3,5) and P2 = (5,7), then:
 - a) Write and apply the 2D rotation matrix **R** that rotate these points by 45° clockwise around the origin.
 - b) Write and apply the 2D matrix **R** that rotate these points by 45° anti-clockwise around the pivot-point (0,3).
 - c) Write and apply the 2D scaling matrix **S** that scale these points by (2, 3) w.r.t. the origin.
 - d) Write and apply the 2D scaling matrix **S** that scale these points by (2, 3) w.r.t. the fixed-point (4, 6).

Programming Questions:

8. Write an OpenGL program that read some points and apply the transformations in question 7.