Yasaman Mostafavi — CS 411 Assignment 2

A20439542

2a. (1,1) translate by (2,3)

$$\begin{bmatrix}1\\1\end{bmatrix}+\begin{bmatrix}2\\3\end{bmatrix}=\begin{bmatrix}3\\4\end{bmatrix}\rightarrow(3,4)$$

2b. (1,1) scale by (2,2)

$$\begin{bmatrix}1\\1\end{bmatrix}\cdot\begin{bmatrix}2&0\\0&2\end{bmatrix}=\begin{bmatrix}2\\2\end{bmatrix}\rightarrow(2,2)$$

2c. (1,1) rotate 45°

$$\begin{bmatrix}1\\1\end{bmatrix}\begin{bmatrix}\cos(45)&-\sin(45)\\\sin(45)&\cos(45)\end{bmatrix}=\begin{bmatrix}\sqrt{2}\\0\end{bmatrix}$$

2d. (1,1) in 2DH (1, 1, 1)

2e. (1, 1, 2) to 2D ($\frac{1}{2}$, $\frac{1}{2}$,)

2f. (1, 2, 3) equivilant in 2DH. $(1,2,3)\cdot 2=(2,4,6)$

2g. (1, 2, 3) to 2D ($\frac{1}{3}$, $\frac{2}{3}$)

2h. what does (1,1,0) mean? Because the Z value is 0, this point is at infinity.

2i. (2,5) rotated 30° around origin.

$$\begin{bmatrix}2\\5\end{bmatrix}\begin{bmatrix}\cos(30)&-\sin(30)\\\sin(30)&\cos(30)\end{bmatrix}=\begin{bmatrix}-0.768\\5.33\end{bmatrix}$$

2j. (2,5) rotated 30° about (1,2)

$$x'=(2-1)\cos(30^\circ)-(5-2)\sin(30)+1$$
$$y'=(2-1)\sin(30^\circ)-(5-2)\cos(30)+2$$
$$=(0.366,-0.098)$$

2k. (2,5) ~~rotate 45 about origin and~~ translate by (3,4) and rotate 45° about the origin.

$$\begin{bmatrix}2\\5\end{bmatrix}+\begin{bmatrix}3\\4\end{bmatrix}=\begin{bmatrix}5\\9\end{bmatrix}\qquad\begin{bmatrix}5\\9\end{bmatrix}\begin{bmatrix}\cos(45)&-\sin(45)\\\sin(45)&\cos(45)\end{bmatrix}=\begin{bmatrix}9.8994\\2.828\end{bmatrix}$$

2l. (2,5) rotate 45° and translate by (3,4)

$x = 3\cos(45) + 4\sin(45)$
$y = -3\sin(45) + 4\cos(45)$

(4.9497+3, 2.1213+4)

(7.9497, 6.1213)

2m. (5,6) translate (1,2) and rotate 45°

(5,6)+(1,2) = (6, 8)

$x = 6\cos(45) - 8\sin(45) = 9.89949$
$y = 6\sin(45) + 8\cos(45) = 1.41421$

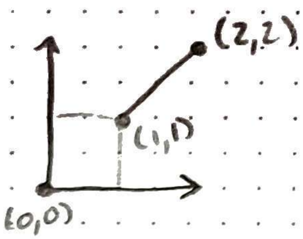
(9.89949, 1.4121)

2n. the combined matrix would equal RT, noting that the order of matrixs is important.

2o. find window to viewport transformation that transforms from a window defined by (1,1)(2,2) to a viewpoint defined by (3,3)(4,5)

$T(3,3)\, S\left(\frac{4-3}{2-1}, \frac{5-3}{2-1}\right) T(-1,-1),$

2p.



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2q. the easiest case is if the line is fully inside the bounding box, which would be if both points have binary endpoints of 0000.
to find a line fully outside, if you can line up the binary and they both have a 1 bit in the same location.