CS-663 Assignment-1 Report

Vetcha Gnana Mahesh
22B0949

1 Question-3

We want to convert coordinates from mathlab to graph. We can view it as transformation to find corresponding points from mathlab to graph. So we will find coordinates for k points in both matlab and graph which we are going to use as control points.

$$\begin{pmatrix} A_{11} & A_{12} & t_x \\ A_{21} & A_{22} & t_y \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} x_1 & x_2 & \cdots & x_k \\ y_1 & y_2 & \cdots & y_k \\ 1 & 1 & \cdots & 1 \end{pmatrix} = \begin{pmatrix} X_1 & X_2 & \cdots & X_k \\ Y_1 & Y_2 & \cdots & Y_k \\ 1 & 1 & \cdots & 1 \end{pmatrix}$$

where x_i is coordinates in matlab and X_i is corresponding coordinates in graph.

This is an equation of type $xA = b$

The bestfit solution to this is $x = b * pinv(A)$
(where pinv(A) is the pseudo inverse of A)

$pinv(A) = A^T(AA^T)^{-1}$

$\implies affinematrix = b * A^T(AA^T)^{-1}$
Now if we want to convert x_i, y_i in matlab coordinates to graph coordinates

$$affinematrix * \begin{pmatrix} x_1 \\ y_1 \\ 1 \end{pmatrix} = \begin{pmatrix} X_1 \\ Y_1 \\ 1 \end{pmatrix}$$

- Since we have 6 parameters atleast 3 control points are required to find solution
- If it is a pure translation all A values will be 0 and we get t_x, t_y values
- If it is translation plus scaling then A_{12}, A_{21} will be zero.
- If it is translation,scaling,rotation,shear then all parameters are non zero.