CS663 Assigment 1 Question 2

August 2023

In order to view the required image in MATLAB we use the impixelinfo function. Often while using systems with different coordinate systems we see that we need to make use of transformation equations and we do the same for this task. These transformation tasks can be done by using a transformation matrix or simply using the equations. We start by first identifying corresponding points from the graph we had on paper and the image on MATLAB. Since we know the coordinates for these points in both coordinate systems, we can establish a transformation that includes translation, scaling, and potentially flipping the y-axis, if needed. The transformation equation for a point (x, y) in MATLAB's coordinate system to the graph's coordinate system can be written as:

$$x_{graph} = x_{scale} * x_{matlab} + x_{trans}$$

$$y_{graph} = y_{scale} * y_{matlab} + y_{trans}$$

Now we solve for the $x_{scale}, x_{trans}, y_{scale}, y_{trans}$ values by plugging in the known coordinates of the points and get the parameters we need for performing the transformation. For example, if we have two known corresponding points:

$(x1_{graph}, y1_{graph})$ and $(x1_{matlab}, y1_{matlab}), (x2_graph, y2_graph)$ and $(x2_matlab, y2_matlab)$

We get the following equations:

$$x1_{graph} = x_{scale} * x1_{matlab} + x_{trans}$$

$$y1_{graph} = y_{scale} * y1_{matlab} + y_{trans}$$

$$x2_{graph} = x_{scale} * x2_{matlab} + x_{trans}$$

$$y2_{graph} = y_{scale} * y2_{matlab} + y_{trans}$$

Solve these equations to find $x_{scale}, y_{scale}, x_{trans}, and y_{trans}$. These parameters can also be written in a matrix format for easy understanding and now we can map any point from MATLAB's coorinate system to the graph's coordinate system. This transformation assumes linear relationships between the two coordinate systems. If the graph has more complex distortions, we can use more advanced techniques such as polynomial transformations.