CS663: Digital Image Processing - Homework 1

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August 23, 2024

1 Homework 1 - Question 3

From MATLAB and the graph, we have the following coordinates of the points in the image:

Sr. No.	Coordinates_MATLAB	Coordinates_Graph
1	(242, 1520)	(-20, 635)
2	(242, 50)	(-20, 543)
3	(568, 422)	(0, 565)
4	(568, 1142)	(0, 610)

Let us denote the graph coordinates as $(x_g, y_g)_i$ and the MATLAB coordinates as $(x_m, y_m)_i$ where i is from 1 to 4.

From observing these points, we can see that the difference of x_m (or y_m) coordinates gets scaled down by $\approx 0.0625 = \frac{1}{16}$ to give the x_g (or y_g) coordinates. Mathematically, we can write this as:

$$x_g = \frac{x_m}{16} + c_1 \tag{1}$$

$$y_g = \frac{y_m}{16} + c_2 \tag{2}$$

where c_1 and c_2 are constants that act as offsets such that the differences in the coordinates are preserved.

In matrix form, we can write this as:

$$\begin{bmatrix} x_g \\ y_g \\ 1 \end{bmatrix} = \begin{bmatrix} \frac{1}{16} & 0 & c_1 \\ 0 & \frac{1}{16} & c_2 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x_m \\ y_m \\ 1 \end{bmatrix} \tag{3}$$

For the points in consideration, we can calculate the values of c_1 and c_2, which come out to be ≈ -35.5 and ≈ 538.625 respectively. The exact values cannot be calculated as the points are collected through manual inspection and are not exact.