

Numerical Analysis Homework 2 Question2

$$A = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ 0 & 0 & 1 \end{bmatrix} \Rightarrow \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ 0 & 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} x \\ y \\ 1 \end{bmatrix} = \begin{bmatrix} x' \\ y' \\ 1 \end{bmatrix}$$

Cordinates in image $B(x, y) \Rightarrow [1, 2], [2, 1], [3, 1]$

Cordinates in image $F(x', y') \Rightarrow [2, 2], [-1, 4], [-4, 4]$

The general linear equations from the system:

$$\begin{array}{lcl} a_{11} + 2a_{12} + a_{13} = 2 & | & a_{21} + 2a_{22} + a_{23} = 2 \\ 2a_{11} + 1a_{12} + a_{13} = -1' & | & 2a_{21} + 1a_{22} + a_{23} = 4 \\ 3a_{11} + 1a_{12} + a_{13} = -4' & | & 3a_{21} + 1a_{22} + a_{23} = 4 \end{array}$$

After find out the equations by matrix multiplication , now I have this equations.

Now I have these two 3x3 matrixes.

$$X_1 = \begin{bmatrix} 1 & 2 & 1 \\ 2 & 1 & 1 \\ 3 & 1 & 1 \end{bmatrix} \quad \text{and} \quad X_2 = \begin{bmatrix} 1 & 2 & 1 \\ 2 & 1 & 1 \\ 3 & 1 & 1 \end{bmatrix} \quad \text{With these to 3x1 matrixes as solutions.}$$

$$Y_1 = \begin{bmatrix} 2 \\ -1 \\ -4 \end{bmatrix} \quad \text{and} \quad Y_2 = \begin{bmatrix} 2 \\ 4 \\ 4 \end{bmatrix}$$

To find out of the coefficients of the matrix that called A , I used the program that I wrote for previous question with GESP(Gauss Elimination Scaled Pivoting).

Then I found the coefficients So the matrix A is like this with the coefficients \Rightarrow

$$A = \begin{bmatrix} -3 & 0 & 5 \\ 3.33 \times 10^{-16} & -1.99 & 5.99 \\ 0 & 0 & 1 \end{bmatrix}$$

Now I can calculate the invese of A. (A^{-1}) $\Rightarrow AZ = I$.

To find out the inverse of A I used Gussian Elimination on this augmented matrix:

$$\begin{bmatrix} -3 & 0 & 5 & 1 & 0 & 0 \\ 3.33E-16 & -1.99 & 5.99 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 0 & 1 \end{bmatrix}$$

ThenI found the inverse of A like this fortunately \Rightarrow

$$A^{-1} = \begin{bmatrix} -5.59E15 & 0.5 & 3.01 \\ 0 & 3.01E15 & -1.79E16 \\ 0 & 0 & 1 \end{bmatrix}$$