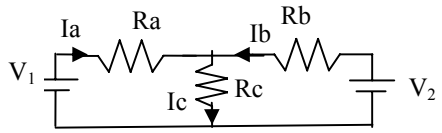
MATRIX APPLICATIONS

ELECTRICAL CIRCUIT ANALYSIS

Seri RLC devresi (zorlanmis)



$$-V_1 + R_a I_a + R_c I_c = 0$$
$$-R_c I_c - R_b I_b + V_2 = 0$$
$$-V_1 + R_a I_a - R_b I_b + V_2 = 0$$
$$I_a + I_b - I_c = 0$$

$$\begin{bmatrix} R_a & 0 & R_c \\ 0 & -R_b & -R_c \\ R_a & -R_b & 0 \\ 1 & 1 & -1 \end{bmatrix} \begin{bmatrix} I_a \\ I_b \\ I_c \end{bmatrix} = \begin{bmatrix} V_1 \\ -V_2 \\ V_1 - V_2 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} R_a & 0 & R_c & V_1 \\ 0 & -R_b & -R_c & -V_2 \\ R_a & -R_b & 0 & V_1 - V_2 \\ 1 & 1 & -1 & 0 \end{bmatrix}$$

$$-R_1 + R_3 \Rightarrow R_3, \qquad -\frac{1}{R_a} R_1 + R_4 \Rightarrow R_4$$

$$\begin{bmatrix} R_a & 0 & R_c & V_1 \\ 0 & -R_b & -R_c & -V_2 \\ 0 & -R_b & -R_c & -V_2 \\ 0 & 1 & -\frac{R_c}{R_a} - 1 & -\frac{R_c}{R_a} V_1 \end{bmatrix}$$

$$-R_2 + R_3 \Rightarrow R_3$$

$$\begin{bmatrix} R_a & 0 & R_c & V_1 \\ 0 & -R_b & -R_c & -V_2 \\ 0 & 0 & 0 & 0 \\ 0 & 1 & -\frac{R_c}{R_a} - 1 & -\frac{R_c}{R_a} V_1 \end{bmatrix}$$

Exchange row 2 and row 3

$$\begin{bmatrix} R_a & 0 & R_c & V_1 \\ 0 & -R_b & -R_c & -V_2 \\ 0 & 1 & -\frac{R_c}{R_a} - 1 & -\frac{R_c}{R_a} V_1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\frac{1}{R_B} R_2 + R_3 \Rightarrow R_3,$$

$$\begin{bmatrix} R_a & 0 & R_c & V_1 \\ 0 & -R_b & -R_c & -V_2 \\ 0 & 0 & -\frac{1}{R_b} R_c - \frac{R_c}{R_a} - 1 & -\frac{1}{R_b} V_2 - \frac{R_c}{R_a} V_1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

rank A=rank $\hat{A}$=3, unique solution.
(number of unknown is 3, Ia,Ib,Ic)

$$R_b I_b + R_c I_c - R_a I_a = 0$$
$$-V_1 + R_c I_c + R_d I_d = 0$$
$$R_d I_d - R_c I_c + V_2 = 0$$
$$-V_1 + R_a I_a - R_d I_d = 0$$

$$I_1 + I_a - I_b = 0$$
$$I_a - I_d - I_c = 0$$
$$I_b - I_c - I_2 = 0$$
$$I_d - I_1 - I_2 = 0$$

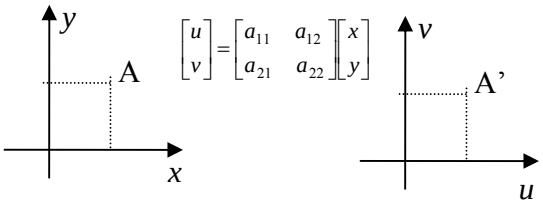
$$\begin{bmatrix} R_a & R_b & R_c & 0 & 0 & 0 & 0 \\ R_a & 0 & 0 & R_d & 0 & 0 & V_1 \\ 0 & 0 & -R_c & -R_d & 0 & 0 & -V_2 \\ 0 & -R_b & 0 & 0 & 0 & 0 & V_1 - V_2 \\ -1 & -1 & 0 & 0 & 1 & 0 & 0 \\ 1 & 0 & 1 & -1 & 0 & 0 & 0 \\ 0 & 1 & -1 & 0 & 0 & 1 & 0 \\ -1 & 0 & 0 & 1 & 0 & -1 & 0 \end{bmatrix}$$

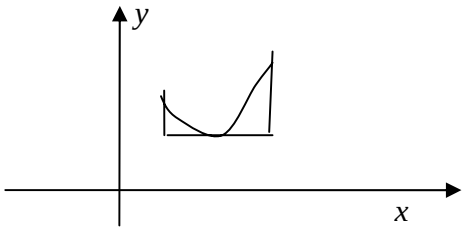
After row operations matrix is brought into the following form.

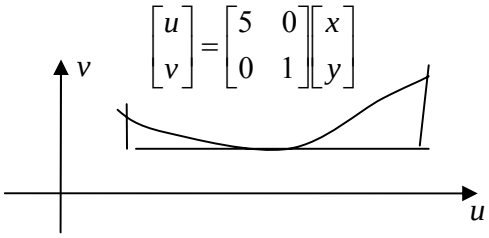
$$\begin{bmatrix} X & X & X & X & X & X & X \\ 0 & X & X & X & X & X & X \\ 0 & 0 & X & X & X & X & X \\ 0 & 0 & 0 & X & X & X & X \\ 0 & 0 & 0 & 0 & X & X & X \\ 0 & 0 & 0 & 0 & 0 & X & X \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

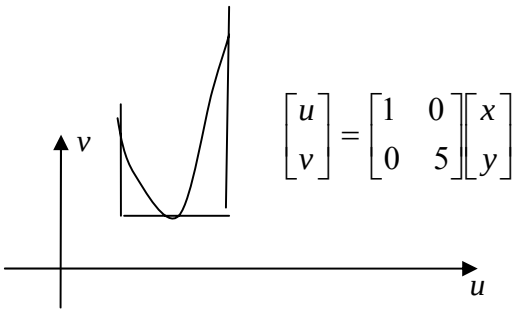
rank A=rank $\hat{A}$=6, unique solution

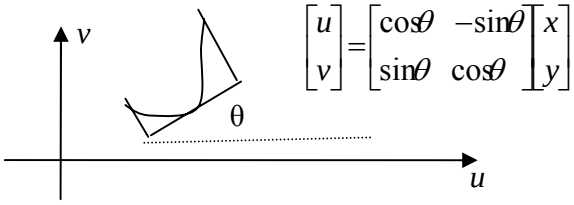
COMPUTER GRAPHICS

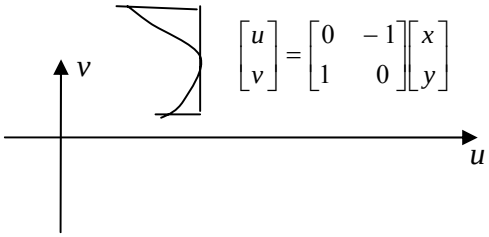


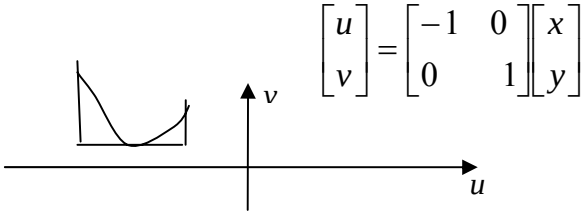


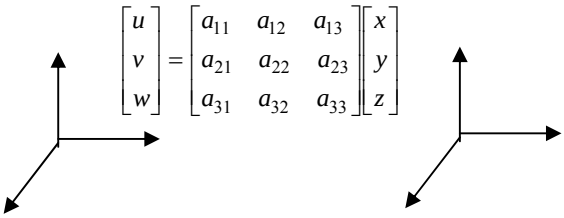











$\begin{bmatrix} u \\ v \\ w \end{bmatrix} = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix}$