CHIZIQLI ALGEBRAIK TENGLAMALAR SISTEMASINI MATRITSA USULIDA YECHISH

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Annotasiya. Ushbu ishda chiziqli algebraik tenglamalarni yechishda matrisadan foydalanish, ya'ni teskari matrisa usulida yechish o'rganilgan.

Kalit so'zlar: tenglama , tenglamalar sistemasi , matritsa , teskari matritsa.

n ta tenglama m ta noma'lumdan iborat tenglamalar sistemasi berilgan bo'lsin:

$a_{11}x_1 + a_{12}x_2 + \dots\dots\dots. + a_{1m}x_m = b_1$

$a_{21}x_2 + a_{22}x_2 + \dots\dots\dots. + a_{2m}x_m = b_2$

....

$a_{n1}x_n + a_{n2}x_2 + \dots\dots\dots. + a_{nm}x_m = b_m$

Sistemaning matritsa yordamida ifodalanishi :

$$AX = B$$

Buyerda A sistema koffisentlaridan tuzilgan matritsa x_j nomalumlardan quydagi matritsani tuzamiz.

$$X=\begin{pmatrix} x_1 \\ x_2 \\ \dots \\ x_m \end{pmatrix}$$

va ozod hadlardan

B=$\begin{pmatrix} b_1 \\ b_2 \\ \dots \\ b_n \end{pmatrix}$

matritsa tuzamiz.

Agar A matritsa xosmas matritsa bo'lsa, u xolda tenglama quydagicha yechiladi. Tenglamaning o'ng va chap qismi A matritsaning teskarisi

A^{-1} ga ko'paytiramiz.

$A^{-1}(AX) = A^{-1}B$ yoki $(A^{-1}A)X = A^{-1}B$,

A^{-1}A=E va $EX = X$ bo'lgani uchun tenglamaning

$X = A^{-1}B$ ko'rinishdagi yechimni olamiz.

Misol: $\begin{cases} x_1 - x_3 = 1 \\ 2x_1 - x_2 + 3x_3 = -1 \\ 3x_1 + 2x_2 - 2x_3 = 5 \end{cases}$

Yechish: $A = \begin{pmatrix} 1 & 0 & -1 \\ 2 & -1 & 3 \\ 3 & 2 & -2 \end{pmatrix}$;

$$X = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix},$$

$$B = \begin{pmatrix} 2 \\ -1 \\ 5 \end{pmatrix}$$

A matritsa determinantni hisoblaymiz:

$$det\,A = \begin{matrix} 1 & 0 & -1 \\ 2 & -1 & 3 \\ 3 & 2 & -2 \end{matrix} = 2 + 0 - 4 - 3 - 6 - 0 = -11 \neq 0$$

A^{-1} mavjud.

A^{-1} ni topamiz:

$$A^{-1} = \frac{1}{15}\begin{pmatrix} A_{11} & A_{12} & A_{13} \\ A_{21} & A_{22} & A_{23} \\ A_{31} & A_{32} & A_{33} \end{pmatrix}$$

$$A_{11} = (-1)^{1+1}\begin{vmatrix} -1 & 3 \\ 2 & -2 \end{vmatrix} = -4$$

$$A_{12} = (-1)^{1+2}\begin{vmatrix} 2 & 3 \\ 3 & -2 \end{vmatrix} = 13$$

$$A_{13=}(-1)^{1+3}\begin{vmatrix} 2 & -1 \\ 3 & 2 \end{vmatrix} = 7$$

$$A_{21} = (-1)^{2+1}\begin{vmatrix} 0 & -1 \\ 2 & -2 \end{vmatrix} = -2$$

$$A_{22} = (-1)^{2+2}\begin{vmatrix} 1 & -1 \\ 3 & -2 \end{vmatrix} = 1$$

$$A_{23} = (-1)^{2+3}\begin{vmatrix} 1 & 0 \\ 3 & 2 \end{vmatrix} = -2$$

$$A_{31} = (-1)^{3+1}\begin{vmatrix} 0 & -1 \\ -1 & 3 \end{vmatrix} = -1$$

$$A_{32} = (-1)^{3+2}\begin{vmatrix} 1 & -1 \\ 2 & 3 \end{vmatrix} = -5$$

$$A_{33} = (-1)^{3+3}\begin{vmatrix} 1 & 0 \\ 2 & -1 \end{vmatrix} = -1$$

Demak , berilgan matritsaga teskari matritsa quydagi ko'rinishga ega bo'ladi:

$$X = \begin{pmatrix} \frac{4}{11} & \frac{2}{11} & \frac{1}{11} \\ -\frac{13}{11} & -\frac{1}{11} & \frac{5}{11} \\ -\frac{7}{11} & \frac{2}{11} & \frac{1}{11} \end{pmatrix}\begin{pmatrix} 2 \\ -1 \\ 5 \end{pmatrix} = \begin{pmatrix} 1 \\ 0 \\ -1 \end{pmatrix}$$

Javob: $x_1 = 1$; $x_2 = 0$; $x_3 = -1$

Foydalinilgan adabiyotlar.

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