MASALALARNI GAUSS USULIDA HISOBLASHNING SODDA TURLARI.

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Annotatsiya: Ushbu maqola matematikadagi muhim algoritmlardan biri – Gauss usuli haqida. Gauss usuli algebraik tenglamalar sistemalarini yechishda eng samarali va tushunarli usullardan biri sifatida keng qo'llaniladi.Gauss usuli matematik va amaliy hisoblash sohasida keng qo'llaniladigon samarali algoritm bo'lib,asosiy g'oya sistemasini matritsaga aylantirib,qadam baqadam soda ko'rinishiga keltirishdir.

Kalit so'zlar: Gauss usuli,algebraik tenglamalar sistemasi,matritsalar.

ПРОСТЫЕ ВИДЫ РЕШЕНИЯ ЗАДАЧ МЕТОДОМ ГАУССА

Аннотация: Эта статья об одном из важных алгоритмов математики — методе Гаусса. Метод Гаусса широко используется как один из наиболее эффективных и понятных методов решения систем алгебраических уравнений. Метод Гаусса — эффективный алгоритм, широко используемый в области математических и практических вычислений.

Ключевые слова: Метод Гаусса, система алгебраических уравнений, матрицы.

SIMPLE TYPES OF PROBLEM-SOLVING USING THE GAUSS METHOD

Annotation: This article is about one of the important algorithms in mathematics - the Gauss method. The Gaussian method is widely used as one of the most effective and understandable methods for solving systems of algebraic equations. The Gaussian method is an efficient algorithm widely used in the field of mathematical and applied computing, the main idea is to transform the system into a matrix and make it look step by step.

Keywords: Gauss method, system of algebraic equations, matrices.

n ta no'malumli n ta chiziqli tenglamalar sistemasini n ning katta (n≥4) qiymatlarida Kramer qoidasi bilan yechish bir nechta yuqori tartibli determinantlarni hisoblashni talab etadi.Shu sababli,bunday sistemalarni yechishda Gauss usulidan foydalansak osonroq hisoblaymiz.Bu usulning mazmuni shundaki,unda noma'lumlar ketma-ket yo'qotilib,sistema uchburchaksimon shaklga keltiriladi.Agar sistema uchburchaksimon shaklga kelsa yagona yechimga ega bo'ladi va uning no'malumlari oxirgi tenglamadan boshlab topilib boriladi.(Sistema cheksiz ko'p yechimga ega bo'lsa,no'malumlar ketma-ket yo'qotilgach,u trapetsion shaklga keladi.)

1-misol: Ushbu

Chiziqli tenglamalar sistemasini Gauss usuli bilan yechamiz.

1-qadam: ushbu

$$\begin{cases} 2x+3y-z+t=-2 \\ 3x-y+2z-3t=-3 \\ 2x+y-z+2t=2 \\ x-2y+z-t=1 \end{cases} \qquad (1)$$

Sistema yechilsin.

Yechish. Sistemani Gauss usuli bilan yechamiz.

1-qadam ushbu

$$\left(\begin{array}{cccc|c} 2 & 3 & -1 & 1 & -2 \\ 3 & -1 & 2 & -3 & -3 \\ 2 & 1 & -1 & 2 & 2 \\ 1 & -2 & 1 & -1 & 1 \end{array}\right)$$

Matritsani birinchi ustunini ikkinchi satridan boshlab barcha elementlarini nolga aylantiramiz.Birinchi satrni ikkiga bo'lib

$$\left(\begin{array}{cccc|c} 1 & \frac{3}{2} & \frac{-1}{2} & \frac{1}{2} & -1 \\ 3 & -1 & 2 & -3 & -3 \\ 2 & 1 & -1 & 2 & 2 \\ 1 & -2 & 1 & -1 & 2 \end{array}\right)$$

ko'rinishida yozamiz.

a) (3) matritsaning birinchi satrini -3 ga ko'paytirib ikkinchi satriga qo'shsak,birinchi satrini -2 ga ko'paytirib uchinchi satriga qo'shsak,birinchi satrini -1 ga ko'paytirib to'rtinchi satriga qo'shsak:

$$\left(\begin{array}{cccc|c} 1 & \frac{3}{2} & \frac{-1}{2} & \frac{1}{2} & -1 \\ 0 & \frac{-11}{2} & \frac{7}{2} & \frac{-9}{2} & -0 \\ 0 & -2 & 0 & 1 & 4 \\ 0 & \frac{-7}{2} & \frac{3}{2} & \frac{-3}{2} & 2 \end{array}\right)$$

hosil bo'ladi.

2-qadam. (4) matritsaning uchinchi satrining ikkinchi ustuni elementidan boshlab qolgan barcha elementlarini nolga aylantiramiz.Ikkinchi satrini $-\frac{11}{2}$ ga bo'lib ushbu

$$\left(\begin{array}{cccc|c} 1 & \frac{3}{2} & \frac{-1}{2} & \frac{1}{2} & -1 \\ 0 & 1 & \frac{-7}{11} & \frac{9}{11} & +0 \\ 0 & -2 & 0 & 1 & 4 \\ 0 & \frac{-7}{2} & \frac{3}{2} & \frac{-3}{2} & 2 \end{array}\right)$$

Ko'rinishida yozamiz.

(5) matritsaning ikkinchi satrini $+2$ ga ko'paytirib uchinchi satriga qo'shsak,ikkinchi satrini $\frac{7}{2}$ ga ko'paytirib to'rtinchi satrga qo'shsak:

$$\left(\begin{array}{cccc|c} 1 & \frac{3}{2} & \frac{-1}{2} & \frac{1}{2} & -1 \\ 0 & 1 & \frac{-7}{11} & \frac{9}{11} & +0 \\ 0 & 0 & \frac{-14}{11} & \frac{29}{11} & 4 \\ 0 & 0 & \frac{-8}{11} & \frac{15}{11} & 2 \end{array}\right)$$

3-qadam: (6) matritsaning to'rtinchi satrini uchinchi ustun elementini nolga aylantiramiz.Dastlab buning uchun matritsani uchinchi satrini $-\frac{14}{11}$ ga bo'lib

$$\left(\begin{array}{cccc|c} 1 & \frac{3}{2} & \frac{-1}{2} & \frac{1}{2} & -1 \\ 0 & 1 & \frac{-7}{11} & \frac{9}{11} & 0 \\ 0 & 0 & 1 & \frac{-29}{14} & -\frac{22}{11} \\ 0 & 0 & \frac{-8}{11} & \frac{15}{11} & 2 \end{array}\right)$$

Ko'rinishida yozamiz.Bu matritsaning uchinchi satrini $\frac{8}{11}$ ga ko'paytirib to'rtinchi satriga qo'shsak:

$$\left(\begin{array}{cccc|c} 1 & \frac{3}{2} & \frac{-1}{2} & \frac{1}{2} & -1 \\ 0 & 1 & \frac{-7}{11} & \frac{9}{11} & 0 \\ 0 & 0 & 1 & \frac{-29}{14} & -\frac{22}{7} \\ 0 & 0 & 0 & \frac{-1}{11} & \frac{-2}{2} \end{array}\right)$$

matritsaga ega bo'lamiz.Bu matritsaga mos sistema quyadigacha bo'ladi.

$$\begin{cases} x+\frac{3}{2}y-\frac{1}{2}z+\frac{1}{2}t=-1 \\ y-\frac{7}{11}z+\frac{9}{11}t=0 \\ z-\frac{29}{14}t=-\frac{22}{7} \\ -\frac{1}{7}t=-\frac{2}{7} \end{cases}$$

Oxirgi tenglamasida bitta t ni noma'lum,undan oldingisida ikkita z va t noma'lumlar,ikkinchi tenglamasida uchta x, y, z, t lar qatnashadi.

4-qadam. (8) sistemasining to'rtinchi tenglamasi $-\frac{1}{7}t=-\frac{2}{7}$ dan t ni topamiz.

$t=\left(-\frac{2}{7}\right):\left(-\frac{1}{7}\right)=2$

5-qadam. t ning topilgan qiymati 2 ni (8) sistemaning uchinchi tenglamasiga qo'yib z noma'lumni topamiz: $z-\frac{29}{14}\cdot 2=-\frac{22}{7}$; $z=\frac{29}{7}-\frac{22}{7}=\frac{7}{7}=1.$

6-qadam. $t=2,\ z=1$ qiymatlarni (8) sistemaning ikkinchi tenglamasi $y-\frac{7}{11}z+\frac{9}{11}t=0$ ga qo'yib y noma'lumni topamiz:

$y-\frac{7}{11}\cdot 1+\frac{9}{11}\cdot 2=0;\qquad y+1=0,\quad y=-1.$

7-qadam. Topilgan $y = -1,\ z = 1,\ t = 2$ qiymatlarni (8) sistemaning birinchi tenglamasi $x + \frac{3}{2}y - \frac{1}{2}z + \frac{1}{2}t = -1$ ga qo'yib x noma'lumni aniqlaymiz:

$x + \frac{3}{2}(-1) - \frac{1}{2} \cdot 1 + \frac{1}{2} \cdot 2 = -1; \qquad x = 0$

Shunday qilib $x = 0, y = -1, z = 1, t = 2$ ya'ni $(o; -1; 1; 2)$ sonlar to'plami berilgan sistemaning yechimi bo'ladi.

Gauss usulining muhim tomoni shundan iboratki sistemani yechishdan oldin uni birgalikda yoki birgalikda emasligini aniqlashning hojati yo'q.

Foydalanilgan adabiyotlar ro'yxati:

1. Euclid, "Elements" – Bu asar qadimiy yunon geometriyasining asosiy manbai hisoblanadi. Euclid geometriyadagi ko'plab shakllar va ularning xususiyatlarini o'rgangan.
2. J. S. Mill, "A System of Logic" – Bu kitobda Mill mantiq va geometriyaning o'zaro aloqalarini muhokama qilgan, eski geometrik shakllar va ularning matematik asoslarini tushuntirgan.
3. E. W. Dijkstra, "The Art of Computer Programming" – Bu kitobda geometrik shakllar va ularning kompyuterda ishlatilishi, shuningdek, matematik modellar haqida ma'lumotlar mavjud.
4. K. L. McLoughlin, "Ancient Geometry" – Bu kitob qadimiy madaniyatlarda (Masalan, Misr, Yunoniston) geometrik shakllarning ilmiy va madaniy rolini o'rganadi.
5. M. T. L. McLeod, "Geometry and Art: Mathematical Visualization in Art and Architecture" – Ushbu asar geometrik shakllarning san'at va arxitekturadagi ahamiyatini, shuningdek, qadimiy madaniyatlarda qanday ishlatilganini tahlil qiladi.