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MULOHAZALAR VA MATRITSALARNING O‘ZORO BOG‘LANISHI

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Annotatsiya: Ushbu maqolada mulohalar va matritsalar bog‘lanishi, mulohazalarni shifrlash, shirflangan ma’lumotlarni yechish, matritsalar ko’paytmasi hamda teskari matritsalarni Matlab programmasida ishlatish haqida ma’lumot berilgan.

Kalit so‘zlar: Mulohaza, sodda mulohaza, shifr matritsa, teskari matritsa, matritsalar ko‘paytmasi.

Insonlar kundalik hayotda o‘zaro muloqot qilish uchun turli mulohazalardan foydalanishadi. Ma’lumki, mulohaza – narsa yoki hodisalarning xususiyatini anglatuvchi darak gapdir. Boshqacha aytganda, mulohaza – rost yoki yolg‘onligi haqida so‘z yuritish mumkin bo‘lgan darak gap.

Mulohazalar sodda va murakkab bo‘lishi mumkin. Biror shart yoki usul bilan bog‘lanmagan hamda faqat bir holatni ifodalovchi mulohazalar sodda mulohazalar deyiladi. Sodda mulohazalar ustida amallar bajarib, murakkab mulohazalarni hosil qilish mumkin.

Shu mulohazalariz ya’ni muloqotlarimiz tegishli doirada dahlsiz yoki sir saqlanishi uchun matritsalardan foydalanamiz. Matritsalarni turli mazmundagi xabarlarni shifrlashda foydalanish mumkin. Buning uchun foydalaniladigan alifboni raqamlashtirib olishimiz kerak bo‘ladi.

Masalan: Lotin alifbosidagi harflarni raqamlashtirish jadvali. (1-jadval)

A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**
1	2	3	4	5	6	7	8	9	10
K	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**
11	12	13	14	15	16	17	18	19	20
U	**V**	**W**	**X**	**V**	**Z**	**·**			
21	22	23	24	25	26	27	0		

(0 raqamiga bo‘sh joy{probel}ni bosib qo‘yamiz).

Keyin esa maxsus faqat kvadrat matritsadan iborat bo‘lgan **shifr matritsa** ni tanlab olamiz.

Misol uchun bizning shifr matritsamiz $\begin{pmatrix} 1 & 3 \\ 2 & 1 \end{pmatrix}$ ko‘rinishida bo‘lsin, so‘ngra berilgan mulohazamizni ya’ni xabarimizni yuqorida berilgan jadval asosida matritsaga aylantiramiz.

Dastlab xabarni sonlar orqali yozib olamiz. Xabar: **Men Toshkentdaman.**

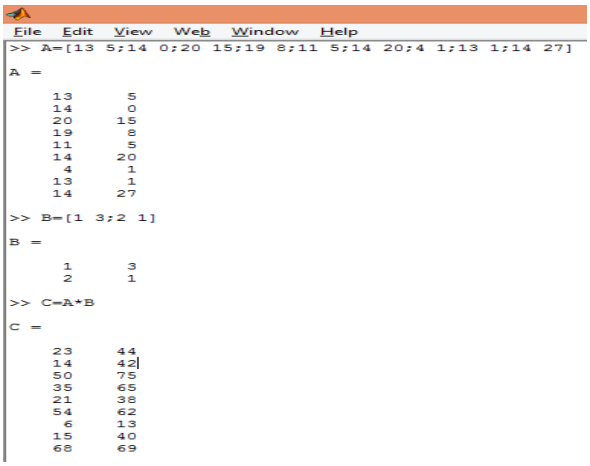
13-5-14-0-20-15-19-8-11-5-14-20-4-1-13-1-14-27

Endi esa bu sonlarni berilgan shifr matritsamizni ustunlar soniga mostlab ikki ustunli matritsa ko‘rinishida yozamiz. $\begin{pmatrix} 13 & 5 \\ 14 & 0 \\ 20 & 15 \\ 19 & 8 \\ 11 & 5 \\ 14 & 20 \\ 4 & 1 \\ 13 & 1 \\ 14 & 27 \end{pmatrix}$.

Xosil bo‘lgan matritsamizni shifr matritsamizga ko‘paytirsak shirflangan muloxaza matritsasi xosil bo‘ladi[1]-[4]

$$\begin{pmatrix} 13 & 5 \\ 14 & 0 \\ 20 & 15 \\ 19 & 8 \\ 11 & 5 \\ 14 & 20 \\ 4 & 1 \\ 13 & 1 \\ 14 & 27 \end{pmatrix} * \begin{pmatrix} 1 & 3 \\ 2 & 1 \end{pmatrix} = \begin{pmatrix} 23 & 44 \\ 14 & 42 \\ 50 & 75 \\ 35 & 65 \\ 21 & 38 \\ 54 & 62 \\ 6 & 13 \\ 15 & 40 \\ 68 & 69 \end{pmatrix}.$$

Matritsalarni ko‘paytamsini MATLAB programmasi yordamida tekshirib qo‘yamiz. (1-rasm)



1-rasm. Matritsalarni Matlab programmasida ko‘paytmasi

Shifrlangan matritsamizni yana sonlar qatoriga aylantirib olsak
23-44-14-42-50-75-35-65-21-38-54-62-6-12-15-40-68-69

Bu biz yaratgan shirflangan muloxaza.

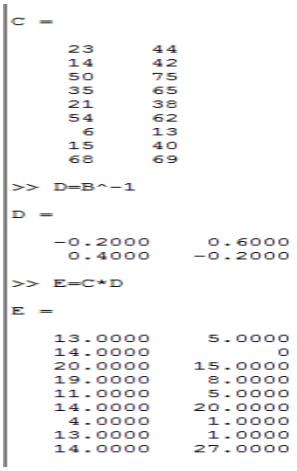
Shifrlangan muloxazani o‘qib olish uchun yuqorida keltirilgan jadval hamda shifr matritsamiz kerak bo‘ladi. Buning uchun dastalab shifr matritsamizni teskari matritsasini topib olamiz.

$$\begin{pmatrix} 1 & 3 \\ 2 & 1 \end{pmatrix}^{-1} = \begin{pmatrix} \frac{-1}{5} & \frac{3}{5} \\ \frac{2}{5} & \frac{-1}{5} \end{pmatrix}$$

Keyin esa shifrlangan muloxaza matritsamizni teskari matritsaga ko‘paytiramiz[1;4].

$$\begin{pmatrix} 23 & 44 \\ 14 & 42 \\ 50 & 75 \\ 35 & 65 \\ 21 & 38 \\ 54 & 62 \\ 6 & 13 \\ 15 & 40 \\ 68 & 69 \end{pmatrix} * \begin{pmatrix} \frac{-1}{5} & \frac{3}{5} \\ \frac{2}{5} & \frac{-1}{5} \end{pmatrix} = \begin{pmatrix} 13 & 5 \\ 14 & 0 \\ 20 & 15 \\ 19 & 8 \\ 11 & 5 \\ 14 & 20 \\ 4 & 1 \\ 13 & 1 \\ 14 & 27 \end{pmatrix}$$

Yuqoridagi ko‘paytmani MATLAB da tekshirish. (2-rasm)



2-rasm. Matlabda shifrlangan muloxazani teskari shifr matritsaga ko‘paytirish

Xosil bo‘lgan matritsamizni jadval asosida harflarga aylantirsak dastlabki xabar olinadi.

Matritsalarni bir biriga ko‘paytiirsh, teskari matritsasini MATLAB dasturidan foydalanib olishingiz mumkin [5]

Xulosa qilib aytish mumkinki, xozirgi axborot texnologiyalari asrining muhim masalalarini Oliy matematikaning “Matritsalar va ular ustida amallar” bo’limi yordamida hal qilish mumkinlagini ko‘rsatamiz. Bu esa keng jamoatchilik o‘rtasida juda qiziqarli hamda ommalashishiga ishonamiz.

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SM4 SHIFRLASH ALGORITMINI APPARAT AMALGA OSHIRISH USULLARI

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Annotatsiya: Ushbu maqolada SM4 shifrlash algoritmini amalga oshirish usullariga bag‘ishlangan bo‘lib, unda SM4 shifrlash algoritmini ma’lumotlarni maxfiyligini ta’minlashdagi o‘rni, ishlash funksiyasi shu bilan birga aparat amalga oshirish usullari va ularni tahlili keltirilgan.

Kalit so‘zlar: SM4, feystel tarmog‘i, FPGA, Elektron Codebook (ECB), Cipher Block Chaining (CBC).

SMS4 nomi bilan ham tanilgan SM4 shifr 2007 yilda Xitoy Milliy Kriptografiya Byurosi tadqiqotchilari tomonidan ishlab chiqilgan. U Xitoy uchun ma’lumotlar maxfiyligini ta’minlashda foydanilgan shifrlash standarti DES va uning vorisi o‘rnini bosuvchi milliy standart shifrlash algoritmi sifatida ishlab chiqilgan.

SM4 shifrlash algoritmi feystel tarmog‘iga asoslangan bo‘lib, uni blok uzunligi 128 bitni tashkil etadi, bu 16 baytga teng. Bu shuni anglatadiki, SM4 shifrlash va shifrni ochish jarayonida bir vaqtning o'zida 128 bitli bloklarda foydaniladi [1,2].
Umumiy olganda 128 bitli blok o'lchami zamonaviy blok shifrlari uchun keng tarqalgan tanlovdir, chunki u xavfsizlik va samaradorlik o'rtasidagi muvozanatni ta'minlaydi. Blokning kattaroq o'lchami ko'proq mumkin bo'lgan kirishlar to'plamini joylashtirish orqali xavfsizlikni oshirishi mumkin, ammo u hisoblashning murakkabligini oshirishi va qayta ishlashni sekinlashtirishi mumkin.1-rasm. Feystel tarmog‘iga asoslangan SM4 shifrlash algoritmi.

Aksincha, kichikroq blok o'lchami samaraliroq bo'lishi mumkin, ammo kirish maydoni cheklanganligi sababli ma'lum turdagi hujumlarga moyil bo'lishi mumkin.

SMS4 algoritmi sifatida ham tanilgan SM4 shifrlash algoritmi ma'lumotlarni shifrlash va shifrini ochish uchun ishlatiladigan simmetrik blokli shifrdir. Bu Xitoyda keng tarqalgan bo'lib qabul qilingan standart bo'lib, turli ilovalarda, jumladan xavfsiz aloqa va ma'lumotlarni himoya qilishda qo'llaniladi. Bu maqolada SM4 algoritmining apparat amalga oshirish jihatlari haqida umumiy ma'lumot keltirilgan [2,3]: