Ministerul Educaţiei, al Culturii și Cercetării al Republicii Moldova

Universitatea Tehnică a Moldovei

Departamentul Informatică și Ingineria Sistemelor

RAPORT

Lucrarea de laborator nr.2
Metode și Modele de Calcul

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Scopul lucrarii practice:

Sa rezolvesistemul de ecuatii liniare Ax = b utilizind:
Metoda eliminatii Gauss
Metoda lui Cholesky
Metoda iterative a lui Jacobi
Metoda iterative Gauss-Seidel

ScreenShot-uri:

Metoda Jacobi

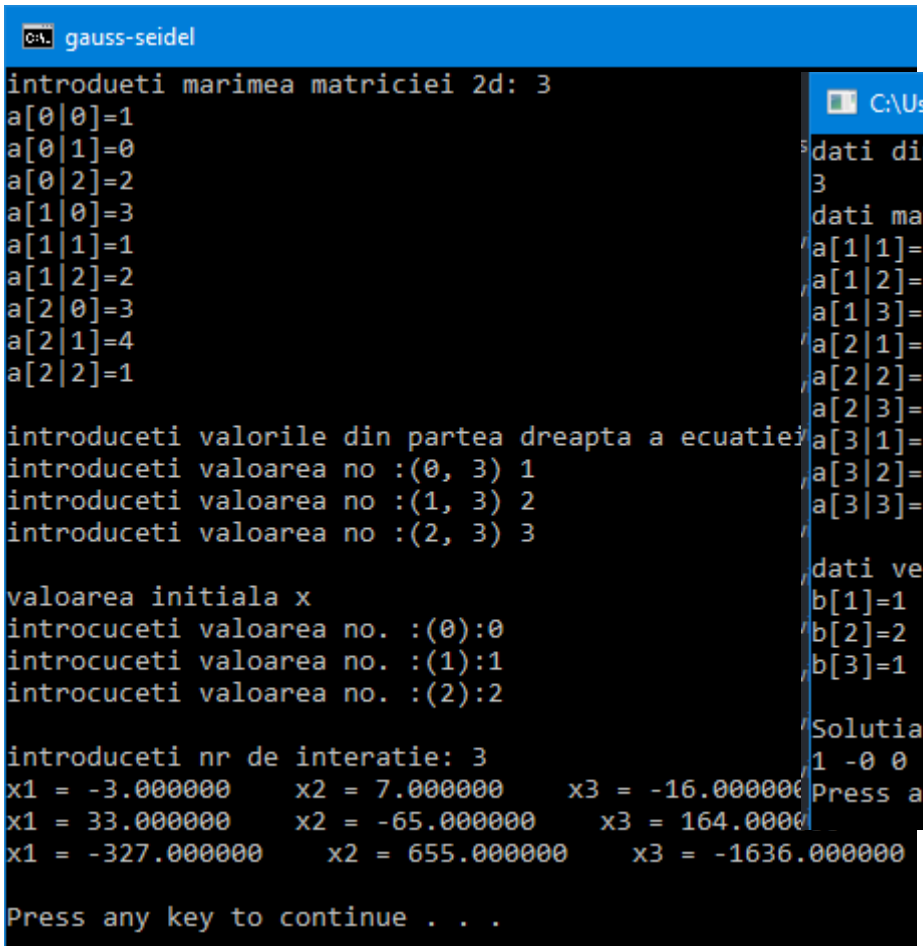
```
jacobi
3
dati matricea sistemului
a[1|1]=6
a[1|2]=1
a[1|3]=-2
a[2|1]=1
a[2|2]=5
a[2|3]=3
a[3|1]=-2
a[3|2]=3
a[3|3]=8

dati vectorul termenilor liberi
b[1]=3
b[2]=2
b[3]=-5

dati aproximatia initiala a solutiei
x[1]=0
x[2]=1
x[3]=-1

dati eroarea
0.00000001

Solutia aproximativa este
0
1
-1
Press any key to continue . . .
```

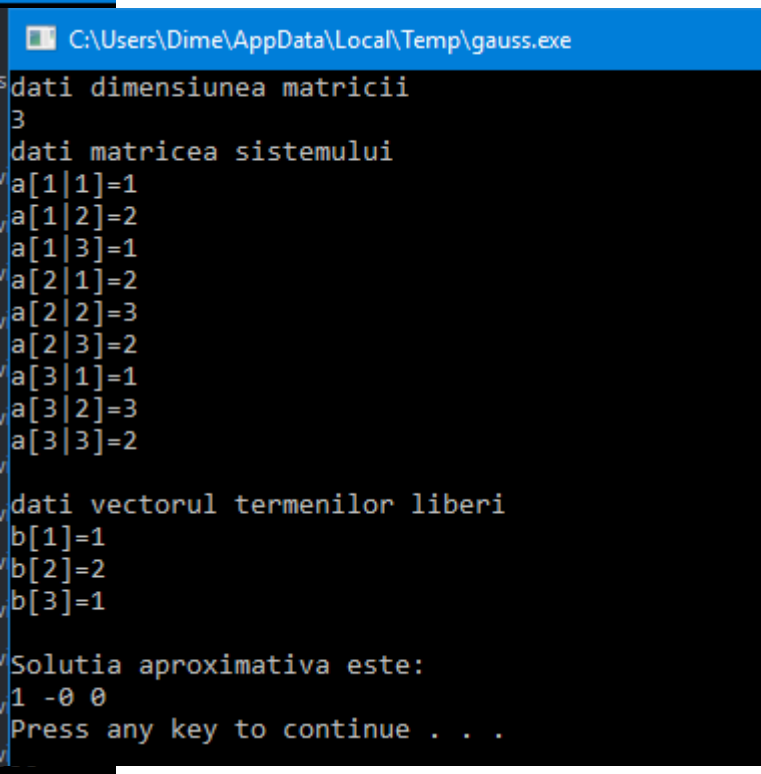
Metoda Cholesky

```
Cholesky2
gradul matricei:
3
Introduceti coeficientii matricei:
Linia (1)
1
2
3

Linia (2)
0
1
4

Linia (3)
0
2
3

introduceti elementele matricei b
3
4
5


Matricea LU este:
1  0  0
0  1  0
0  2  -5

1  2  3
0  1  4
0  0  1

Solutiile:

-2
1.6
0.6
```

Metoda Gauss – Seidel

Metoda Gauss





Codul programului:

Metoda Gauss – Seidel

```
#include<iostream>
#include<conio.h>
using namespace std;

int main(void)
{
   float a[10][10], b[10], x[10], y[10];
   int n = 0, m = 0, i = 0, j = 0;
   cout << "introdueti marimea matriciei 2d: ";
   cin >> n;
  for (i = 0; i < n; i++){
      for (j = 0; j < n; j++)
      {
                  cout << "a[" << i <<"|"<< j << "]=";
         cin >> a[i][j];
      }
   }
   cout << "\nintroduceti valorile din partea dreapta a ecuatiei\n";

   for (i = 0; i < n; i++){
      cout << "introduceti valoarea no :(" << i << ", " << j << ") ";
      cin >> b[i];
   }
   cout << "\nvaloarea initiala x\n";

   for (i = 0; i < n; i++){
      cout << "introcuceti valoarea no. :(" << i<<"):";
      cin >> x[i];
   }
```

```
   cout << "\nintroduceti nr de
interatie: ";
   cin >> m;
   while (m > 0){
      for (i = 0; i < n; i++)
      {
         y[i] = (b[i] / a[i][i]);
         for (j = 0; j < n; j++)
         {
            if (j == i)
               continue;
```

Metoda Gauss

```
#include <iostream>
#include <math.h>
using namespace std;
#define max 15

int main(void)
{
        float s;
        float a[max + 1][max + 1]
[max + 1], b[max + 1][max + 1],
x[max + 1];
        int n, i, j, k;
        cout << "dati dimensiunea
matricii" << endl;          cin >> n;
        cout << "dati matricea
sistemului " << endl;
for (i = 1; i <= n; i++)
        for (j = 1; j <= n; j++){
                cout << "a[" << i
<<"|"<< j << "]=";
                cin >> a[i][j][1];
        }

        cout << endl;
        cout << "dati vectorul
termenilor liberi " << endl;

        for (i = 1; i <= n; i++){
                cout << "b[" << i <<
"]=";
                cin >> b[i][1];
```

```
            y[i] = y[i] - ((a[i][j] / a[i]
[i]) * x[j]);
            x[i] = y[i];
         }
         printf("x%d = %f    ", i + 1,
y[i]);
      }
      cout << "\n";
      m--;
   }
   return 0;
}


        }

        cout << endl;
for (k = 1; k <= n - 1; k++){
                for (i = 1; i <= n; i++)
                for (j = 1; j <= n; j++){
                        if (i <= k)a[i][j][k
+ 1] = a[i][j][k];
                        else if (j <= k)a[i]
[j][k + 1] = 0;
                        else a[i][j][k + 1]
= a[i][j][k] - a[i][k][k] * a[k][j][k] /
a[k][k][k];
                }
                for (i = 1; i <= n; i++)
                if (i <= k)b[i][k + 1] =
b[i][k];
                else b[i][k + 1] = b[i][k]
- a[i][k][k] * b[k][k] / a[k][k][k];
        }

        x[n] = b[n][n] / a[n][n][n];

        for (i = n - 1; i >= 1; i--)
        {
                s = 0;
                for (j = i + 1; j <= n; j+
+)
                        s = s + a[i][j][i] *
x[j];
```

```
            x[i] = (b[i][i] - s) / a[i]
[i][i];
        }cout << "Solutia aproximativa
este:" << endl;
```

Metoda Jacobi

```
#include <iostream>
#include <math.h>
using namespace std;

#define max 10

int main()
{
        float s, s1, eps;
        float a[max + 1][max + 1],
b[max + 1], x[max + 1], y[max + 1];
        int n, i, j;
        cout << "dati numarul de
ecuatii si necunoscute " << endl;
        cin >> n;
        cout << "dati matricea
sistemului " << endl;
        for (i = 1; i <= n; i++)
        for (j = 1; j <= n; j++){
                cout << "a[" << i
<<"|"<< j << "]=";
                cin >> a[i][j];
        }
        cout << endl;
        cout << "dati vectorul
termenilor liberi " << endl;
        for (i = 1; i <= n; i++){
                cout << "b[" << i <<
"]=";
                cin >> b[i];
        }
        cout << endl;
        for (i = 1; i <= n; i++)
                cout << x[i] << ' ';
        cout << endl;
        system("pause");
}
        cout << "dati aproximatia
initiala a solutiei " << endl;
        for (i = 1; i <= n; i++){
                cout << "x[" << i <<
"]=";
                cin >> y[i];
        }
        cout << endl;
        cout << "dati eroarea " <<
endl; cin >> eps; cout << endl;
        s = eps + 1;
        while (s >= eps){
                for (i = 1; i <= n; i++)
                {
                        s1 = 0;
                        for (j = 1; j <= n;
j++)
                        if (j != i)s1 = s1 +
a[i][j] * y[j]; x[i] = (b[i] - s1) / a[i]
[i];
                }
                s = 0;
                for (i = 1; i <= n; i++)
                        s = s + abs(x[i] -
y[i]);
                for (i = 1; i <= n; i++)
                        y[i] = x[i];
        }
        cout << "Solutia aproximativa
este " << endl;
        for (i = 1; i <= n; i++)
                cout << x[i] << endl;
        system("pause");
}
```

Metoda Cholesky

```
#include <iostream>
#include <conio.h>
using namespace std;
int main()
{
   int n,i,k,j,p;
   float a[10][10],l[10][10]={0},u[10]
[10]={0},sum,b[10],z[10]={0},x[10]={0};
//    clrscr();
   cout<<"gradul matricei: "<<endl;
```

```
   cin>>n;
   cout<<"Introduceti coeficientii matricei:
";
   for(i=1;i<=n;i++)
   {
      cout<<"\nLinia ("<<i<<")  \n";
      for(j=1;j<=n;j++)
         cin>>a[i][j];
   }
   cout<<"\nintroduceti elementele matricei
b"<<endl;
   for(i=1;i<=n;i++)
      cin>>b[i];

   for(k=1;k<=n;k++)
   {
      u[k][k]=1;
      for(i=k;i<=n;i++)
      {
         sum=0;
         for(p=1;p<=k-1;p++)
            sum+=l[i][p]*u[p][k];
         l[i][k]=a[i][k]-sum;
      }

      for(j=k+1;j<=n;j++)
      {
         sum=0;
         for(p=1;p<=k-1;p++)
            sum+=l[k][p]*u[p][j];
         u[k][j]=(a[k][j]-sum)/l[k][k];
      }
   }
   //******** Displaying LU
matrix**********//
   cout<<endl<<endl<<"Matricea LU
este: "<<endl;
   for(i=1;i<=n;i++)
   {
      for(j=1;j<=n;j++)
         cout<<l[i][j]<<"  ";
      cout<<endl;
   }
   cout<<endl;
   for(i=1;i<=n;i++)
   {
      for(j=1;j<=n;j++)
         cout<<u[i][j]<<"  ";
      cout<<endl;
   }


   for(i=1;i<=n;i++)
   {                              //forward
subtitution method
      sum=0;
      for(p=1;p<i;p++)
      sum+=l[i][p]*z[p];
      z[i]=(b[i]-sum)/l[i][i];
   }

   for(i=n;i>0;i--)
   {
      sum=0;
      for(p=n;p>i;p--)
         sum+=u[i][p]*x[p];
      x[i]=(z[i]-sum)/u[i][i];
   }
      cout<<endl<<"Solutiile: "<<endl;
   for(i=1;i<=n;i++)
      cout<<endl<<x[i];

   getch();
   return 0;
}
```

Concluzie:

In urma efectuarii laboratorului au fost obtinute anumite abilitati in domeniu MMC si rezolvarea sistemelor de ecuatie utilizind metodele eliminatii Gauss, metoda lui Cholesky. metoda iterative a lui Jacobi si metoda iterative Gauss-Seidel