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/*
Name of student:- Swami Amit Bandu
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Assignment No:-2
Title of Assignment:-Implementation of following matrix operations:
addition of two sparse matrices, subtraction of
two sparse matrices, multiplication of two sparse
matrices, transpose of a matrix.
*/
#include<iostream>
using namespace std;
class Matrix
{
public: //Privatemembers
        int a[10][10],b[10][10],ar,ac,br,bc;
        void input();
        void add();
        void sub();
        void mul();
        void saddle();
};
void Matrix::input()
{                                       //TOGIVEINPUTFROMUSER
        int i,j;
        cout<<"Enter order of A matrix"<<endl;          //Amatrixinput
        cin>>ar>>ac;
        cout<<"Enter elements of A=";
        for(i=0; i<ar; i++)
         {
                for(j=0; j<ac; j++)
                 {
                        cin>>a[i][j];
                 }
         }
        cout<<"Matrix A:"<<endl;
        for(i=0; i<ar; i++)
         {
                for(j=0; j<ac; j++)
                 {
                        cout<<a[i][j]<<"";
                 }
                cout<<endl;
         }
        cout<<"Enter order of B matrix"<<endl;          //Bmatrixinput
        cin>>br>>bc;
        cout<<"Enter elements of B=";
        for(i=0; i<br; i++)
         {
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            for(j=0; j<bc; j++)
            {
                    cin>>b[i][j];
            }
        }
        cout<<"Matrix B:"<<endl;
        for(i=0; i<br; i++)
        {
            for(j=0; j<bc; j++)
            {
                    cout<<b[i][j]<<"";
            }
            cout<<endl;
        }
}
void Matrix::add() { //ADDITIONOFTWOMATRIX
        int i,j,c[10][10];
        if(ar==br && ac==bc)
        {
            for(i=0; i<ar; i++)
            {
                    for(j=0; j<ac; j++)
                    {
                            c[i][j]=a[i][j]+b[i][j];
                    }
            }
            cout<<"Addition is:"<<endl;
            for(i=0; i<ar; i++)
            {
                    for(j=0; j<ac; j++)
                    {
                            cout<<c[i][j]<<"";
                    }
                    cout<<endl;
            }
        }
        else
        {
            cout<<"Addition is NOT possible"<<endl;
        }
}
void Matrix::sub() { //SUBSTRACTIONOFTWOMATRIX
        int i,j,c[10][10];
        if(ar==br && ac==bc) {
                for(i=0; i<ar; i++) {
                        for(j=0; j<ac; j++) {
                                c[i][j]=a[i][j]-b[i][j];
                        }
```

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			}
			cout<<"Addition is:"<<endl;
			for(i=0; i<ar; i++) {
				for(j=0; j<ac; j++) {
					cout<<c[i][j]<<"";
				}
				cout<<endl;
			}
		} else {
			cout<<"Addition is NOT possible"<<endl;
		}
}
void Matrix::mul() { //MULTIPLICATIONOFTWOMATRIX
		int i,j,k,c[10][10];
		if(ac==br)
		 {
			for(i=0; i<ar; i++)
			{
				for(j=0; j<bc; j++)
				{
					c[i][j]=0;
					for(k=0; k<ar; k++)
					{
						c[i][j]=c[i][j]+a[i][k]*b[k][j];
					}
				}
			}
			for(i=0; i<ar; i++)
			{
				for(j=0; j<bc; j++)
				{
					cout<<c[i][j]<<"";
				}
				cout<<endl;
			}
		}
		 else
   {
			cout<<"Multiplication is NOT possible"<<endl;
		}
}
void Matrix::saddle() { //SADDLEPOINTOFMATRIX
		int i,j,min,max,big[3],small[3];
		if(ar==ac)
		{
			for(i=0; i<3; i++)
			{
				big[i]=a[i][0];
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                        for(j=0; j<3; j++)
                        {
                                if(a[i][j]>big[i])
                                {
                                        big[i]=a[i][j];
                                }
                        }
                }
                min=big[0];
                for(i=0; i<3; i++)
                {
                        if(min>big[i])
                        {
                                min=big[i];
                        }
                }
                for(i=0; i<3; i++)
                {
                        small[i]=a[0][i];
                        for(j=0; j<3; j++)
                        {
                                if(a[j][i]<small[i])
                                {
                                        small[i]=a[i][j];
                                }
                        }
                }
                max=small[0];
                for(i=0; i<3; i++)
                {
                        if(max<small[i])
                        {
                                max=small[i];
                        }
                }
        }
        if(min==max)
        {
                cout<<"saddle point of A is="<<min<<endl;
        } else
        {
                cout<<"NO saddle point found"<<endl;
        }
}
int main()
{
                        //MAINFUNCTION
        int ch;
```

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        Matrix ob;
        ob.input();
        while(1) {
                cout<<"1 ADDITION"<<endl;
                cout<<"2 SUBSTRACTION"<<endl;
                cout<<"3 MULTIPLICATION"<<endl;
                cout<<"4 SADDLEPOINT"<<endl;
                cout<<"Enter your choice=";
                cin>>ch; //switchcase
                switch(ch) {
                        case1:
                                ob.add();
                                break;
                        case2:
                                ob.sub();
                                break;
                        case3:
                                ob.mul();
                                break;
                        case4:
                                ob.saddle();
                                break;
                }
        }
}


/*
OUTPUT:
Enter order of A matrix
22
Enter elements of A=1234
Matrix A:
12
34
Enter order of B matrix
22
Enter elements of B=1111
Matrix B:
11
11
1ADDITION
2SUBSTRACTION
3MULTIPLICATION
4SADDLEPOINT
Enter your choice=1
Addition is:
23
```

```
45
1ADDITION
2SUBSTRACTION
3MULTIPLICATION
4SADDLEPOINT
Enter your choice=2
Addition is:
01
23
1ADDITION
2SUBSTRACTION
3MULTIPLICATION
4SADDLEPOINT
Enter your choice=3
33
77
1ADDITION
2SUBSTRACTION
3MULTIPLICATION
4SADDLEPOINT
Enter your choice=4
saddle point of A is=2
1ADDITION
2SUBSTRACTION
3MULTIPLICATION
4SADDLEPOINT
Enter your choice=
*/
```