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Practical 07: Guass Elimination Method

Objective: To find root of the system equation using Guass Elimination method.

2. Algorithm:

1. Start
2. Input the matrix of equations in `arr[n][n+1]` where n is number of unknown variables
3. Making upper triangular Matrix:

```
for (i = 0; i < n-1; i++)
{
    for (j = i+1; j < n; j++)
    {
        p= arr[j][i] / arr[i][i];

        for (k = 0; k < n+1; k++)
        {
            arr[j][k]= arr[j][k]- p*arr[i][k];
        }
    }
}
```
4. Matrix `X[n]` , for unknown variables.
5. Backward Substitution:

```
for(i= n-1; i>=0; i--){
    sum=0;
    for (j = i+1; j < n; j++)
    {
        sum= sum+ arr[i][j]* X[j];
    }

    X[i]= (arr[i][n]- sum)/arr[i][i];
}
```

6. Print X

7. Stop

Code:

```
#include<iostream>
using namespace std;

int main(){
    int n;
    // cout<<"Enter the number of unknown variables: ";
    printf("Enter the number of unknown variables: ");
    cin>>n;
    // scanf("%d", n);

    double arr[n][n+1];

    double X[n]; // variable array
    for (int i = 0; i < n; i++)
    {
        for (int j = 0; j < n+1; j++)
        {
            printf("Enter arr[%d][%d]: ", i, j);
            scanf("%lf",&arr[i][j]);
        }
    }

    printf("\n\n");

    for (int i = 0; i < n; i++)
    {
        for (int j = 0; j < n+1; j++)
        {
            printf("%.6lf\t", arr[i][j]);
        }
        printf("\n");
    }
```

```
}
```

```
printf("\n\n");
```

```
for (int i = 0; i < n-1; i++)
{
    for (int j = i+1; j < n; j++)
    {
        double p= arr[j][i] / arr[i][i];
        // printf("%lf\n", p);

        for (int k = 0; k < n+1; k++)
        {
            arr[j][k]= arr[j][k]- p*arr[i][k];
        }
    }
}
```

```
for (int i = 0; i < n; i++)
{
    for (int j = 0; j < n+1; j++)
    {
        printf("%.6lf\t", arr[i][j]);
    }
    printf("\n");
}
```

```
printf("\n\n");
```

```
// upper triangular matrix
```

```
// backward substitution
```

```
for(int i= n-1; i>=0; i--){
    double sum=0;
    for (int j = i+1; j < n; j++)
    {
        sum= sum+ arr[i][j]* X[j];
    }
}
```

```

    }

    X[i]= (arr[i][n]- sum)/arr[i][i];

}

printf("The values of unknown variables is: \n");
for (int i = 0; i < n; i++)
{
    printf("X[%d]= %lf\n", i, X[i]);
}

}

```

Output:

```

PS D:\01_Java\Deepankar\CCpp\CBNST\Practical-07-
GuassEliminationMethod> cd "d:\01_Java\Deepankar\CCpp\CBNST\Practical-
07-GuassEliminationMethod\" ; if ($?) { g++ _02_GuassEliminationMethod.cpp
-o _02_GuassEliminationMethod } ; if ($?) { .\_02_GuassEliminationMethod }
Enter the number of unknown variables: 3

```

```

Enter arr[0][0]: 4
Enter arr[0][1]: 5
Enter arr[0][2]: 6
Enter arr[0][3]: 7
Enter arr[1][0]: 8
Enter arr[1][1]: 9
Enter arr[1][2]: 4
Enter arr[1][3]: 3
Enter arr[2][0]: 4
Enter arr[2][1]: 5
Enter arr[2][2]: 7
Enter arr[2][3]: 5

```

4.000000	5.000000	6.000000	7.000000
8.000000	9.000000	4.000000	3.000000
4.000000	5.000000	7.000000	5.000000

4.000000	5.000000	6.000000	7.000000
0.000000	-1.000000	-8.000000	-11.000000

0.000000 0.000000 1.000000 -2.000000

The values of unknown variables is:

X[0]= -29.000000

X[1]= 27.000000

X[2]= -2.000000