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<u>Experiment No:</u>	03
<u>Aim:</u>	Strassen's Multiplication
<u>Algorithm:</u>	<p>Step 1: Start</p> <p>Step 2: Take 2 matrices as input from user say A and B</p> <p>Step 3: Divide A and B into 10 matrices of n/2 size $S[0] = B[0][1] - B[1][1];$ $S[1] = A[0][0] + A[0][1];$ $S[2] = A[1][0] + A[1][1];$ $S[3] = B[1][0] - B[0][0];$ $S[4] = A[0][0] + A[1][1];$ $S[5] = B[0][0] + B[1][1];$ $S[6] = A[0][1] - A[1][1];$ $S[7] = B[1][0] + B[1][1];$ $S[8] = A[0][0] - A[1][0];$ $S[9] = B[0][0] + B[0][1];$</p> <p>Step 4: Compute p1 to p7 $P[0] = A[0][0] * S[0];$ $P[1] = B[1][1] * S[1];$ $P[2] = B[0][0] * S[2];$ $P[3] = A[1][1] * S[3];$ $P[4] = S[5] * S[4];$ $P[5] = S[6] * S[7];$ $P[6] = S[8] * S[9];$</p> <p>Step 5: computer the resultant matrix c: $C[0][0] = P[4] + P[3] - P[1] + P[5];$ $C[0][1] = P[0] + P[1];$ $C[1][0] = P[2] + P[3];$ $C[1][1] = P[4] + P[0] - P[2] - P[6];$</p> <p>Step 6: display c</p> <p>Step 7: End</p>
<u>Code:</u>	<ul style="list-style-type: none"> <u>2*2 Matrix:</u> <pre>#include<stdio.h></pre>

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int main(){

    int a[2][2], b[2][2], c[2][2], i, j;

    int m1, m2, m3, m4 , m5, m6, m7;


    printf("Enter the 4 elements of first matrix: ");

    for(i = 0; i < 2; i++)

        for(j = 0; j < 2; j++)

            scanf("%d", &a[i][j]);


    printf("Enter the 4 elements of second matrix: ");

    for(i = 0; i < 2; i++)

        for(j = 0; j < 2; j++)

            scanf("%d", &b[i][j]);


    printf("\nThe first matrix is\n");

    for(i = 0; i < 2; i++){

        printf("\n");

        for(j = 0; j < 2; j++)

            printf("%d\t", a[i][j]);

    }


    printf("\nThe second matrix is\n");

    for(i = 0; i < 2; i++){

        printf("\n");

        for(j = 0; j < 2; j++)
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        printf("%d\t", b[i][j]);

    }

    m1= (a[0][0] + a[1][1]) * (b[0][0] + b[1][1]);
    m2= (a[1][0] + a[1][1]) * b[0][0];
    m3= a[0][0] * (b[0][1] - b[1][1]);
    m4= a[1][1] * (b[1][0] - b[0][0]);
    m5= (a[0][0] + a[0][1]) * b[1][1];
    m6= (a[1][0] - a[0][0]) * (b[0][0]+b[0][1]);
    m7= (a[0][1] - a[1][1]) * (b[1][0]+b[1][1]);

    c[0][0] = m1 + m4- m5 + m7;
    c[0][1] = m3 + m5;
    c[1][0] = m2 + m4;
    c[1][1] = m1 - m2 + m3 + m6;

    printf("\nAfter multiplication using Strassen's algorithm \n");
    for(i = 0; i < 2 ; i++){

        printf("\n");

        for(j = 0;j < 2; j++)

            printf("%d\t", c[i][j]);

    }
    printf("\n");

    return 0;

```

	}
<u>Output:</u>	<ul style="list-style-type: none"> ● <u>2*2 Matrix:</u> <pre> students@students-HP-280-G3-SFF-Business-PC:~/Desktop\$ gcc matrix.c -o matrix students@students-HP-280-G3-SFF-Business-PC:~/Desktop\$./matrix Enter the 4 elements of first matrix: 7 10 11 18 Enter the 4 elements of second matrix: 4 6 8 25 The first matrix is 7 10 11 18 The second matrix is 4 6 8 25 After multiplication using Strassen's algorithm 108 292 188 516 </pre>
<u>Conclusion:</u>	<p>Thus, after performing this experiment I understood that Strassen's matrix multiplication improves the run time a lot when multiplying matrices than traditional matrix multiplication. It is also very easy to implement but takes a lot of space as we need to store multiple arrays.</p>