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Aim – To implement strassens matrix multiplication on 2x2 matrix.

Theory: In linear algebra, the Strassen algorithm, named after Volkar Strassen, is an algorithm for matrix multiplication. It is faster than the standard matrix multiplication algorithm for large matrices, with a better asymptotic complexity, although the naive algorithm is often better for smaller matrices. The Strassen algorithm is slower than the fastest known algorithm for extremely large matrices, but such galactic matrices are not useful in practice, as they are much slower for matrices of practical size. For small matrices even faster algorithms exist.

Algorithm:

step 1: Start

step 2: Take 2 matrices as input from user say A and B

Step2: 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];

Step 3: 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];

Step 4: 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];

Step5: display c

Step6: End

Code :

```
#include<iostream>
using namespace std;
int main() {
int z[2][2];
int i, j;
Int m1, m2, m3, m4 , m5, m6, m7;
Int x[2][2] = {
{12, 34}, {22, 10}
};
int y[2][2] = {
{3, 4}, {2, 1}
};
cout<<"\nThe first matrix is\n";
for(i = 0; i < 2; i++) {
cout<<endl;
for(j = 0; j < 2; j++)
cout<<x[i][j]<<" ";
}
cout<<"\nThe second matrix is\n";
for(i = 0;i < 2; i++){
cout<<endl;
for(j = 0;j < 2; j++)
cout<<y[i][j]<<" ";
}
m1 = (x[0][0] + x[1][1]) * (y[0][0] + y[1][1]);
m2 = (x[1][0] + x[1][1]) * y[0][0];
m3 = x[0][0] * (y[0][1] - y[1][1]);
m4 = x[1][1] * (y[1][0] - y[0][0]);
m5 = (x[0][0] + x[0][1]) * y[1][1];
m6 = (x[1][0] - x[0][0]) * (y[0][0]+y[0][1]);
m7 = (x[0][1] - x[1][1]) * (y[1][0]+y[1][1]);
z[0][0] = m1 + m4- m5 + m7;
z[0][1] = m3 + m5;
z[1][0] = m2 + m4;
z[1][1] = m1 - m2 + m3 + m6;
cout<<"\nProduct achieved using Strassen's algorithm \n";
for(i = 0; i < 2 ; i++) {
cout<<endl;
for(j = 0; j < 2; j++)
cout<<z[i][j]<<" ";
}
return 0;
}
```

Output :

```
The first matrix is

12 34
22 10
The second matrix is

3 4
2 1
Product achieved using Strassen's algorithm

104 82
86 98
```

Conclusion : Thus , I have successfully completed performing Strassens Matrix Multiplication on a 2*2 matrix .