**Tugas 04**

Devide and Conquer

1. Hitung perkalian matriks berikut menggunakan algoritma perkalian matriks Strassen !

4 5 1 2

𝐴 = ( ) 𝑑𝑎𝑛 𝐵 = ( )

2 6 3 4

1. Dengan konsep devide and conquer hitung perkalian matriks berikut menggunakan algoritma perkalian matriks Strassen !

1 2 1 1

0 3 2 4 (

0 1 1 1

5 0 1 0

2 1 0 2

1 2 1 1

) ( )

0 3 2 1

4 0 0 4

Jawab

1. M1 = (A12 – A22)(B21 + B22) M2 = (A11 + A22)(B11 + B22) M3 = (A11 – A21)(B11 + B12) M4 = (A11 + A12)B22

M5 = A11 (B12 – B22) M6 = A22 (B21 – B11) M7 = (A21 + A22)B11

Jadi,

M1 = (5 – 6)(3 + 4) = -7

M2 = (4 + 6)(1 + 4)= 50

M3 = (4 – 2)(1 + 2) = 6 M4 = (4 + 5)\*4 = 36 M5 = 4\*(2 – 4) = -8 M6 = 6\*(3 – 1) = 8 M7 = (2 + 6)\*1 = 8

Lalu,

C11 = M1 + M2 – M4 + M6 C12 = M4 + M5

C21 = M6 + M7

C22 = M2 – M3 + M5 – M7

Jadi,

C11 = -7 + 50 – 36 + 8 = 15

C12 = 36 + (-8) = 28

C21 = 8 + 8 = 14

C22 = 50 – 6 + (-8) – 8 = 28

Hasil Perkalian Matriks A x B menggunakan metode strassen adalah,

2.

1 2 1 1

0 3 2 4

15 28

𝐶 = ( )

14 28

2 1 0 2

1 2 1 1

𝐴 = ( ) , 𝐵 = ( )

0 1 1 1

5 0 1 0

0 3 2 1

4 0 0 4

Partisi terlebih dahulu menjadi, berikut

1 2

𝐴11 = ( )

0 3

1 1

𝐴12 = ( )

2 4

0 1

𝐴21 = ( )

5 0

1 1

𝐴22 = ( )

1 0

2 1

𝐵11 = ( )

1 2

0 2

𝐵12 = ( )

1 1

0 3

𝐵21 = ( )

4 0

2 1

𝐵22 = ( )

0 4

Formula Hasil Matriks Baru, adalah

((𝐴11 × 𝐵11) + (𝐴12 × 𝐵21)) ((𝐴11 × 𝐵12) + (𝐴12 × 𝐵22))

𝐶 = (((𝐴21 × 𝐵11) + (𝐴22 × 𝐵21)) ((𝐴21 × 𝐵12) + (𝐴22 × 𝐵22)))

Mulai Perkalian Strassen

a. 𝐴11 × 𝐵11

M1 = (2 – 3)(1 + 2) = -3

M2 = (1 + 3)(2 + 2) = 16

M3 = (1 – 0)(2 + 1) = 3

M4 = (1 + 2)2 = 6

M5 = 1 (1 – 2) = -1

M6 = 3 (1 – 2) = -3

M7 = (0 + 3)2 = 6

Lalu,

C11 = -3 + 16 – 6 + (-3) = 4

C12 = 6 + (-1) = 5

C21 = -3 + 6 = 3

C22 = 16 – 3 + (-1) – 6 = 6

Jadi,

Hasil Perkalian Matriks A11 x B11 menggunakan metode strassen adalah,

4 5

𝐶 = ( )

3 6

b. 𝐴12 × 𝐵21

M1 = (1 – 4)(4 + 0) = -12

M2 = (1 + 4)(0 + 0) = 0

M3 = (1 – 2)(0 + 4) = -4

M4 = (1 + 1)0 = 0

M5 = 1 (3 – 0) = 3

M6 = 4 (4 – 0) = 16

M7 = (2 + 4)0 = 0

Lalu,

C11 = -12 + 0 – 0 + 16 = 4

C12 = 0 + 3 = 3

C21 = 16 + 0 = 16

C22 = 0 – (-4) + 3 – 0 = 7

Jadi,

Hasil Perkalian Matriks A12 x B21 menggunakan metode strassen adalah,

𝐶 = ( 4 3

)

16 7

c. 𝐴21 × 𝐵11

M1 = (1 – 0)(1 + 2) = 3

M2 = (0 + 0)(2 + 2) = 0

M3 = (0 – 5)(2 + 1) = -15

M4 = (0 + 1)2 = 2

M5 = 0 (1 – 2) = 0

M6 = 0 (1 – 2) = 0

M7 = (5 + 0)2 = 10

Lalu,

C11 = 3 + 0 – 2 + 0 = 1

C12 = 2 + 0 = 2

C21 = 0 + 10 = 10

C22 = 0 – (-15) + 0 – 10 = 5

Jadi,

Hasil Perkalian Matriks A21 x B11 menggunakan metode strassen adalah,

𝐶 = ( 1 2

d. 𝐴22 × 𝐵21

M1 = (1 – 0)(4 + 0) = 4

M2 = (1 + 0)(0 + 0) = 0

M3 = (1 – 1)(0 + 3) = 0

M4 = (1 + 1)0 = 0

M5 = 1 (3 – 0) = 3

M6 = 0 (4 – 0) = 0

M7 = (1 + 0)0 = 0

Lalu,

C11 = 4 + 0 – 0 + 0 = 4

C12 = 0 + 3 = 3

C21 = 0 + 0 = 0

C22 = 0 – 0 + 3 – 0 = 3

Jadi,

)

10 5

Hasil Perkalian Matriks A22 x B21 menggunakan metode strassen adalah,

4 3

𝐶 = ( )

0 3

e. 𝐴11 × 𝐵12

M1 = (2 – 3)(1 + 1) = -2

M2 = (1 + 3)(0 + 1) = 4

M3 = (1 – 1)(0 + 2) = 0

M4 = (1 + 2)1 = 3

M5 = 1 (2 – 1) = 1

M6 = 3 (1 – 0) = 3

M7 = (0 + 3)0 = 0

Lalu,

C11 = -2 + 4 – 3 + 3 = 2

C12 = 3 + 1 = 4

C21 = 3 + 0 = 3

C22 = 4 – 0 + 1 – 0 = 5

Jadi,

Hasil Perkalian Matriks A11x B12 menggunakan metode strassen adalah,

2 4

𝐶 = ( )

3 5

f. 𝐴12 × 𝐵22

M1 = (1 – 4)(0 + 4) = -12

M2 = (1 + 4)(2 + 4) = 30

M3 = (1 – 2)(2 + 1) = -3

M4 = (1 + 1)4 = 8

M5 = 1 (1 – 4) = -3

M6 = 4 (0 – 2) = -8

M7 = (2 + 4)2 = 16

Lalu,

C11 = -12 + 30 – 8 + (-8) = 2

C12 = 8 + (-3) = 5

C21 = -8 + 16 = 8

C22 = 30 – (-3) + (-3) – 16 = 8

Jadi,

Hasil Perkalian Matriks A12 x B22 menggunakan metode strassen adalah,

2 5

𝐶 = ( )

8 8

g. 𝐴21 × 𝐵12

M1 = (1 – 0)(1 + 1) = 3

M2 = (0 + 0)(0 + 1) = 0

M3 = (0 – 5)(0 + 2) = -10

M4 = (0 + 1)1 = 1

M5 = 0 (2 – 1) = 0

M6 = 0 (1 – 0) = 0

M7 = (5 + 0)0 = 0

Lalu,

C11 = 3 + 0 – 1 + 0 = 2

C12 = 1 + 0 = 1

C21 = 0 + 0 = 0

C22 = 0 – (-10) + 0 – 0 = 10

Jadi,

Hasil Perkalian Matriks A21 x B12 menggunakan metode strassen adalah,

h. 𝐴22 × 𝐵22

2 1

𝐶 = ( )

0 10

M1 = (1 – 0)(0 + 4) = 4

M2 = (1 + 0)(2 + 4) = 6

M3 = (1 – 1)(0 + 4) = 0

M4 = (1 + 1)4 = 8

M5 = 1 (1 – 4) = -3

M6 = 0 (0 – 2) = 0

M7 = (1 + 0)2 = 2

Lalu,

C12 = 8 + 0 = 8

C21 = 0 + 2 = 2

C22 = 6 – 0 + (-3) – 2 = 1

Jadi,

Hasil Perkalian Matriks A22 x B22 menggunakan metode strassen adalah,

2 8

𝐶 = ( )

2 1

Terakhir kita menentukan bentuk akhir hasil perkalian matriks

((𝐴11 × 𝐵11) + (𝐴12 × 𝐵21)) ((𝐴11 × 𝐵12) + (𝐴12 × 𝐵22))

𝐶 = (((𝐴21 × 𝐵11) + (𝐴22 × 𝐵21)) ((𝐴21 × 𝐵12) + (𝐴22 × 𝐵22)))

4 5 4 3 2 4 2 5

(( ) + (

)) ((

) + ( ))

𝐶 = ( 3 6 16 7

3 5 8 8 )

(( 1 2 4 3

2 1 2 8

10 ) + (

)) ((

) + ( ))

5 0 3 0 10 2 1

8 8

𝐶 = (19 13

5 5

10 8

4 9

11 13)

4 9

2 11