Week 16

27.2-3

P-SQUARE-MATRIX-MULTIPLY (A, B)

1 $n = A.$ rows

2 let C be a new $n \times n$ matrix

3 parallel for $i = 1$ to n

4 parallel for $j = 1$ to n

5 c_{ij} = P-DOT-PRODUCT($a_{i,:}, b_{:,j}$)

6 return C

P-DOT-PRODUCT用于并行计算向量点乘，时间复杂度为$\Theta(lgn)$

27-2

a

修改P-MATRIX-NULTIPLY_RECURSIVE(C,A,B)的3行为：

$c_{11} += a_{11} b_{11}$

移除所有与T有关的描述

修改P-MATRIX-NULTIPLY_RECURSIVE(C,A,B)的6-14行为：

$C = 0_{n \times n}$

6 spawn P-MATRIX -MULTIPLY-RECURSIVE (C_{11}, A_{11}, B_{11})

7 spawn P-MATRIX -MULTIPLY-RECURSIVE (C_{12}, A_{11}, B_{12})

8 spawn P-MATRIX -MULTIPLY-RECURSIVE (C_{21}, A_{21}, B_{11})

9 P-MATRIX -MULTIPLY-RECURSIVE (C_{22}, A_{21}, B_{12})

10 sync

11 spawn P-MATRIX -MULTIPLY-RECURSIVE (C_{11}, A_{12}, B_{21})

12 spawn P-MATRIX -MULTIPLY-RECURSIVE (C_{12}, A_{12}, B_{22})

13 spawn P-MATRIX -MULTIPLY-RECURSIVE (C_{21}, A_{22}, B_{21})

14 P-MATRIX -MULTIPLY-RECURSIVE (C_{22}, A_{22}, B_{22})

15 sync

移除P-MATRIX-NULTIPLY_RECURSIVE(C,A,B)的15-17行

b

$M_\infty(n) = 2M_\infty(n/2) + \Theta(\lg n)$

c

由(b)和主定理，可以得到并行算法复杂度为$\Theta(n)$，所以并行度为$\Theta(n^2) = 1000000$，小于原来的并行度。