Algorithms Fall 2016 Homework 7 Solution

November 9, 2016

PROBLEM 1

Assume we need P processors. We have

$$T_1/P + T_\infty = T_1'/p + T_\infty'$$

$$\Rightarrow 2048/P + 1 = 1024/P + 8$$

$$\Rightarrow P \approx 146$$

PROBLEM 2

We can parallel the loops from line 5 - 7 in the procedure FLOYD-WARSHALL. The pseudocode is as follow:

```
P-FLOYD-WARSHALL(W)
1  n = W.rows
2  D^(0) = W
3  for k = 1 to n
4        let D^(k) = (d_ij^(k)) be a new nn matrix
5        parallel for i = 1 to n
6              parallel for j = 1 to n
7                    d_ij^(k) = min(d_ij^(k-1), d_ik^(k-1) + d_kj^(k-1))
8  return D^(n)
```

The work is $T_1 = \Theta(n^3)$, total span is $T_\infty = \Theta(lgn)$, the parallelism is $T_1/T_\infty = \Theta(n^2 lgn)$