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HW-7

ALGORITHMS

Kiran Shettar

Problem - 1   27.1-9 (pg 792)

No. of processors = ?

Assuming the equation $T_P = T_1/P + T_\infty$

Initially we have to set $T_P = T'_P$

Here, we solve for 'P'.

$$\frac{T_1}{P} + T_\infty = \frac{T_1'}{P} + T'_\infty$$

$$\frac{2048}{P} + 1 = \frac{1024}{P} + 8$$

$$\frac{1024}{P} = 8 - 1$$

Then,

$$P = \frac{1024}{7} \simeq 146$$

NOTE:

$\because T_1 = 2048$ seconds

Span $T_\infty = 1$ sec.

With optimization, the work became $T_1' = 1024$ sec & the span will be $T'_\infty = 8$ sec

Hence, we can conclude that there should be approximately 146 processors for the two versions of the chess program run equally fast assuming the given equation.

Problem 2 27.2-6 (pg 797)

The Floyd-Warshall algorithm considers the intermidiate vertices of a shortest path where an intermidiate vertex of simple path $p = \{v_1, v_2, v_3 \dots v_l\}$ is any vertex of p other than v_1 or v_l, that is any vertex in the set $\{v_2, v_3 \dots v_{l-1}\}$

Here in the algorithm below, D^k matrices cannot be computed without D^{k-1} as we cannot parellelize the for loop of line 3 of floyd-warshall

And we can parellelize the remaing for loops.

If it is a serial case then the running time will be $\Theta(n^2)$. Then the span will be $\Theta(n \lg n)$.

Hence, the parellelism would be $\Theta(n/\lg n)$.

Algorithm

PARELLEL - FLOYD - WARSHALL (W)

1. $n = W.rows$
2. $D^0 = W$
3. for $k = 1$ to 'n' do
4. let $D^{(k)} = (d_{ij}^{(k)})$ be a new $n \times n$ matrix
5. parellel for $i = 1$ to n do
6. $d_{ij}^{(k)} = \min(d_{ij}^{(k-1)}, d_{ik}^{(k-1)} + d_{kj}^{(k-1)})$
7. return $D^{(n)}$