

Distributed Systems MPI Assignment

Deadline: Tuesday 22/9/15 23:59

1. Matrix Multiplication

Consider two matrices M1 and M2 of sizes $l \times m$ and $m \times n$ dimensions, respectively. Implement distributed multiplication of these two matrices using multiple process with MPI.

Hint 1: The multiplication can be parallelised with row i of M1 multiplied with column j of M2 to generate the element $[i,j]$ of result matrix M3 on process p . Each process can generate an element of M3 which should be collected back on process 0 to form the final matrix.

Hint 2: Another approach would be to cluster each matrix into sub-matrices with each process handling the multiplication between a sub-matrix of M1 and M2.

Any other approaches are also accepted.

2. Stable Marriage Problem

Let Men and Women each be array of n processes. Each man ranks the women from 1 to n and each woman ranks the men from 1 to n . A pairing is a one-to-one correspondence of men and women. A pairing is stable if, for two men m_1 and m_2 and their paired women w_1 and w_2 , both of the following conditions are satisfied:

- m_1 ranks w_1 higher than w_2 or w_2 ranks m_2 higher than m_1 ; and
- m_2 ranks w_2 higher than w_1 or w_1 ranks m_1 higher than m_2 .

Expressed differently, a pairing is unstable if a man and woman would both prefer each other to their current pair. A solution to the stable marriage problem is a set of n pairings, all of which are stable.

Write a program to solve the stable marriage problem. The processes should communicate using asynchronous message passing. The men should send proposal and the women should listen. A woman has to accept the first proposal she gets, because a better one might not come along; however, she can dump the first man if she later gets a better proposal.

Write the program using MPI. Print a trace of key events as they happen.