Parallel Algorithms - Spring 2001

Assignment No. 1

Course homepage: http://hyde.eng.tau.ac.il/~Parallel/

Deadline: March 28th

Questions:

1. Extend the functionality of the cells of the sorting linear array described in class, so that the "input front" initializes the cells. Prove the correctness of your extension.

2. Consider a linear array in which cell i holds item y_i. The goal is to output the $y_1, ..., y_n$. Describe how the following tasks can be fulfilled. For each task describe the functionality of the cells and the time it requires to empty the array.

   (a) The Host sends a request and the items are output in ascending index order: namely, y_1 is output first, and y_n is output last.

   (b) The Host sends a request and the items are output in descending index order: namely, y_n is output first, and y_1 is output last.

   (c) The Host sends a request and cell n outputs the items to another host positioned on the right hand side in ascending index order.

   (d) The Host sends a request and cell n outputs the items to another host positioned on the right hand side in descending index order.

3. * The firing squad problem. Consider the following synchronization problem on a linear array consisting of n identical cells (except for the extreme cells). At cycle 1, all the cells are in initial state "Init". The Host feeds the first cell with a "fire" command. After a t cycles, all the cells enter simultaneously the state "fire". The cells enter the state "fire" for the first time in cycle t.

   Design the cells so that they meet the above specification. Prove the correctness of your design. Try to minimize t, the time that elapses from the "fire" command till the cells enter the "fire" state.