

Parallel and Distributed Algorithms

Winter 2009/10

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Assignment 1

Issue: 19.10.2009

Due: 26.10.2009

1.1. Problem (8)

Efficient broadcasts

Let p be a power of two. Assume that a node has to broadcast a message to its $p - 1$ colleagues. Is it a good idea to organize the broadcast by a binary tree or are more general tree shapes better?

You may assume that a node can send its data to exactly one other node in a single time step.

1.2. Problem (8)

Prefix problems

Show how to solve the prefix problem on the complete binary tree T_k .

Hint: observe that a nephew link is inserted for a left child only.

1.3. Problem (8)

The Dyck language

We recursively define the language of a well-formed brackets:

- $()$ is well formed,
- if K_1 and K_2 are well-formed, then so is (K_1) and K_1K_2 .

Describe a fast parallel algorithm to decide whether a given expression of brackets is well-formed.