Technische Universität München
Fakultät für Informatik
Lehrstuhl für Effiziente Algorithmen
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Winter Semester 2013/14
Problem Set 4
November 12th, 2013

Parallel Algorithms

Due date: November 19th, 2013 **before** *class!*

Problem 1 (10 Points)

Show how to solve the parallel search problem on a sorted array of n elements in $\mathcal{O}(\log n - \log p)$ steps on an EREW PRAM with p processors, provided that the search key can be accessed concurrently by all the processors.

Problem 2 (20 Points)

Consider the ANSV problem, defined on Problem Set 3.

1. Using a balanced binary tree, develop an $\mathcal{O}\left(\log^2 n\right)$ time algorithm to solve the ANSV problem of an array of length n with a total of $\mathcal{O}(n \log n)$ operations.
   Hint: Use recursion and the developed algorithms for prefix and suffix minima.

2. How can this algorithm run in $\mathcal{O}(\log n)$ time?

Problem 3 (10 Points)

Show how to reduce the merging of two sorted sequences of lengths n and m to the ANSV problem corresponding to an array of length $n + m$.