Technische Universität München
Fakultät für Informatik
Lehrstuhl für Effiziente Algorithmen
Prof. Dr. Ernst W. Mayr
Chris Pinkau

Winter Semester 2012/13
Problem Set 10
January 29th, 2013

Parallel Algorithms

Due Date: January 29, 2013 **before** *class!*

Problem 1 (10 Points)

Given two families of graphs $\mathcal{G}$ and $\mathcal{H}$ and an embedding of any graph $G \in \mathcal{G}$ into some graph of $\mathcal{H}$ with constant expansion, load, congestion, and dilation, show that any graph $G \in \mathcal{G}$ can be simulated by some graph in $\mathcal{H}$ with constant slowdown and constant loss in efficiency.

Problem 2 (10 Points)

Show that the bounds in the Theorem about the flip-bit algorithm (Theorem 3.4. in Leighton's book) hold with probability $1 - N^{-\alpha}$ for any constant α.

Problem 3 (10 Points)

Show that the number of hypercube nodes with i 1s is at most $O(N/\sqrt{\log N})$ for any i.

Problem 4 (10 Points)

Given any deterministic algorithm for dynamically embedding an N-node binary tree in an N-node hypercube with load L, show that there is a way to grow a binary tree that will force the dilation of the embedding to be $\Omega(\sqrt{\log N}/L^2)$.