

May 2011

MADALGO seminars by Pooya Davoodi, Aarhus University

Succinct Dynamic Cardinal Trees with Constant Time Operations for Small Alphabet

Abstract:

A k -ary cardinal tree is a rooted tree in which each node has at most k children, and each edge is labeled with a symbol from the alphabet $\{1, \dots, k\}$. We present a succinct representation for k -ary cardinal trees of n nodes where $k = O(\text{polylog}(n))$. Our data structure requires $2n + n \log k + o(n \log k)$ bits and performs the following operations in $O(1)$ time: **parent**, **i -th child label-child**, **degree**, **subtree-size**, **preorder**, **is-ancestor**, **insert-leaf**, **delete-leaf**. The update times are amortized. The space is close to the information theoretic lower bound. The operations are performed in the course of traversing the tree. This improves the succinct dynamic k -ary cardinal tree representation of Arroyuelo (CPM'08) for small alphabet, by speeding up both the query time of $O(\log \log n)$, and the update time of $O((\log \log n)^2 / \log \log \log n)$ to $O(1)$, solving an open problem which has been previously reported.

Joint work with S. Srinivasa Rao