TITLE: "A Verification-Friendly Concurrent Binary Tree"

ABSTRACT: We present novel practical concurrent binary search tree (BST) algorithms based on the following general idea: we explicitly maintain logical ordering information in the data structure, permitting clean separation from its physical tree layout.

We capture logical ordering using intervals, enabled by the following key observation: any set of totally ordered items can be uniquely partitioned into logical interval ranges with the property that an item belongs to the set if and only if the item is an endpoint of some interval.

These ideas enable us to construct efficient, synchronization-free and intuitive lookup operations. Specifically, we present: (i) a concurrent non-balanced BST with a lock-free lookup based on a local recovery mechanism for when an item is missing from its expected location, and (ii) a concurrent AVL tree with a lock-free lookup which proceeds without synchronizing with any mutating operation, including balancing operations. We have implemented our concurrent BST algorithms and evaluated them against several state-of-the-art concurrent tree algorithms. Our experimental results show that our algorithms with lock-free contains and on-time deletion are practical and often comparable to state of the art BST algorithms.