Advanced Algorithms Homework

Intereswing

October 16, 2024

1 Lecture 8: Augmenting Data Structures

1 Insertion into a red-black tree consists of two phases. The first phase inserts the new node, and the second phase maintaining the red-black properties, which may perform rotations.

To maintain the rank of subtree in the first phase, simply increment $x.rank$ for each node x, whose left child is also on the simple path traversed from the root down towards the leaves.

In the second phase, the only structural changes to the underlying red-black tree are caused by rotations. Moreover, only one node have its $rank$ attributes invalidated in a rotation. Referring to the code for LEFT-ROTATE(T, x) on page 336 in *Introduction to Algorithms*, add the following line:

1: $y.rank = x.rank + y.rank$
