Range counting

Count (or enumerate) objects in a given range (many times)
USE ARRAY: $O(\log n)$ to place $L, R \rightarrow$ to count.

(binary search)
USE ARRAY: $O(\log n)$ to place $L, R \rightarrow$ to count.
$O(k + \log n)$ to enumerate/report.
USE ARRAY: $O(\log n)$ to place $L, R \rightarrow$ to count.
$O(k + \log n)$ to enumerate/report.

but this is not dynamic $[\text{insert/delete data} : O(n)]$
Store size of each subtree
$O(\log n)$ nodes visited

- 2 paths root→leaf
- 1 neighbor off path per node

○: "inside"
×: "outside"
Can we update subtree sizes when inserting/deleting data?
Can we update subtree sizes when inserting/deleting data?

Use a RB tree

when are subtree sizes affected?
Can we update subtree sizes when inserting/deleting data?

Use a RB tree

when are subtree sizes affected? Rotations