Design and Analysis
of Algorithms I

Data Structures

Balanced Search
Trees: Supported
Operations

Sorted Arrays: Supported Operations

3	6	10	11	17	23	30	36

OPERATIONS

BUT WHAT ABOUT INSERTIONS? + DELETIONS (would take $O(n)$ time)

RUNNING TIME

SEARCH $\Theta(\log n)$

SELECT (given order statistic i) $O(1)$

MIN / MAX $O(1)$

PRED / SUCC (given pointer to a key) $O(1)$

RANK (i.e., # of keys less than or equal to a given value) $O(\log n)$

OUTPUT IN SORTED ORDER $O(n)$

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Balanced Search Trees:
Supported Operations

Raison d'être : like sorted array + fast (logarithmic) inserts + deletes!

OPERATION

SEARCH
SELECT
MIN/MAX
PRED/SUCC
RANK
OUTPUT IN SORTED ORDER
INSERT
DELETE

RUNNING TIME

also supported by hash tables

$O(\log n)$
$O(\log n)$
$O(\log n)$ } up from $O(1)$
$O(\log n)$
$O(\log n)$
$O(n)$

also supported by heaps

$O(\log n)$ } new
$O(\log n)$

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