Range Search Tree

1. a
Range search data set

Search time: \( U \leq 2 \log n \) 1-d data structures

Almost every interval of \( R \) is \( O(\log^2 n) \)
$\text{Space} = O(m) \text{ per level } \Rightarrow O(n \log m)$

$= c \cdot n + c \cdot \left(\frac{n}{2} + \frac{n}{2}\right) + c \cdot \left(\frac{4 \cdot n}{4}\right) + ..$

Preprocessing Time:

Related data structures

1. Segment trees
2. Interval Trees

Multidimensional Data Structures
(including k-d-trees)
Point location in Planar regions

$(x_1, y_1)$

$R_1, R_2, R_3, R_5, R_6, L_{10}$
Point location in simple polygon

Observation: Changes happen only at endpoints.

There are $2n$ vertical slabs.
First do binary search in $x$ direction and then in $y$ direction (within a slab).

Total: $2 \log n$ runs.

Space is $O(n)$. $O(n) \Rightarrow O(n^2)$ too much.