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Point Location

Performance Of Trapezoidal Map

- Time For Point Location

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$E[\ T(i)\ ] = \mathcal{O}(\log n)$

- It's just been pointed out that:

$$T(i) = t(i) + \mathcal{O}(k(i))$$

- Taking expectations of both sides, we obtain that

$$\begin{aligned} & E[T(i)] \\ = \ & E[t(i)] + E[\mathcal{O}(k(i))] \\ = \ & E[t(i)] + \mathcal{O}(E[k(i)]) \end{aligned}$$

$E[\ T(i)\ ] = \mathcal{O}(\log n)$

- We have see that:

$$E[k(i)] = \mathcal{O}(1)$$

and will see soon that:

$$E[t(i)] = \mathcal{O}(\log(i))$$

- It then follows that:

$$E[T(i)]$$

$$= \mathcal{O}(\log i) + \mathcal{O}(1)$$

$$= \mathcal{O}(\log n)$$

E[$\sum_{i=1}^{n} T(i)$] = $\mathcal{O}$(nlogn)

- This implies that

  the time for $\boxed{\text{insertions}}$ is dominated by

  the time for $\boxed{\text{locating}}$/$\boxed{\text{querying}}$ the left endpoint

  in the previous (version of the) map

- Now,

  $E[\sum_{i=1}^{n} T(i)]$

  $= \sum_{i=1}^{n} E[T(i)]$

  $= n \times \mathcal{O}(\log n)$

  $= \mathcal{O}(n\log n)$