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Point Location

Kirkpatrick Structure

- Performance

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Preprocessing

- Claim: the time for preprocessing is $O(n \log n)$

- There are all together $O(\log n)$ iterations,

  each of which needs

  - $O(n)$ time

    find an independent set,

  - $O(n)$ time

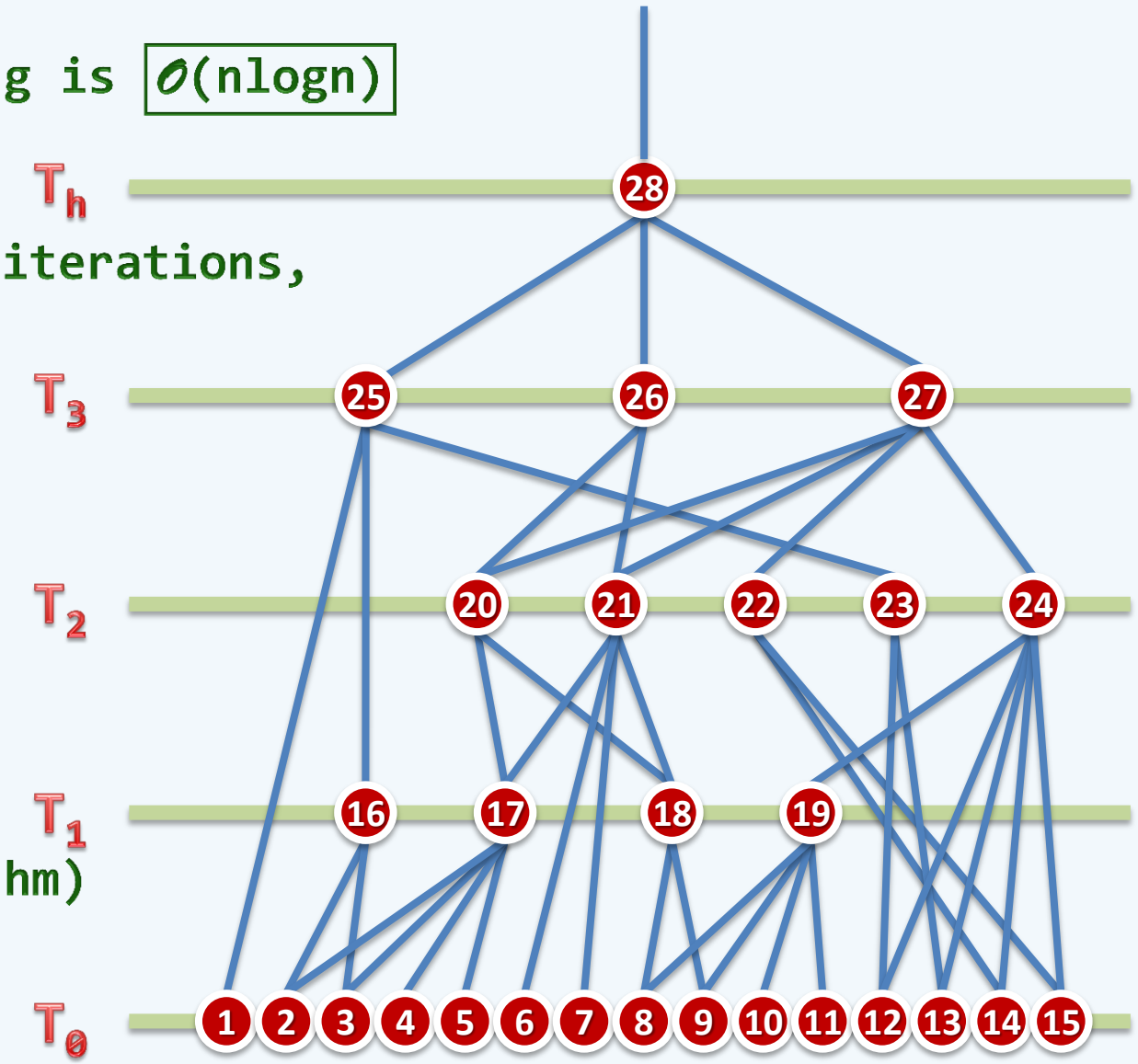
    to delete vertices,

  - $O(n)$ time to re-triangulate

    (using, say, Chazelle algorithm)

  - $O(8n)$ time

    to test triangle overlapping



Storage

❖ Claim: Kirkpatrick structure has a **linear** size

❖ The size of a triangulation

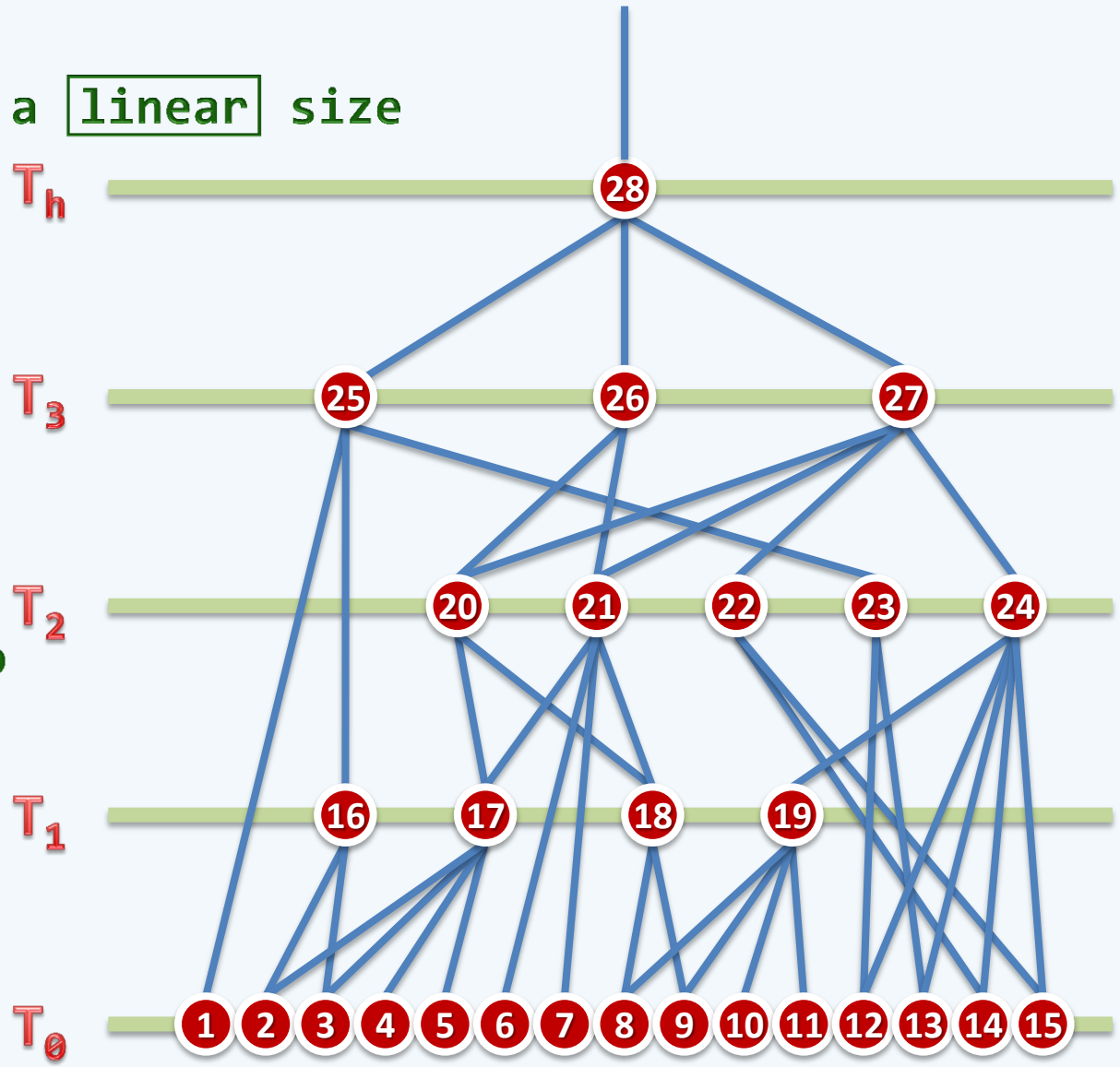
is proportional to

the number of vertices

❖ The total size is proportional to

$$n \times \left[\left(\frac{17}{18}\right)^0 + \left(\frac{17}{18}\right)^1 + \cdots + \left(\frac{17}{18}\right)^{O(\log n)}\right]$$

$< 18n = O(n)$



Query

- Claim: each query can be answered in $O(\log n)$ time
- There are $O(\log n)$ levels,
  each of which is
  a triangulation
- It takes $O(1)$ time to
  descend one level down
- In fact,
  the delay is no more than 8
  point-in-triangle tests