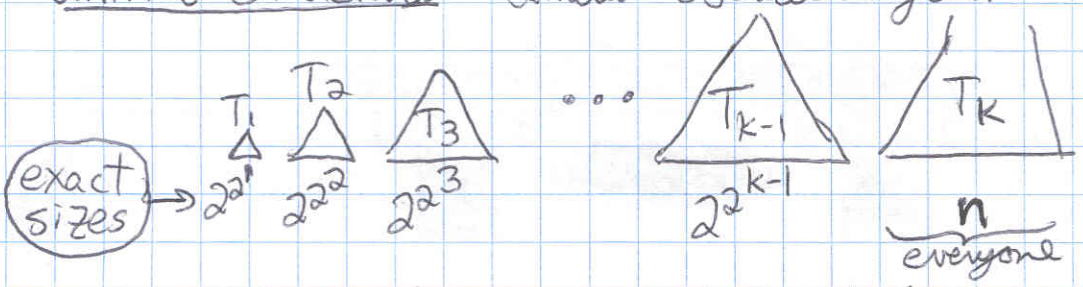
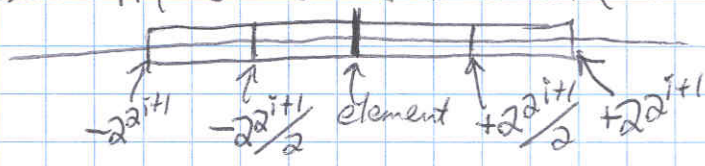
6.897
L 8.3
Mar. 10, 2003

Unified structure: similar overall layout



- each T_i has some subset of elements. No nesting.
- also a queue Q_i but only storing "childless" elements of T_i.
- every element in T_i has a parent in T_{i+1} within distance $2^{2^{i+1}}$ (rankwise)
- every element in T_{i+1} stores its children, divided into 4 groups:



- most elements are childless: $2^{2^{i+1}} - 2^{2^i}$ within T_{i+1}.
  $\Rightarrow |Q_{i+1}| \geq 2^{2^{i+1}} - 2^{2^i}$.

Search(x):

- can find in $O(2^i)$ whether there's an elt. in T_i within $2 \times 2^{2^i}$ of x:
  - find where x fits in T_i
  - ~~check against~~ these 2 elts. store their rank
  - binary search in range $\pm 2 \times 2^{2^i}$ around each elt. for x.
- so search in $T_1, T_2, T_3, \ldots$ for such an elt.
- suppose T_ℓ has y which is within $2 \times 2^{2^\ell}$ of x.
- Add $x \to T_\ell$ with same parent as y
- Add $x \to T_{\ell-1}$ with parent $= x$ in T_ℓ
- Add $x \to T_{\ell-2}$ with parent $= x$ in $T_{\ell-1}$
- ...
- Add $x \to T_1$ with parent $= x$ in T_2.

<<still need to define Add>>
<<suppose total time is $O(2^{2^\ell})$>>