6.897
L6.5
Feb. 17, 2005

Augmentation for delete:

- subtree sizes ⇒ can test $|T_v| \leq |T_w|$ in $O(1)$ time
- for each node v in tree in F_i:
  does v's subtree contain any nodes incident to level-i edges?
  ⇒ can find next level-i edge incident to $x \in T_v$ in $O(\lg n)$ time (successor, jumping over empty subtrees)
  ⇒ $O(\lg n)$ charge to edge (x,y)'s decrease in level
- total cost:
  - each inserted edge charged $O(\lg n)$ times ⇒ $O(\lg^2 n)$
  - remaining cost in delete is $O(\lg^2 n)$ [# trees × cost to remove]

Queries in $O(\lg n / \lg\lg n)$:

- modify branching factor of T (only) to $\Theta(\lg n)$ [B-tree]
  ⇒ $O(\lg^2 n / \lg\lg n)$ to update (depth × branching)
  & $O(\lg n / \lg\lg n)$ to findroot (depth)