Level ancestors in a compressed trie

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L19.5
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- in "don't care" data structure, need ancestor of v of letter depth d

⇒ effectively weights on the edges (length of label)

- still know that total weight along any path $\leq n (= |T|)$

① lookup table: as before (still $\leq n^2$ queries)

② jump pointers: now in terms of letter depth/dist.
⇒ may point to middle of edge — round up

③ long-path decomposition:
depths of nodes in a path now stored in predecessor DS
⇒ $O(\lg \lg n)$ per path ($u \leq n$)

④ ladder decomposition: as before + predecessor

⑤ combine: as before

⑥ jump-pointer tuning: as before

⑦ ART decomposition: uh oh!

OPEN: simple $O(\lg \lg n)$-query $O(n)$-space weighted level-ancestor DS?

SOLUTION: (with Tim Abbott & Ilya Baran & al.)

use ④ on bottom trees
⇒ look at $O(\lg \lg n)$ paths (size of tree)

only in last step look at predecessor structure of path
⇒ additive $O(\lg \lg \lg n)$ time
⇒ $O(\lg \lg n)$ query