

**11.7:** A standard implementation of Fibonacci heaps requires four links per node: a link to its parent, a link to one of its children, and links to its left and right siblings. However there are some ways to decrease the number of links with the cost of only at most a constant factor in the running time. One approach is to use Quake heaps, which have the same functionality as Fibonacci heaps, but they allow for less links. Just like Fibonacci heaps, Quake heaps can perform insert, merge, decrease-key, and find-min in  $O(1)$  amortized time and it can perform delete-min in  $O(\log n)$  amortized time. This reduction in the number of links can result in improved performance and reduced memory usage, which can make Quake heaps more useful in certain scenarios.