Two-tier relaxed heaps

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Abstract. We introduce a data structure which provides efficient heap operations with respect to the number of element comparisons performed. Our data structure guarantees the worst-case cost of $O(1)$ for finding the minimum, inserting an element, extracting an (unspecified) element, and replacing an element with a smaller element; and the worst-case cost of $O(\lg n)$ with at most $\lg n + 3 \lg \lg n + O(1)$ element comparisons for deleting an element. We thereby improve the comparison complexity of heap operations known for run-relaxed heaps and other worst-case efficient heaps.

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