Binary Heaps: Homework

17/3/2020

- Implement the array-based representation of binary heap together with the functions `HEAP_MIN`, `REMOVE_MIN`, `HEAPIFY`, `BUILD_HEAP`, `DECREASE_KEY`, and `INSERT_VALUE`.

- Implement an iterative version of `HEAPIFY`.

- Test the implementation on a set of instances of the problem and evaluate the execution time.

- (Ex. 6.1-7 in [**?**]) Show that, with the array representation, the leaves of a binary heap containing n nodes are indexed by $\lfloor n/2 \rfloor + 1, \lfloor n/2 \rfloor + 2, \ldots n$.

- (Ex. 6.2-6 in [**?**]) Show that the worst-case running time of `HEAPIFY` on a binary heap of size n is $\Omega(\log n)$. (Hint: For a heap with n nodes, give node values that cause `HEAPIFY` to be called recursively at every node on a simple path from the root down to a leaf.)

- (Ex. 6.3-3 in [**?**]) Show that there are at most $\lceil n/2^{h+1} \rceil$ nodes of height h in any n-element binary heap.

References