Binary heaps: homework 2 (24/3/2020)

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1.

The code required by the exercise is inside the folder `Ad_binheaps`, organized as the provided repository `AD_bin_heaps` (git repo binary heaps). Compiling the codes will produce, as for the previous homework, two executables `test_insert` and `test_delete_min` testing the main functions implemented for binary heaps, and comparing the time elapsed when deleting the minimum element from a binary heap and from an array (provided that the keys of the heap's node are the same elements of the array).

2.

- if build, is_empty $\in \Theta(1)$ and extract_min $\in \Theta(|D|)$, then:

$T(|D|) = \Theta(1) + \sum_{i=1}^{|D|}(\Theta(1) + \Theta(|D|)) = \Theta(1) + \sum_{i=2}^{|D|}\Theta(|D|) \in \Theta(|D|^2)$.

- if build $\in \Theta(|A|)$, is_empty $\in \Theta(1)$ and extract_min $\in O(\log(n))$, then, assuming $|A| = n = |D|$, we can put an upper-bound to the complexity of the algorithm in the following way:

$T(n) = \Theta(n) + \sum_{i=1}^{n}(\Theta(1) + O(\log(n))) = \Theta(n) + \sum_{i=1}^{n} O(\log(n)) =$
$= \Theta(n) + O(n \cdot \log(n)) \in O(n \cdot \log(n))$.