Sorting: Homework

31/3/2020

- By using the code at:

  `https://github.com/albertocasagrande/AD_sorting`

  implement Insertion Sort, Quick Sort, Bubble Sort, Selection Sort, and Heap Sort.

- For each of the implemented algorithm, draw a curve to represent the relation between the input size and the execution-time.

- Argue about the following statement and answer the questions

  1. Heap Sort on a array A whose length is n takes time $O(n)$.
  2. Heap Sort on a array A whose length is n takes time $\Omega(n)$.
  3. What is the worst case complexity for Heap Sort?
  4. Quick Sort on a array A whose length is n takes time $O(n^3)$.
  5. What is the complexity of Quick Sort?
  6. Bubble Sort on a array A whose length is n takes time $\Omega(n)$.
  7. What is the complexity of Bubble Sort?

- Solve the following recursive equation:

$$T(n) = \begin{cases} \Theta(1) & \text{if } n = 32 \\ 3 * T\left(\frac{n}{4}\right) + \Theta\left(n^{3/2}\right) & \text{otherwise} \end{cases}$$