HUST

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Applied Algorithm Lab

Max-distance Sub-sequence

- Given a sequence $a_1, \ldots, a_N$

- Consider a subset of the sequence

    The distance of the subset is defined to be the minimum distance between two elements

- Find the subset of N given elements containing exactly C elements such that the distance is maximal.

- Example

stdin	stdout
1 5 3 1 2 8 4 9	3

- Idea to solve: Sort $a_1,\ldots, a_N$ in increasing order
- The max-distance must be $\leq \dfrac{a_N - a_1}{c-1}$
- Find max-distance: traverse from $\mathbf{d} = \dfrac{a_N - a_1}{c-1}$ down to 1:
  - check(d): Check if we can find a sub-sequence with distance $\geq d$: Greedy
  - Add a1 into subsequence, use an auxiliary variable **last**
  - for i=2, i<=n; i++:
    - if a[i]-last $\geq$ d then we add a[i] to the subsequence and update **last**
    - otherwise continue
  - If the subsequence has C elements then d is max-distance. Print d
  - Complexity: O(n^2)

- Idea to solve: Sort $a_1, \ldots, a_N$ in increasing order
- The max-distance must be $\leq \dfrac{a_N - a_1}{c-1}$
- Find max-distance from $d = \dfrac{a_N - a_1}{c-1}$ down to 1: this can be improved
  - Binary search for d
  - Complexity: O(n log n)

THANK YOU !