Selection Algorithm

Not seletion Sort

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Selection Algorithm

Keyword: Sorted!

- Definition
  - Find the k-th smallest number (aka k-th order statistic) in an list or array
- Examples
  - Find the minimum
  - Find the maximum
  - Find the median 中位數
- Time complexity
  - O(n) for worst case

Methods for Selection Algorithms

- Basic methods for selection algorithms
  - Selection by sorting: O(n log(n))
  - Partial selection sort : O(kn)
  - Partition-based selection (Quickselect): O(n) in average
  - Partial heap sort: O(n + k log(n))
- References
  - Wikipedia
  - 寻找第K大的数的方法总结

Partition-based selection (Quickselect)

- Used by nth_element() in STL
- Based on the concept of “divide and conquer”
- Pseudo code

QS(S, k)
  if $|S|=1$, return x_1
  $S_L=\{x_i | x_i \text{ in } S, x_i<x_1\}$
  $S_R=\{x_i | x_i \text{ in } S, x_i>x_1\}$
  if $|S_L|=k-1$, return(x_1)
  if $|S_L|>k-1$, return QS(S_L, k)
  if $|S_L|<k-1$, return QS(S_R, k-$|S_L|$-1)

- Reference
  - Median Selection Algorithm (Part #2 - Improving Effeciency)