SELECT Algorithm

The SELECT algorithm determines the $i$th smallest of an input array of $n$ elements by executing the following steps.

1. Divide the $n$ elements of the input array into ⌊$n/5$⌋ groups of 5 elements each and at most one group made up of the remaining $n \ mod \ 5$ element.

2. Find the median of each of the ⌈$n/5$⌉ groups by insertion sorting the elements of each group (of which there are 5 at most) and taking its middle element. (If the group has an even number of elements, take the larger of the two medians.)

3. Use SELECT recursively to find the median $x$ of the ⌈$n/5$⌉ medians found in step 2.

4. Partition the input array around the median-of-median $x$ using a modified version of PARTITION. Let $k$ be the number of elements on the low side of the partition, so that $n - k$ is the number of elements on the high side.

5. Use SELECT recursively to find the $i$th smallest element on the low side if $i \leq k$, or the $(i - k)$th smallest element on the high side if $i > k$. 