

# Assignment 5

Fei Li<sup>1</sup>

---

<sup>1</sup>Department of Computer Science, George Mason University, Fairfax, VA  
22030. Email: fli4@gmu.edu

The original SELECT algorithm is as below.

1. Divide the  $n$  elements of the input array into  $\lfloor n/5 \rfloor$  groups of 5 elements each and at most one group made up of the remaining  $n \bmod 5$  elements.
2. Find the median of each of the  $\lfloor n/5 \rfloor$  groups and then picking the median from the sorted list of group elements.
3. Use SELECT recursively to find the median  $x$  of the  $\lfloor n/5 \rfloor$  medians found in step 2.
4. Partition the input array around the median-of-medians  $x$  using the modified version of PARTITION. Let  $k$  be one more than the number of elements on the low side of the partition.
5. If  $i = k$ , then return  $x$ . Otherwise, use SELECT recursively to find the  $i$ th smallest element on the low side if  $i < k$ , or the  $(i - k)$ -th smallest element on the high side if  $i > k$ .

In the original algorithm SELECT, the input elements are divided into groups of 5. Will the algorithm work in linear time if they are divided into groups of 7? Will the algorithm work in linear time if they are divided into groups of 3? Prove your claims.