

Searching and Selection

Hengfeng Wei

hfwei@nju.edu.cn

April 8 ~ April 8, 2017



Searching and Selection

1 Selection

2 Searching

The 3rd largest element (Problem 3.1)

$$V_k(n) :$$

The 3rd largest element (Problem 3.1)

$$V_k(n) :$$

$$V_1(n) = n - 1$$

$$V_2(n) = (n - 1) + (\lceil \log n \rceil - 1)$$

The 3rd largest element (Problem 3.1)

$$V_k(n) :$$

$$V_1(n) = n - 1$$

$$V_2(n) = (n - 1) + (\lceil \log n \rceil - 1)$$

$$V_3(n) = ?$$

The 3rd largest element (Problem 3.1)

$$V_k(n) :$$

$$V_1(n) = n - 1$$

$$V_2(n) = (n - 1) + (\lceil \log n \rceil - 1)$$

$$V_3(n) = ?$$

$$V_3(n) \leq (n - 1) + (\lceil \log n \rceil - 1) + (n - 3)$$

The 3rd largest element (Problem 3.1)

$$V_k(n) :$$

$$V_1(n) = n - 1$$

$$V_2(n) = (n - 1) + (\lceil \log n \rceil - 1)$$

$$V_3(n) = ?$$

$$V_3(n) \leq (n - 1) + (\lceil \log n \rceil - 1) + (n - 3)$$

$$V_3(n) \leq (n - 1) + (\lceil \log n \rceil - 1) + (\lceil \rceil)$$

The 3rd largest element (Problem 3.1)

“What is the exact value of $V_3(n)$?”

The 3rd largest element (Problem 3.1)

“What is the exact value of $V_3(n)$?”

“I don’t know!”

The 3rd largest element (Problem 3.1)

“What is the exact value of $V_3(n)$?”

“I don’t know!”

Reference

“The Art of Computer Programming, Vol 3: Sorting and Searching” by Donald E. Knuth.

The 3rd largest element (Problem 3.1)

“Does your algorithm need to find the 1st and the 2nd elements?”

The 3rd largest element (Problem 3.1)

“Does your algorithm need to find the 1st and the 2nd elements?”

“YES!”

The 3rd largest element (Problem 3.1)

“Does your algorithm need to find the 1st and the 2nd elements?”

“YES!”

“Do all algorithms have to find the 1st and the 2nd elements?”

The 3rd largest element (Problem 3.1)

“Does your algorithm need to find the 1st and the 2nd elements?”

“YES!”

“Do all algorithms have to find the 1st and the 2nd elements?”

“NO!”

The 3rd largest element (Problem 3.1)

“Does your algorithm need to find the 1st and the 2nd elements?”

“YES!”

“Do all algorithms have to find the 1st and the 2nd elements?”

“NO!”

References

“Selecting the Top Three Elements” by Aigner, 1982.

The largest k elements (Problem 3.5)

Close to median (Problem 3.6)

Medians of sorted arrays (Problem 3.7)

Weighted median (Problem 3.9)

Searching and Selection

1 Selection

2 Searching