Illustration of illustration

Question 8[6 Points]

Illustrate QuickSelect(A, 8) where A = {9, 3, 5, 1, 4, 2, 7, 6, 8, 10, 11}. Please use "median of the three" to pick your pivot and show details as in your class notes. (otherwise, no credit).

k = 8.

First = A[0] = 9, last = A[10] = 11, middle value = A[(0 + 10)/2] = A[5] = 2.

So the median of three values {9, 11, 2} is 9. Hence the pivot = 9.

Swap pivot and last

11 3 5 1 4 2 7 6 8 10 9

i j <- j //move I and j

8 3 5 1 4 2 7 6 11 10 9 //swap A[i], A[j]

I j //i++, j—

8 3 5 1 4 2 7 6 11 10 9 // move I and j

j i

[8 3 5 1 4 2 7 6] [9] [10 11] //swap A[i], pivot

|L| = 8. |E| = 1. |G| = 2.

Since |L| = 8 <= k. k remains as 8.

Recursive call QuickSelect(L, 8).

8 3 5 1 4 2 7 6

First = A[0] = 8, last = A[7] = 6, middle value = A[(0 + 7)/2] = A[3] = 1. So the median of three values {8. 6, 1} is 6. Hence the pivot = 6.

Swap pivot and last

8 3 5 1 4 2 7 6

i j <- j //move I and j

2 3 5 1 4 8 7 6 //swap A[i], A[j]

2 3 5 1 4 8 7 6

i j //i++, j—

2 3 5 1 4 8 7 6

j I //move I and j

[2 3 5 1 4] [6] [7 8] //swap A[i], pivot

|L| = 5. |E| = 1. |G| = 2. Since |L|+|E| = 6 < k = 8, the k value changes to

k – (|L|+|E|) = 8 – 6 = 2.

Recursive call QuickSelect(G, 2).

7 8

First = A[7] = 7, last = A[8] = 8, middle value = A[(7 + 8)/2] = A[7] = 7. So the median of three values {7, 8, 7} is 7. Hence the pivot = 7.

Swap pivot and last

8 7

Ij //move I and j.

J←

[7] [8] //swap A[i], pivot

|L| = 0. |E| = 1. |G| = 1.

Since |L|+|E| = 1 < k = 2, the k value changes to

k – (|L|+|E|) = 2 – 1 = 1.

Recursive call QuickSelect(G, 1) returns 8 since G has only one item.