Humboldt University of Berlin

Einführung in das wissenschaftliche Rechnen

XXX

Christian Parpart & Kei Thoma

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Contents

1 Worked Example 1

Color Key

- partitions to be sorted in the following steps are marked with orange
- partitions currently ignored are marked with gray
- pivots are marked with teal
- elements which were swapped are in red

7	1	5	4	9	2	8	3	0	6	(1) choose pivot
1	7	5	4	9	2	8	3	0	6	(2) swap 7 and 1
1	5	7	4	9	2	8	3	0	6	(3) swap 7 and 5
1	5	4	7	9	2	8	3	0	6	(4) swap 7 and 4
1	5	4	2	9	7	8	3	0	6	(5) swap 7 and 2
1	5	4	2	3	7	8	9	0	6	(6) swap 9 and 3
1	5	4	2	3	0	8	9	7	6	(7) swap 7 and 0
1	5	4	2	3	0	6	9	7	8	(8) swap 8 and the pivot
1	5	4	2	3	0	6	9	7	8	(9) 6 is in the correct place
partition the sequence into $(1, 5, 4, 2, 3, 0)$ and $(9, 7, 8)$										
1	5	4	2	3	0	6	9	7	8	(10) sort left side
1	5	4	2	3	0	6	9	7	8	(11) choose pivot
0	5	4	2	3	1	6	9	7	8	(12) swap 1 and the pivot
0	5	4	2	3	1	6	9	7	8	(13) 0 is in the correct place
partition the sequence into () and $(5, 4, 2, 3, 1)$										
0	5	4	2	3	1	6	9	7	8	(14) nothing to sort on the left side
0	5	4	2	3	1	6	9	7	8	(15) sort right side
0	5	4	2	3	1	6	9	7	8	(16) choose pivot
0	1	4	2	3	5	6	9	7	8	(17) swap 5 and the pivot
0	1	4	2	3	5	6	9	7	8	(18) 1 is in the correct place
partition the sequence into () and $(4, 2, 3, 5)$										
0	1	4	2	3	5	6	9	7	8	(19) nothing to sort on the left side
0	1	4	2	3	5	6	9	7	8	(20) sort right side
0	1	4	2	3	5	6	9	7	8	(21) choose pivot
0	1	4	2	3	5	6	9	7	8	(22) 5 is in the correct place
partition the sequence into $(4, 2, 3)$ and ()										
0	1	4	2	3	5	6	9	7	8	(23) sort left side
0	1	4	2	3	5	6	9	7	8	(24) choose pivot
0	1	2	4	3	5	6	9	7	8	(25) swap 4 and 2
0	1	2	3	4	5	6	9	7	8	(26) swap 4 and the pivot

0	1	2	3	4	5	6	9	7	8	(27) 3 is in the correct place
0	1	2	3	4	5	6	9	7	8	(28) nothing to sort on the right side
partition the sequence into (2) and (4)										
0	1	2	3	4	5	6	9	7	8	(27) sort left side
0	1	2	3	4	5	6	9	7	8	(28) 2 is in the correct place
0	1	2	3	4	5	6	9	7	8	(29) sort right side
0	1	2	3	4	5	6	9	7	8	(30) 4 is in the correct place
0	1	2	3	4	5	6	9	7	8	(31) sort right side
0	1	2	3	4	5	6	9	7	8	(32) choose pivot
0	1	2	3	4	5	6	7	9	8	(33) swap 9 and 7
0	1	2	3	4	5	6	7	8	9	(34) swap 9 and pivot
0	1	2	3	4	5	6	7	8	9	(34) 8 is in the correct place
partition the sequence into (7) and (9)										

2 Worked Example 2

7	1	5	4	9	2	8	3	0	6	find the pivot
1	7	5	4	9	2	8	3	0	6	swap 7 and 1
1	5	7	4	9	2	8	3	0	6	swap 7 and 5
1	5	4	7	9	2	8	3	0	6	swap 7 and 4
1	5	4	2	9	7	8	3	0	6	swap 7 and 2
1	5	4	2	3	7	8	9	0	6	swap 9 and 3
1	5	4	2	3	0	8	9	7	6	swap 7 and 0
1	5	4	2	3	0	6	9	7	8	swap 8 and the pivot

Now, the pivot 6 is on the right place and every element on the left side is smaller and every element on the right side is larger than the pivot.

1	5	4	2	3	0	6	9	7	8

We partition the sequence into two smaller ones and apply the algorithm on each.

1	5	4	2	3	0	find the pivot
0	5	4	2	3	1	swap 1 and the pivot

The pivot 0 is correctly placed.

0	5	4	2	3	1

Since there is no left side of the pivot, we proceed with the right side.

5	4	2	3	1	find the pivot
1	4	2	3	5	swap 5 and the pivot

Again, 1 is placed correctly in the far left. The following sequence is left.

1	4	2	3	5

Now we have

4	2	3	5	find the pivot

since the pivot 5 is already correctly placed, there is no swapping to do. We continue with

4	2	3	find the pivot
2	4	3	swap 4 and 2
2	3	4	swap 4 and the pivot

After this, the left side of the inital partition is correctly sorted.

0	1	2	3	4	5	6	9	7	8

We continue with the right side.

9	7	8	find the pivot
7	9	8	swap 9 and 7
7	8	9	swap 9 and the pivot

At the end of the algorithm we have the correctly sorted list.

0	1	2	3	4	5	6	7	8	9