

Sorting Algorithms

Introduction

- Sorting elements held within a vector can be performed in various different ways (algorithms).

Bubble Sort

- Each phase we will iterate over all items comparing each pair of elements bubbling up the biggest number we find.
- Each followed phase we will continue with iterating all items excluding the last element we reached in the previous phase.

Bubble Sort

- Assuming we have the following array of numbers:

[25,5,642,1,22]

First Phase

[**25**,5,642,1,212] -> [5,25,642,1,212]

comparing 25 and 5 we bubble up 25

[5,**25**,**642**,1,212] -> [5,25,642,1,212]

642 is bigger than 25 so we don't bubble

[5,25,**642**,1,212] -> [5,25,1,642,212]

comparing 642 and 1 we bubble up 642

[5,25,1,**642**,**212**] -> [5,25,1,212,**642**]

comparing 642 and 212 we bubble up 642

At the end of this stage we can say the left most element is the biggest one of all elements. In the next phase we will iterate over the first four elements only.

Bubble Sort

Second Phase

[**5**,**25**,1,212,642] -> [5,25,1,212,**642**]

25 is bigger than 5 so we don't bubble

[5,**25**,**1**,212,642] -> [5,1,25,212,**642**]

comparing 25 and 1 we bubble up 25

[5,1,**25**,**212**,642] -> [5,1,25,**212**,**642**]

212 is bigger than 25 so we don't bubble

At the end of this stage we can say the two right most elements are already sorted. In the next phase we will iterate over the first three elements only.

Bubble Sort

Third Phase

[5,1,25,212,642] -> [1,5,25,212,642]

comparing 5 and 1 we bubble up 5

[1,5,25,212,642] -> [1,5,25,212,642]

25 is bigger than 5 so we don't bubble

At the end of this stage we can say the three left most elements are already sorted. In the next phase we will iterate over the first two elements only.

Fourth Phase

[1,5,25,212,642] -> [1,5,25,212,642]

5 is bigger than 1 so we don't bubble

At the end of this stage we can say the four left most elements are already sorted. In the next phase we theoretically need to sort the first element only. A redundant phase we can skip.

Bubble Sort

- Checking each phase whether any element was bubbled or not will improve the algorithm.
- If there wasn't any bubbling in a given phase we can deduce the array of elements is sorted already and there is no need to move forward with the next phases.

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06/19/11

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- Assuming we have the following array of numbers:

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First Phase

[**25**,5,642,1,212] -> [5,25,642,1,212]

comparing 25 and 5 we bubble up 25

[5,**25**,**642**,1,212] -> [5,25,642,1,212]

642 is bigger than 25 so we don't bubble

[5,25,**642**,**1**,212] -> [5,25,1,642,212]

comparing 642 and 1 we bubble up 642

[5,25,1,**642**,**212**] -> [5,25,1,212,**642**]

comparing 642 and 212 we bubble up 642

At the end of this stage we can say the left most element is the biggest one of all elements. In the next phase we will iterate over the first four elements only.

Bubble Sort

Second Phase

[**5**,**25**,1,212,642] -> [5,25,1,212,**642**]

25 is bigger than 5 so we don't bubble

[5,**25**,**1**,212,642] -> [5,1,25,212,**642**]

comparing 25 and 1 we bubble up 25

[5,1,**25**,**212**,642] -> [5,1,25,**212**,**642**]

212 is bigger than 25 so we don't bubble

At the end of this stage we can say the two right most elements are already sorted. In the next phase we will iterate over the first three elements only.

Bubble Sort

Third Phase

[5,1,25,212,642] -> [1,5,25,212,642]

comparing 5 and 1 we bubble up 5

[1,5,25,212,642] -> [1,5,25,212,642]

25 is bigger than 5 so we don't bubble

At the end of this stage we can say the three left most elements are already sorted. In the next phase we will iterate over the first two elements only.

Fourth Phase

[1,5,25,212,642] -> [1,5,25,212,642]

5 is bigger than 1 so we don't bubble

At the end of this stage we can say the four left most elements are already sorted. In the next phase we theoretically need to sort the first element only. A redundant phase we can skip.

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- Checking each phase whether any element was bubbled or not will improve the algorithm.
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