

Bubble Sort

Algorithms

Algorithms are series of step-by-step instructions for a computer to complete a task.

Well-Known Algorithms

There are many well-known algorithms that describe a specific way to solve common problems.

For example, one such problem is being able to sort data, which can be solved with the following algorithms:

- Bubble Sort
- Merge Sort
- Quicksort

Bubble Sort Algorithm

The Bubble Sort algorithm is a simple algorithm to sort a list of N numbers in ascending order. Bubble sort works by iterating through a list and checking whether the current element is larger or smaller than the next element.

This algorithm consists of an outer iteration and an inner iteration. In the inner iteration, the first and second elements are first compared and swapped so that the second element has a higher value than the first. This is repeated for the subsequent second and third element pairs and so forth until the last pair of $(N-2, N-1)$ elements is compared. At the end of the inner iteration, the largest element appears last. This is repeated for all elements of the list in the outer iteration.



3 5 4 6 2 1

Bubble Sort Big-O Runtime

The Bubble Sort algorithm utilizes two loops: an outer loop to iterate over each element in the input list, and an inner loop to iterate, compare and exchange a pair of values in the list. The inner loop takes $(N-1)$ iterations while the outer loop takes N iterations. Hence, the Big-O runtime for the algorithm is the product of $O(N)$ and $O(N-1)$, which is $O(N^2)$.

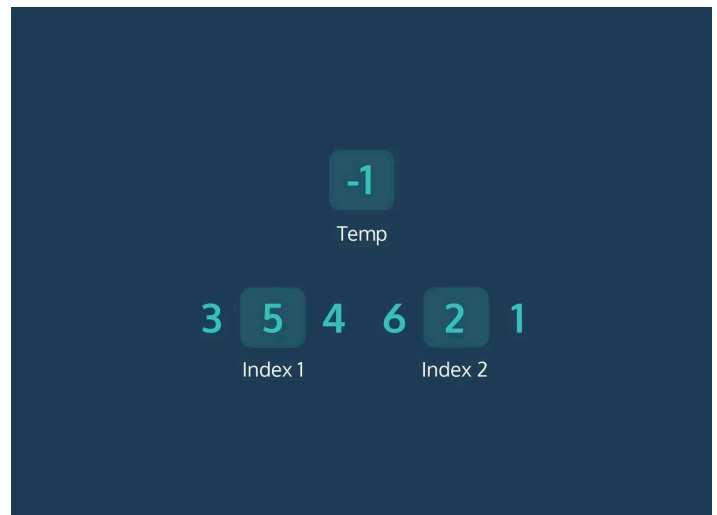
Bubble Sort Swapping Variables

The Bubble Sort algorithm requires swapping of variables in order to sort them. The swapping algorithm is dependent on the programming language. For most languages, a temporary variable is needed to hold one of the values being swapped:

```
temp_variable = number_1
number_1 = number_2
number_2 = temp_variable
```

For others, the swapping can be done in a single assignment:

```
number_1, number_2 = number_2, number_1
```



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