

Selection Sort

January 31, 2014

The selection sort algorithm sorts an array by repeatedly finding the minimum element (considering ascending order) from unsorted part and putting it at the beginning. The algorithm maintains two subarrays in a given array.

- 1) The subarray which is already sorted.
- 2) Remaining subarray which is unsorted.

In every iteration of selection sort, the minimum element (considering ascending order) from the unsorted subarray is picked and moved to the sorted subarray.

Following example explains the above steps:

```
arr[] = 64 25 12 22 11
```

```
// Find the minimum element in arr[0...4] and place it at beginning
```

```
11 25 12 22 64
```

```
// Find the minimum element in arr[1...4] and
```

```
// place it at beginning of arr[1...4]
```

```
11 12 25 22 64
```

```
// Find the minimum element in arr[2...4] and
```

```
// place it at beginning of arr[2...4]
```

```
11 12 22 25 64
```



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```
// Find the minimum element in arr[3...4] and
// place it at beginning of arr[3...4]
11 12 22 25 64
```

```
// C program for implementation of selection sort
#include <stdio.h>
```

```
void swap(int *xp, int *yp)
{
    int temp = *xp;
    *xp = *yp;
    *yp = temp;
}
```

```
void selectionSort(int arr[], int n)
{
    int i, j, min_idx;

    // One by one move boundary of unsorted subarray
    for (i = 0; i < n-1; i++)
    {
        // Find the minimum element in unsorted array
        min_idx = i;
        for (j = i+1; j < n; j++)
            if (arr[j] < arr[min_idx])
                min_idx = j;

        // Swap the found minimum element with the first element
        swap(&arr[min_idx], &arr[i]);
    }
}
```

```
/* Function to print an array */
void printArray(int arr[], int size)
{
    int i;
    for (i=0; i < size; i++)
        printf("%d ", arr[i]);
    printf("\n");
}
```

```
// Driver program to test above functions
int main()
{
    int arr[] = {64, 25, 12, 22, 11};
```

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```

int n = sizeof(arr)/sizeof(arr[0]);
selectionSort(arr, n);
printf("Sorted array: \n");
printArray(arr, n);
return 0;
}

```

Output:

Sorted array:
1 5 7 8 9 10

Time Complexity: $O(n^2)$ as there are two nested loops.

Auxiliary Space: $O(1)$

The good thing about selection sort is it never makes $O(n)$ swaps and can be useful when memory write is a costly operation.

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disqus_kEyYedb4C · 24 days ago

Is it stable



GeeksforGeeks Mod → disqus_kEyYedb4C · 21 days ago

The above implementation of selection sort is not stable. To make it needs to be modified to insert the minimum element rather swappir



monty024 · 2 months ago

this post explain why it is n^2 <http://cs.stackexchange.com/qu...>



kx · 3 months ago

why isn't the complexity = $O(n!)$? since the inner loop traverses as : $n, n-1$



Sudhakar Mishra I think it should be $2n + 1$

Data Structures | Binary Trees | Question 12 · 8 hours ago

Sudhakar Mishra $(2n)! / ((n+1)! * n!)$

Data Structures | Binary Trees | Question 6 · 1 day ago

Sudhakar Mishra Always Y will be more than one because after...

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kx → kx · 3 months ago

Wrong question..!

^ | v ·



monty024 → kx · 2 months ago

I don't think there is wrong question in the world. there are w

^ | v ·



jagadish · 3 months ago

We Can optimize the Selection Sort algorithm by selecting minimum element and then swapping it with the minimum element.

The Total Time Complexity will be reduced from $O(n^2)$ to $O(n \log n)$.

^ | v ·



Thrinadh → jagadish · a month ago

@jagadish Heap takes $O(n)$ to get a minimum element. So by using

1 ^ | v ·



Guest · 3 months ago

what if we want to order numbers in array in increasing order through selection sort?

^ | v ·



jagadish → Guest · 3 months ago

Pick the Maximum element from the unsorted array each time and swap it with the last element of the unsorted array.

^ | v ·



Jai · 3 months ago

ama12, Cycle Sort is a better algorithm in terms of memory writes. selection sort is better in terms of memory reads.

^ | v ·



Selection sort is good if we use with the combination with heap, wh



ama12 • 3 months ago

Is selection Sort the best algorithm in terms of memory writes?



ama12 • 3 months ago

Is selection sort the best algorithm in terms of number of swaps?



Sumit Khatri → ama12 • 8 hours ago

yes, it is the only sorting technique which requires $O(n)$ swaps ever



jagadish → ama12 • 3 months ago

Quicksort even better then selection sort in terms of number of swa



Sumit Khatri → jagadish • 8 hours ago

no, quick sort requires more swaps than selection sort in w



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