

Selection Sort Algorithm

Introduction

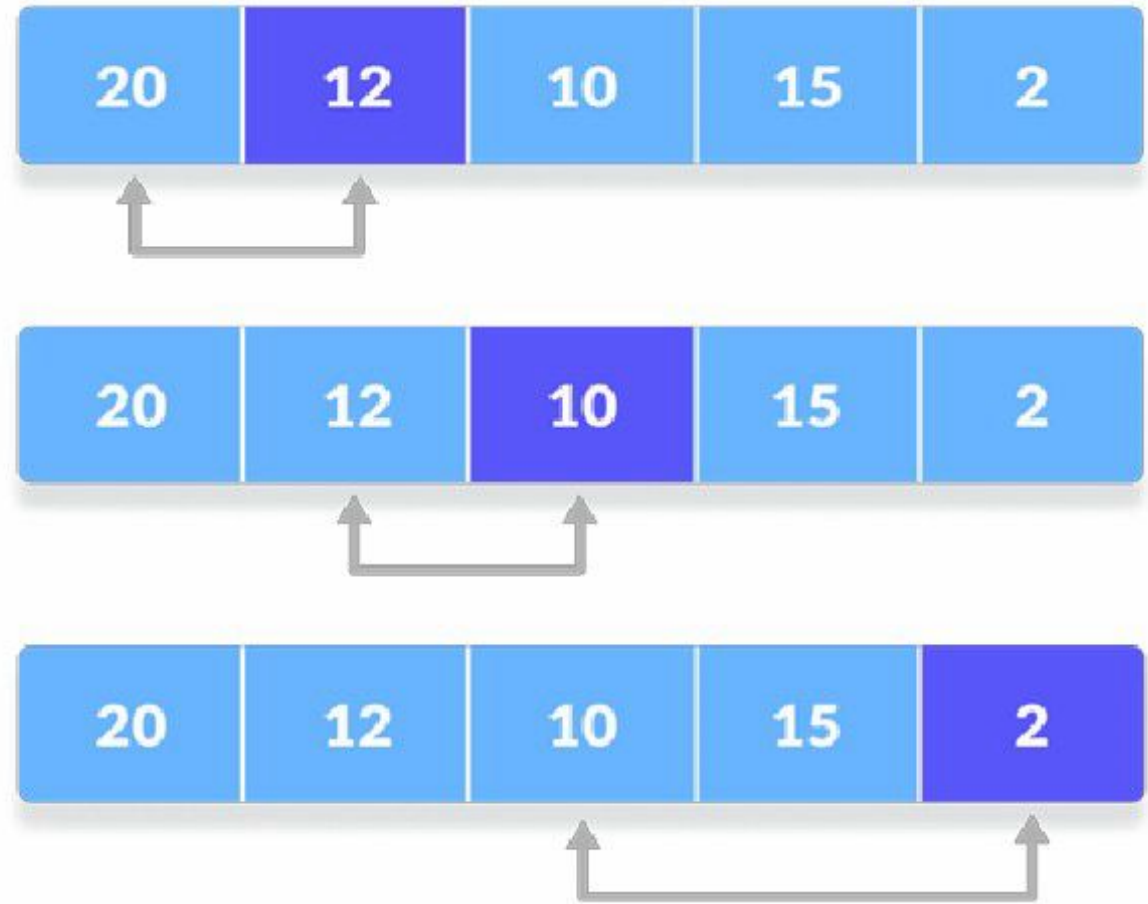
- Selects the smallest element from an unsorted list in each iteration
- places that element at the beginning of the unsorted list.
- **Example:**
 - Steps to sort the elements 20, 12, 10, 15, 2
 - **Step 1:** Set the first element as minimum.



Cont...

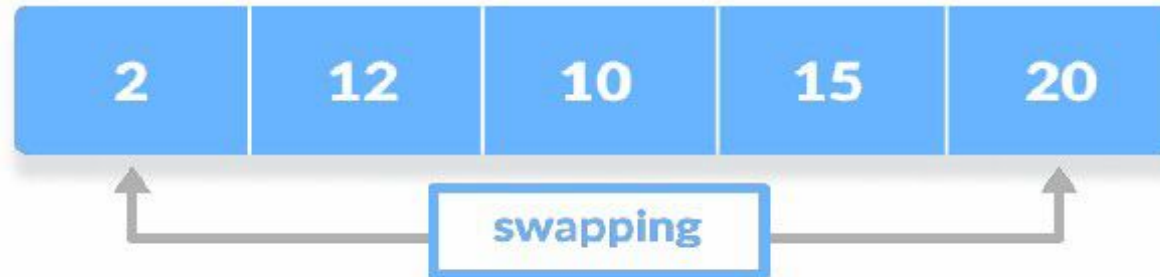
- **Step 2:** Compare minimum with the second element. If the second element is smaller than minimum, assign second element as minimum.

Compare minimum with the third element. Again, if the third element is smaller, then assign minimum to the third element otherwise do nothing. The process goes on until the last element.



Cont...

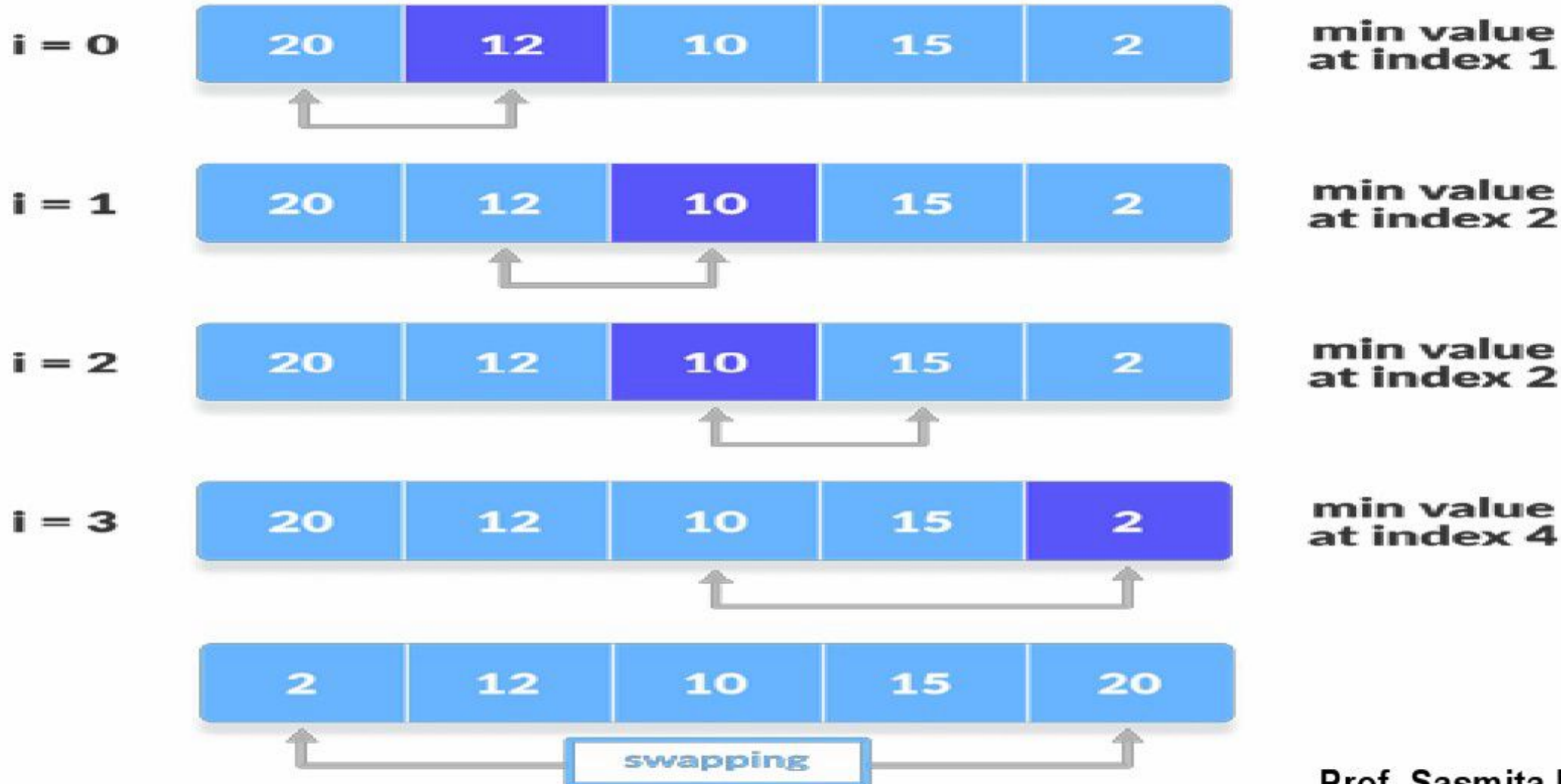
- **Step 3:** After each iteration, minimum is placed in the front of the unsorted list.



- For each iteration, indexing starts from the first unsorted element.
- Steps 1 to 3 are repeated until all the elements are placed at their correct positions.

Complete Problem Solving solution

step = 0



Cont...

step = 1

i = 0



**min value
at index 2**



i = 1



**min value
at index 2**



i = 2



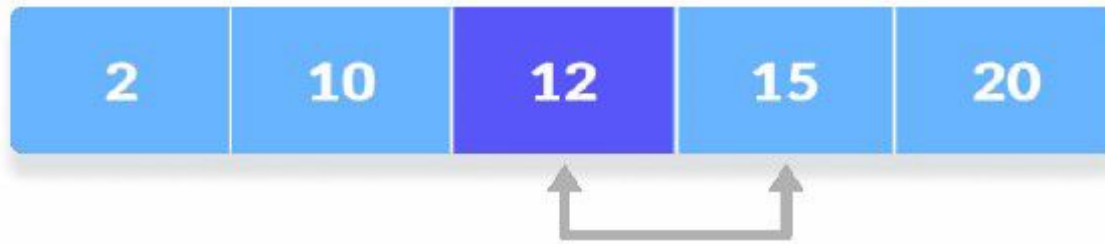
**min value
at index 2**



Cont...

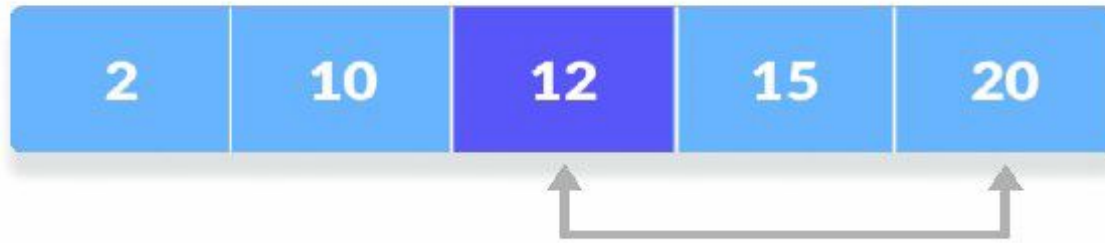
step = 2

$i = 0$



min value
at index 2

$i = 2$



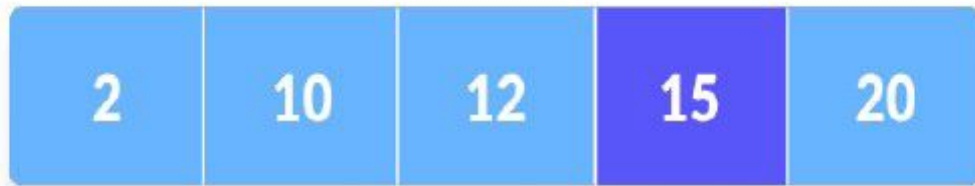
min value
at index 2



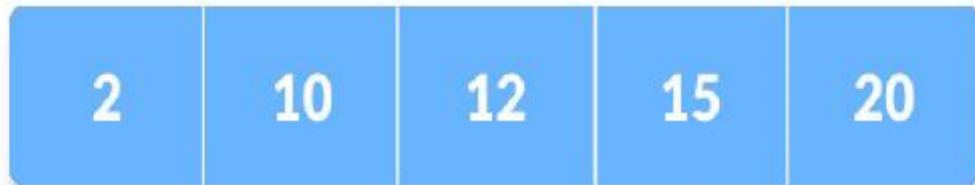
Cont...

step = 3

i = 0



min value
at index 3



already in place

Algorithm:

```
selectionSort(array, size)
  repeat (size - 1) times
    set the first unsorted element as the minimum
  for each of the unsorted elements
    if element < currentMinimum
      set element as new minimum
  swap minimum with first unsorted position
end selectionSort
```

Analysis of Selection sort Algorithms

- To find the minimum element from the array of N elements, $N-1$ comparisons are required.
- After putting the minimum element in its proper position, the size of an unsorted array reduces to $N-1$ and then $N-2$ comparisons are required to find the minimum in the unsorted array.
- Therefore $(N-1) + (N-2) + \dots + 1 = (N \cdot (N-1))/2$ comparisons and N swaps result in the overall complexity of $O(N^2)$.