CORRECTNESS OF SELECTION SORT

Guess: The part of the array before the current index is sorted i.e., let us consider two sub arrays :

A[0……i-1] and A[i…..n-1] in which 'i' is considered as current index. Also, the sub array A[0…..i-1] is sorted and A[i…..n-1] is unsorted array.

Initialization: At the beginning of the algorithm, before any iterations have been occurred, we can consider the value of i=1. So, A[0….0] means the sub array consists of only one element. Array with one element is always sorted.

Maintenance: During each iteration of selection sort, the algorithm selects the smallest element from the unsorted portion of the array and swaps it with the element at the current index. After each iteration, the smallest unsorted element is placed in its correct position. As a result, the selected element becomes part of the sorted portion of the array. Therefore, the sub array [0…..i-1] remains sorted after each iteration and the sub array A[i…..n-1] remains unsorted after each iteration.

Termination: When the algorithm completes all iterations, the entire array is sorted, and thus the invariant holds true. Since, the invariant holds true at starting, is maintained throughout the execution of algorithm and still holds true upon termination, we can conclude that the algorithm produces the desired result.

In n+1 iteration, i.e., i=n+1, then sub array A[0…..i-1] = A[0….n+1-1] = A[0….n] is sorted array