Selection Sort Algorithm

Consider sorting n numbers stored in array A by first finding the smalles element of A and exchanging it with element in $A[1]$. Then find the second smallest element of A, and exchange it with $A[2]$. Continue this manner for the first $n-1$ elements of A.
You can find the implementation **here** or go to the next url: https://github.com/DiegoMendezMedina/Algorithms/tree/master/Sort/Selection_Sort/implementations.

Pseudocode

SELECTION-SORT(A)

1. **for** i = 1 **to** n-1
2. smallest = A[i]
3. k = i
4. **for** j = i **to** n
5. **if** A[j] < smallest
6. smallest = A[j]
7. k = j
8. **if** i ≠ k
9. $change(a, i, k)$

CHANGE(A, b, c)

1. aux = A[b]
2. A[b] = A[c]
3. A[C] = aux

Proof

Loop invariant:
At the start of each iteration of the **for** loop (lines 1-9), $A[1..i]$ is sorted. i.e the i-th element of the array is greather for every previous numbers on the array.
On the second **for** loop (lines 4-7), the smallest number in A[i..n] is found **if** it's different from the one in the $i-$th position there's a *change*. So now A[1...i+1] is also sorted.

Initialization:
When $i = 1$ there are no previous **i** values.
The smallest number in A[1..n] is found and is changed with the one in A[1]. Now A[1,2] is sorted.

Maintenance:
There's another iteration which means that $A[1..i]$ is sorted.
The smallest number in A[i..n] is found and is changed with the one in A[i]. Now A[1...i+1] is sorted.

Termination:
$A[i...n-1]$ is sorted and $A[n]$ is greater than $A[n-1]$, hence $A[1...n]$ is sorted.