CLRS, 2-2 Corectness of bubblesort

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May 3, 2012

a. A' has to be a permutation of A.

b. *Loop invariant (2-4:)* In the subarray $A[j...n]$, j are the minimum element in the array. Also $A'[j...n]$ is a permutation of $A[j...n]$.

   i. Initialization At this point $j = n$ and therefore $A[j...n] = A[j]$, which satisfy the loop invariant.

   ii. Maintenance By the initialization in the loop invariant we know that $A[j]$ is a minimum element. For each iteration we see that if $A[j] < A[j-1]$, then $A[j]$ and $A[j-1]$ are swapped, thus $A[j-1]$ will be a minimum element for the next iteration where it is $A[j]$. The loop invariant then holds for maintenance.

   iii. Termination The loop will terminate when $j = i$, at this point $A[i]$ will be the minimum element in $A[i...n]$.

c. *Loop invariant (1-4):* The subarray $A[1...i-1]$ appended with $A[i...n]$ will be a permutation of the original A. The subarray array $A[1...i-1]$ will be sorted, which follows from $b.$. Also all the elements in $A[1...i-1]$ will be smaller or equal to the the elements in $A[i...n]$.

   i.

d.