Chapter 2

November 14, 2022

1 Exercise 2.1-1

Using Figure 2.2 as a model, illustrate the operation of INSERTION- SORT on an array initially containing the sequence [31, 41, 59, 26, 41,58].

31	41	59	26	41	58
31	41	59	26	41	58
31	41	59	26	41	58
31	41	59	26	41	58
31	41	59	26	41	58
31	41	59	26	41	58

2 Exercise 2.1-2

3 Exercise 2.1-3

Rewrite the INSERTION-SORT procedure to sort into monotonically decreasing instead of monotonically increasing order.

3.0.1 pseudo code

```
for i = 2 to n
    key = A [ i ]
    j = i- 1
    while j > 0 and A [ j ] < key
        A [ j + 1] = A [ j ]
        j = j - 1
    A [ j + 1] = key
```

4 Exercise 2.1-4

Consider the searching problem :
Input: A sequence of n numbers $\langle$ a 1, a 2, . . . , an $\rangle$ stored in array A [1 : n] and a value x .
Output: An index i such that x equals A [i] or the special value NIL if does not appear in A .
Write pseudocode for linear search , which scans through the array from beginning to end, looking for x . Using a loop invariant, prove that your algorithm is correct. Make sure that your loop invariant fulfills the three necessary properties.

```
Linear Search(A,v)
for i=1 to length(array A)
    do if v == A[i]
        return i
return NIL
```

5 Exercise 2.1-5

Consider the problem of adding two n-bit binary integers, stored in two n-element arrays A and B. The sum of the two integers should be stored in binary form in an (n + 1)-element array C. State the problem formally and write pseudocode for adding the two integers.

5.0.1 INPUT

Array A and B of Length n

5.0.2 OUTPUT

Array C, with length n+1

5.0.3 code

```
C = Array[A.length+1]
carry <- 0,
for i <- A.length to 1
    C[i+1] <- (A[i] + B[i] + carry) % 2;
    carry = (A[i] + B[i] + carry)/2;
C[1] <- carry;
return C
```