Algorithms and Data Structures

CSE 311

Fall 2020

Group 1 - Section 1

Assignment 1

Ahmed Moustafa AbdElfatah Mohamed Ramadan

Personal Email: geekahmed1@gmail.com

Problem 1: Hiring Problem

Algorithm Pseudo-Code:

```
Hire-Assistant(n):
best = 0
for i = 1 to n:
        interview candidate i
        if candidate i is better than candidate best
                best = i
                hire candidate i
```

We will interview n people each interview will cost ci so the total interview cost is nci. Also, we will hire m people each of the hiring processes will cost ch so total hiring cost is mch. So, the total cost is (nci + mch). Since, ch >> ci and by assuming that the worst case is to hire all candidates, then the worst-case cost is O(nch). If the hiring cost is constant over time, then the worst-case running time is O(n).

Implementation in JAVA:

You could find the implementation here:

https://drive.google.com/file/d/1Dlp1Ss8B43oiY5FWi6xLUbfQy-ixC3YZ/view?usp=sharing

Problem 2: Right Dominant Problem

Quadratic implementation

Pseudo-Code

```
Right-Dominant(L){
    D = empty list
    for i = 1 to n:
        isDominant = true
        for j = i + 1 to n:
            if (A[i] <= A[j]) isDominant = false
            if (isDominant) append A[i] to D
    return D
```

Analysis

On the ith iteration of the outer loop, the inner loop is executed n - i times and each statement in the inner loop is constant time. So, the overall algorithm is in order of O(n^2).

Linear implementation

Pseudo-Code

```
Right-Dominant-Linear(L):
tempList = emptyList
maxFromRight = L[L.size - 1]
Append maxFromRight to the tempList
for i = L.size - 2 to 0:
    if (maxFromRight <= L[i]):
        maxFromRight = L[i]
        Append maxFromRight to the tempList
return tempList
```

Analysis

Iteration is in order of O(n) and each statement in the loop in constant time. So, the overall running time is O(n).

Java Implementation

Here you could find both solutions implemented with their running time comparison:

https://drive.google.com/file/d/1KcAYruSSeat-ostfvhNf2n4T88AGxM_2/view?usp=sharing