Programming Assignment 4

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Statement of Integrity: I, Joni Vrapi, attempted to answer each question honestly and to the best of my abilities. I cited any, and all, help that I received in completing this assignment.

Problem 1c.

PROCESS-SIGNAL(x, y, s)

```
1   xSet = ySet = noiseSet = []
2   xMovingIndex = yMovingIndex = xCompleted = yCompleted = 0
3   for index = 0 to length(s)
4       if s[index] is the i'th character of both x and y
5           if x has been completed more than y
6               ySet.append(index + 1)
7               move y index by 1 through y
8           elseif xCompleted == yCompleted
9               if xMovingIndex is ahead of yMovingIndex
10                  xSet.append(index + 1)
11                  move x index by 1 through x
12              else
13                  ySet.append(index + 1)
14                  move y index by 1 through y
15          else
16              xSet.append(index + 1)
17              move x index by 1 through x
18          continue
19
20      if s[index] is the i'th character of x
21          xSet.append(index + 1)
22          move x index by 1 through x
23          continue
24
25      if s[index] is the i'th character of y
26          ySet.append(index + 1)
27          move y index by 1 through y
28          continue
29
30      if length(noiseSet != 0)
31          assign to noiseSet an array of integers from 1 to length(s)
32          that do not include any numbers that are in xSet or ySet
33
34      if length(xSet) + length(ySet) + length(noiseSet) == length(s)
35          this is an interweaving
```

Problem 1d. This algorithm processes the signal "as it comes in" via a single for loop which iterates through the input string only once for an $O(n)$ time. There are many comparisons that are made, all of which are $O(1)$ operations. Finally, to get the noise in the signal, it generates another array of size $m < n$ in $O(m)$ time. In total, this is $O(n) + O(m)$ which is linear with respect to inputs, so this is an $O(n)$ algorithm.