Psudo Code: Ahmet Furkan Kurban

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```
Function lis2 (a[]){
Count=1,low=0,max=1,k=0,best[]
        İf n is equal 0{                    #check array empty or not
                Print "Array is Empty"
                Return -1
        }
        Loop i from 0 to N                  # fill array with 1
                Assign best[i]  1
        Endofloop
        Loop1 i from 1 to N {
                Loop2 j from 0 to i {
                        İf a[i] is greater than a[j] and best[i] is less than best[j] +1{ #find max
increasing sequence size
                                Assign best[j] +1 to best[i]
                                İf max is less than best[i]{
                                        Assign best[i] to max           #find max value
                                }
                        }
                Endofloop2
        Endofloop1
        Assign zero to low
        Loop i from 0 to N
                İf count is equal best[i]{          #for 7 ,6,5,4,3 condiniton there is no increasing
sequence so ı check it.
                        İncrement low
                İf best[i] is equal 2{
                        break
                }
        Endofloop
```

```
Create space for best1 array with max size        #create new array according to the max size
Loop i from low-1 to N
        İf count is equal best[i]{    #check special number
                Assign -1 to control var   #for checking add once
                İf count is equal best[i+1]{        # add number that has true special number
                        İf a[i] is equal and larger than a[i+1]{    #add smaller one
                                Assign a[i+1] to best1[k]
                                Assign 1 to control var      #check added once
                        }
                }
        }
        İf control is equal -1{     #check it is added before or not
                Assign a[i] to best1[k]
        }
        İncrement count    # find the special number ı will explain above
        İncrement k   # best1 counting
Endofloop

Free best
Return max
EndOfFunction
```

There is some explanation about code for assembly part but it is the same manner with this psudo code so ı did not want to write same thing here you can read above .There is some comment in the psudo code.

Space Compexity:

There is three dynamic array , their size is n so space compexity is O(n)

Time Complexity:

There is two intertwined for loop and there is some if statement and there is no break statement for this two intertwined loop so that space compexity is Teta(n).

Test Cases:

output - Not Defteri

Dosya Düzen Biçim Görünüm Yardım

```
3,4,7,8,9,11,12,13, SIZE: 8
1,2,3,4,5,6,7,8,12, SIZE: 9
3,6,7,9,11,15, SIZE: 6
3,4,5,7, SIZE: 4
3,5,6,7,9, SIZE: 5
7, SIZE: 1
7,8,11, SIZE: 3
2,9,13, SIZE: 3
```

arrays - Not Defteri

Dosya Düzen Biçim Görünüm Yardım

```
3,4,7,8,9,5,11,12,10,13
1,2,3,4,5,6,7,8,12
3,6,7,9,4,5,8,11,2,15
6,5,3,4,5,7
3,5,6,7,6,9
7,7,7,7,7,7
7,7,7,7,7,7,8,11
7,6,5,4,3,2,9,13
```

output - Not Defteri

Dosya Düzen Biçim Görünüm Yardım

```
3,4,5,7,8,9, SIZE: 6
7,8,9,13,15,16, SIZE: 6
2,3,23,24, SIZE: 4
2,25,26,29,44, SIZE: 5
2,4,9,12,14,15, SIZE: 6
9,10,33,44,51,74,87, SIZE: 7
```

arrays - Not Defteri

Dosya Düzen Biçim Görünüm Yardım

```
3,4,2,5,7,8,3,5,2,9
7,8,9,4,13,9,15,6,16,7
4,22,2,3,23,24,7,11
5,2,25,26,7,13,29,44
2,4,9,12,14,5,6,7,15
12,22,9,10,33,44,51,74,87,33
```

output - Not Defteri

Dosya Düzen Biçim Görünüm

```
2,3,8,11,22, SIZE: 5
2,8,9,19,21,22, SIZE: 6
2,11,15,22,23, SIZE: 5
1,11,15,35, SIZE: 4
10,14,17,18,19, SIZE: 5
81,99, SIZE: 2
13,51,67,e, SIZE: 4
```

arrays - Not Defteri

Dosya Düzen Biçim Görünüm Yardım

```
2,5,2,3,8,11,3,9,22
2,8,9,5,19,21,15,16,22
21,7,5,2,11,15,22,23,22
3,1,11,15,35,9,11,13,9
11,21,10,14,17,18,19,15,19
81,99,53,34,11,25,17
71,16,99,13,51,67,101
```

output - Not Defteri

Dosya Düzen Biçim Görünüm Yardım

```
22,23,24,25,26, SIZE: 5
11,12,15,51,52, SIZE: 5
2,6,16,28,66,67,68, SIZE: 7
13,21,22,23, SIZE: 4
21,25,26,44,45, SIZE: 5
12,22,23,32,33, SIZE: 5
```

arrays - Not Defteri

Dosya Düzen Biçim Görünüm Yardım

```
22,23,21,20,24,25,23,26,21
26,21,28,29,11,12,15,51,52,22
11,21,13,2,6,16,28,66,67,21,68
16,15,14,13,21,22,19,13,23
23,21,25,26,44,22,32,45,25
12,22,23,21,32,8,5,11,6,33
```

output - Not Defteri

Dosya Düzen Biçim Görünüm Yardım

```
4,26,64,69,70, SIZE: 5
2,24,26,33, SIZE: 4
22,34, SIZE: 2
1,2,3,5,7,9, SIZE: 6
3,11,22,43, SIZE: 4
5,36,44,55,69, SIZE: 5
```

arrays - Not Defteri

Dosya Düzen Biçim Görünüm Yardım

```
4,26,64,69,62,23,44,55,22,70
43,2,24,26,33,16,32,25,24
52,22,34,19,27,3,22,1,2
1,2,3,5,7,9,6,5,4,3
10,9,8,7,6,5,3,11,22,6,43
5,36,44,22,55,69,6,7,12,53,22
```

Arrays file has input, there is some different inputs with different size and there is output file on the left and their size.Inputs array has some increasing ,decreasing and same number , and their result have been writing to the output file on the left.

I wrote the last array to the console and to the file.

Missing Parts:

When writing the output array to the file 3 digits number is not writing to the file and there is something about special number mistake but i did not solve them.

Explanation of Assembly Functions

Write:

```
loop99:
        beq $s2,$s1 ,loop99exit
        add $t3,$s2,$s6
        lb   $t6 , ($t3) #load from array
        slt $t1 ,$t6,$t5
        beq $t1, 1,label200
        slt $t1 ,$t6,$t4
        beq $t1, 1,label202
        j label203
label200:
        addi $t6,$t6,48 #convert it to char
        j label201
```

This is part of , there is a loop there it read number from array and it classify the number one digit or two digit then it put numbers in pieces then it save the pieces to the string after all of this string is writing to the file.

getMaxLength:

GetMaxLength function classify the numbers to the increasing order for example there are 2 and 3 number with this order here 2 is classified with 1 , 3 is classified with 2 so after this classification we can find the increasing order their special added number then return the max number of array that has increasing order for example -> 1,2,3,4,2 -> max length is 4 , and their special numbers is 1,2,3,4,1 last number has “one” special number because four is greater than two thats it all.

After getMaxLength function we assign the returned value to the $s1 register then there are two loop to find the number according to the increasing special number so that we can find the increasing numbers one by one there is count fort his calculation , count aim is to find the special number with this order “1 , 2, 3, 4, 5 …” then in this manner we can find the increasing numbers then we assign the number to the dynamic array then i can to go past the write function to write the founded numbers to the file .

loop4exit:

```
        jal Write #reach write function to write file

        beq $t0 ,8,Exit  # There is 8 array in the input file if you can add new array to the input file please incerase 8 to the 9 or maybe more

        j label39 #it returns to the begininng of the algorithm.
```

Exit: #exit the mıps

```
        jal CloseFile

        li $v0,4

        la $a0, newLine # \n value

        syscall

        li $v0,4

        la $a0, by

        syscall

        li $v0 ,10 #for exit

        syscall
```

I open the file begininng of the algorithm and ı close the final end of the algoritm because of when ı try to write the file after one array ı open the final one by one and ı close it then it override the file so there is only last array is writing to the file.