

HOMWORK 7

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SECTION 002 (MW -2:30-2:50)

D1) Fill-out edit distance table for the words NONSTOP and ROUND. An empty table is provided below. Fill out however much you need.

	O	R	O	U	N	D
O	0	↖ 1	↖ 2	↖ 3	↖ 4	↖ 5
N	1	↗ 1	↗ 2	↗ 3	↗ 3	↖ 4
O	2	↗ 2	↖ 1	↖ 2	↖ 3	↖ 4
N	3	↗ 3	↗ 2	↗ 2	↗ 2	↖ 3
S	4	↗ 4	↗ 3	↗ 3	↗ 3	↖ 3
T	5	↗ 5	↗ 4	↗ 4	↗ 4	↖ 4
O	6	↗ 6	↗ 5	↗ 5	↗ 5	↖ 5
P	7	↗ 7	↗ 6	↗ 6	↗ 6	↖ 6

P2) a) Show the solution path on the table

If two direction give the optimal lost, give the preference in this order: diagonal, left, up.

	a	s	t	e	r	n
0	↑ 1	↑ 2	↑ 3	↑ 4	↑ 5	↑ 6
s	↓ 1	↓ 1	↓ 2	↓ 3	↓ 4	↓ 5
t	↑ 2	↑ 2	↑ 2	↑ 1	↑ 2	↑ 3
r	↑ 3	↑ 3	↑ 3	↑ 2	↑ 2	↑ 3
e	↑ 4	↑ 4	↑ 4	↑ 3	↑ 2	↑ 3
n	↑ 5	↑ 5	↑ 5	↑ 4	↑ 3	↑ 3
g	↑ 6	↑ 6	↑ 6	↑ 5	↑ 4	↑ 4
t	↑ 7	↑ 7	↑ 7	↑ 6	↑ 5	↑ 5
h	↑ 8	↑ 8	↑ 8	↑ 7	↑ 6	↑ 6

Homework 7 written part (50 points) - Updated 11/1/18, See red text

**P1.** (15 points) Fill-out the edit distance table for the words **NONSTOP** and **ROUND**. An empty table is provided below. Fill-out however much you need.


**P2.** (10 points)

- a) (4 points) Show the solution path on the table (bold, highlight or circle the cells). If two directions give the optimal cost, give preference in this order: diagonal, left, up

		a	s	t	e	r	n
	0	1	2	3	4	5	6
s	1	1	1	2	3	4	5
t	2	2	2	1	2	3	4
r	3	3	3	2	2	2	3
e	4	4	4	3	2	3	3
n	5	5	5	4	3	3	3
g	6	6	6	5	4	4	4
t	7	7	7	6	5	5	5
h	8	8	8	7	6	6	6

- b) In the table below the symbols indicate: \ - diagonal, ^ - up arrow, < - left arrow

		r	e	g	r	e	s	s	i	o	n
	(<	<	<	<	<	<	<	<	<	<	<
s	^	\	\	\	\	\	\	\	<	<	<
e	^	\	\	\	<	<	\	<	\	\	\
g	^	\	\	\	\	<	<	<	<	<	<
m	^	\	\	\	\	\	\	\	\	\	\
e	^	\	\	\	\	\	\	\	<	<	<
n	^	\	\	\	\	\	\	\	\	\	\
t	^	\	\	\	\	\	\	\	\	\	\

b1) (2 points) Show in the symbols table the path you followed (e.g. bold, highlight, circle).

b2) (3 points) Show all 3 strings: the 2 strings that show the word alignments and the 3<sup>rd</sup> one showing the cost.

DOWN :	t n - - - e m g e s
UP :	n o i s s e r g e r
lost (• or x) :	x x x x x • x • • x

b3) (1 point) Using the 3<sup>rd</sup> string, what is the edit distance between these 2 strings? (See the Recover the Alignment slide)

t n - - - e m g e s  
 n o i s s e r g e r  
 1 1 1 1 0 1 0 0 1

edit-distance = 7

P3 (10 points) (Stair climbing with gain)

The jump sizes below have the given gain (e.g. health points). You can assume that any other jump size is allowed, but has 0 health points.

Jump size:	4	6	10	12
Gain (Health points):	10	21	33	36

a) (7 points) Fill out the solution array, sol, using bottom-up dynamic programming. Follow the style we did in class: for each work-out box (in rows for jump sizes 4,6,10,12) show the remaining stairs and the optimal value obtained by using that jump size. Fill-out all the table (starting from 0). For "Picked", give the jump size.

The Stair Climbing problem is explained and has sample examples in the Extra materials section at the end of the Dynamic Programming Slides.

	0	1	2	3	4	5	6	7	8	9	10	11	12
Sol:	0	0	0	0	10	10	21	21	21	21	33	33	42
Picked	-1	-1	-1	-1	4	4	6	6	6	6	10	10	6
4 (10)	-	-	-	-	0,10	1,10	2,10	3,10	4,10	5,10	6,10	7,10	8,10
6 (21)	-	-	-	-	-	0,21	1,21	2,21	3,21	4,21	5,21	6,21	6,42
10 (33)	-	-	-	-	-	-	-	-	-	0,33	1,33	2,33	
12 (36)	-	-	-	-	-	-	-	-	-	-	-	-	0,36

b) (3 points) Use the table above to recover the jumps that achieve the optimal value for 12 stairs.

at Highest value  $\rightarrow 6 \rightarrow$  Jump Size of 6 is 6 Recovery Jump Size  $\rightarrow 6, 6$   
 $12 - 6 = 6$   
 $so 6 - 6 = 0$

P3 (15 pts) Solve the Weighted Job Scheduling problem below and recover the solution.

P3) Weighed Job Scheduling Job.

$i$	$V_i$	$P_i$	$m(i)$	$m(i)$ used: Y/N	In opt solution Y/N
0	-	0	0	-	
1	4	0	$4+0, 0$ $\textcircled{4}, 0$	4, Y	Yes
2	3	0	$3+0, 4$ $3, \textcircled{4}$	4, N	
3	4	1	$4+4, 4$ $\textcircled{8}, 4$	8, Y	Yes
4	5	2	$5+4, 8$ $\textcircled{9}, 8$	9, Y	
5	3	2	$3+4, 9$ $7, \textcircled{9}$	9, N	
6	2	3	$2+8, 9$ $\textcircled{10}, 9$	10, Y	Yes

Recover the Solution:  $\Rightarrow 6, 3, 1$

**COMPILATION INSRUCTIONS:**

1. login to omega server using your student id
2. Copy the below files under hw6 folder
  - a)edit\_distance.c
  - b)data1.txt
3. Compile using below command:-

```
gcc -o editD edit_distance.c
```
4. Run the code without input re direction(Enter inputs manually)  

```
./editD
```
5. Run the code with input re direction  

```
./editD <data1.txt
```
7. To Check valgrind memory leaks(Enter inputs manually)  

```
valgrind --leak-check=yes ./editD
```
8. To check valgrind memory leaks with input redirection  

```
valgrind --leak-check=yes ./editD <data1.txt
```