

Hirschberg

Hint: Many test values are taken from project Algorithms for Bioninformatics of Alexander Mattheis or the lectures.

Test 1 (used Needleman-Waterman-Implementation for calculation)

Input

Sequence A: AATCG

Sequence B: AACG

Deletion: 2

Insertion: 2

Match: -1

Mismatch: 1

Output

1. $Trace(A_1, A_2, T_3, C_4, G_5 | A_1, A_2, C_3, G_4)$ and $i = \text{ceil}(5/2) = 3$

		A	A	C	G
	0	2	4	6	8
A	2	-1	1	3	5
A	4	1	-2	0	2
T	6	3	0	-1	1
C	8	5	2	-1	0
G	10	7	4	1	-2

	G	C	A	A	
G	-2	1	4	7	10
C	0	-1	2	5	8
T	1	-1	0	3	6
A	2	0	-2	1	4
A	5	3	1	-1	2
	8	6	4	2	0

Optimum: -2

	0	1	j=2	3	4
i=3	6	3	0	-1	1
	2	0	-2	1	4
Σ	8	3	-2	0	5

or: $i = 5-3 = 2$ in the matrix below and then reverse the line horizontally

		G	C	A	A
	0	2	4	6	8
G	2	-1	1	3	5
C	4	1	-2	0	2
T	6	3	0	-1	1
A	8	5	2	-1	-2
A	10	7	4	1	-2

		A	A	C	G
A					
A					
T					
C					
G					

1.1. $Trace(A_1, A_2 | A_1, A_2)$: and $i = \text{ceil}(2/2) = 1$

		A	A
	0	2	4
A	2	-1	1
A	4	1	-2

	A	A	
A	-2	1	4
A	1	-1	2
	4	2	0

Optimum: -2

	0	j=1	2
i=1	2	-1	1
	1	-1	2
Σ	3	-2	3

		A	A
A			
A			

1.1.1. $Trace(|A_1|)$: and $i = \text{ceil}(0/2) = 0$

		A
	0	2

	A	
	2	0

Not shown!

1.1.2. $Trace(A_2 | A_1, A_2)$: and $i = \text{ceil}(1/2) = 1$ (local for that matrix)

		A	A
	0	2	4
A	2	-1	1

	A	A	
A	1	-1	2
	4	2	0

Optimum: **1**

	0	j=1	2
i=1	2	-1	1
	4	2	0
Σ	6	1	1

(search minimum from right side, because right node)

1.2. $Trace(C_4, G_5 | A_2, C_3, G_4)$:

and $i = \text{ceil}(2/2) = 1$ (local for that matrix)

		A	C	G
	0	2	4	6
C	2	1	1	3
G	4	3	2	0

	C	G	A	
G	0	-2	1	4
C	3	1	-1	2
	6	4	2	0

Optimum: **0**

	0	2	j=3	4
i=4	2	1	1	3
	3	1	-1	2
Σ	5	2	0	5

	A	C	G
C			
G			

1.2.1. $Trace(A_2, C_3)$:

and $i = \text{ceil}(0/2) = 0$ (local for that matrix)

		A	C
	0	2	4

Not shown!

1.2.2. $Trace(C_4 | C_3, G_4)$:

and $i = \text{ceil}(1/2) = 1$ (local for that matrix)

		C	G
	0	2	4
G	2	1	1

	G	C	
G	1	-1	2
	4	2	0

Optimum: **1**

	0	2	j=4
i=5	2	1	1
	4	2	0
Σ	6	3	1

so:

		A	A	C	G
A					
A					
T					
C					
G					