

Algorithms in Genome Research
Winter 2018/2019

Exercises

Number 11, Discussion: 2019 February 01

1. Given two linear, unichromosomal genomes

$$A = [-2 \ 1 \ 3 \ 5 \ 4 \ 6 \ -12 \ -11 \ -9 \ -10 \ -8 \ 7]$$

and

$$B = [1 \ 2 \ 3 \ 4 \ 5 \ 6 \ 7 \ 8 \ 9 \ 10 \ 11 \ 12].$$

- What is the breakpoint distance between A and B ?
 - Draw the adjacency graph of A and B .
 - What is the DCJ distance between A and B ?
 - Give an optimal DCJ sorting scenario from A to B .
 - Name the operations in your sorting scenario. If it contains operations other than inversions and transpositions, find an alternative optimal DCJ sorting scenario that consists only of these two types of operations.
 - Calculate the inversion distance.
2. How many different optimal DCJ sorting scenarios can you find for the following two linear genomes?

$$\begin{aligned} A &= [1] [4 \ 3 \ 2 \ 5] \\ B &= [1 \ 2 \ 3 \ 4 \ 5] \end{aligned}$$

3. Given the following linear genomes:

$$\begin{aligned} A &= [2 \ 1 \ x \ -4 \ 5 \ y \ -z \ -3] \\ B &= [1 \ 2] [3 \ 4 \ 5] \end{aligned}$$

Give a scenario sorting A into B with 4 DCJs and 1 indel.

4. Given a duplicated genome with three linear chromosomes:

$$G = [3 \ 5 \ -4 \ 2 \ -5] [2 \ 1] [3 \ 4 \ 1]$$

Solve the genome halving problem under the DCJ distance, i.e., find a perfectly duplicated genome H with smallest DCJ distance to G .