

Algorithms in Genome Research
Winter 2015/2016

Exercises

Number 8, Discussion: 2016 January 15

1. Consider the permutation $\pi = (0 -4 -5 -1 +2 +3 +6)$.
 - (a) What is the lower bound for the reversal distance based on the number of breakpoints?
 - (b) Draw the Breakpoint Graph of π .
 - (c) What is the lower bound for the reversal distance based on the number of cycles of the BP graph?
 - (d) Sort the permutation π by reversals, using reversals defined by *oriented pairs* (consecutive integers with opposite signs). Can you sort in the number of steps given by the lower bound above?
 - (e) If you reverse the block $(-4, -5, -1)$, as defined by the oriented pair $(0, -1)$, can you still sort the permutation in the minimal number of steps? Why?
2. Consider the special case of Sorting By Reversals where only reversals of length two are allowed (swap of consecutive elements), called SB2R.
 - (a) Give an algorithm for SB2R of an *unsigned* permutation. Can you show if this algorithm is optimal, that is, that it sorts the permutation in the minimum possible number of swaps?
 - (b) The same as the previous item, but now for *signed* permutations.