Algorithms in Comparative Genomics

Exercise sheet 7, 31.05.2024

Exercise 1 (Reversal Distance) (6 pts)

1. Draw the breakpoint diagram for $(0\,\overline{1}\,\overline{4}\,5\,3\,2\,7\,\overline{8}\,6\,9\,\overline{10}\,12\,\overline{11})$ and $(0\,1\,2\,3\,4\,5\,6\,7\,8\,9\,10\,11\,12)$.

2. Draw the overlap graph for this breakpoint diagram.

3. Find an optimal sorting sequence using the best scoring good vertices in the overlap graph. Don't forget to update the overlap graph using local complementation!

4. What is the reversal distance for this pair of genomes?

Exercise 2 (Bad Components) (6 pts)
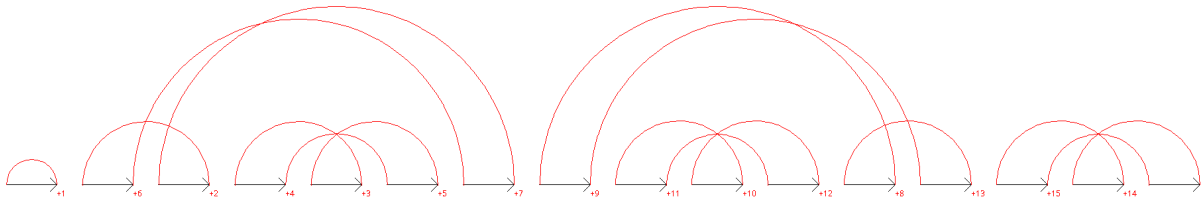
1. Consider the breakpoint diagram above. How many bad components does it have?

2. There are two ways to turn a bad component good:

   i Perform an extra reversal within a cycle of the component.
   ii Merge two bad components. Note that this decreases the number of cycles.

   Find an example reversal for each of these options in the diagram. You can use the InversionVisualization Program. I have provided the file that generates this breakpoint diagram on the website.

3. Find a series of reversals that results in a breakpoint diagram without bad components. Try to make it of lowest cost, where reversals of Type (i) cost 1 and reversals of Type (ii) cost 2. Again, you can use InversionVisualization to play around.