

Intensive Course on Genome Rearrangements, Winter 2018

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Exercises

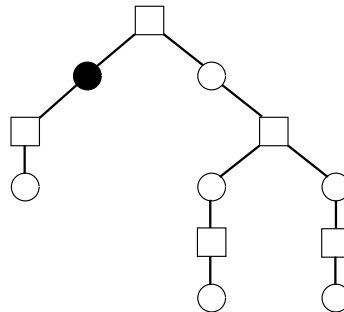
Exercise 02, 09.01.2018

- In computing $srd(\pi)$, the offset for additional reversals needed to orient unoriented components can be calculated by determining the *minimum* cost of a *cover* of the component tree T_π . The cost $t(C)$ of a cover C is the sum of costs of all paths, whereby a short path has cost 1 and a long path has cost 2.

Consider permutation

$$\pi^6 = (1\ 3\ -8\ 7\ -6\ 4\ 5\ 9\ 11\ -13\ 10\ -12\ 14\ -2\ 15\ 17\ 22\ 18\ 20\ 19\ 21\ 23\ 28\ 24\ 26\ 25\ 27\ 29\ 16),$$

- use the Java program `InversionVisualization` provided on the course website to draw $BG(\pi^6)$. The file containing π^6 is included in the corresponding archive along with the software. Using $BG(\pi^6)$, construct the component tree T_{π^6} ;
 - find an optimal tree cover (i.e. a cover with minimum cost) for T_{π^6} .
- Consider the following component tree T :



Find a permutation π whose component tree is T .

- Give an algorithm for computing optimal covers of a component tree T_π .
- Sort the permutation $\pi^7 = (2\ -5\ 3\ -1\ 4)$. Indicate all intermediate steps by drawing the overlap graph $OV(\cdot)$ and include the reversal scores as annotation to each vertex. Indicate your choice of a safe reversal by marking the corresponding vertex in $OV(\cdot)$.
- Prove the following:

Theorem 1 Given a permutation π and its overlap graph $OV(\pi) = (V, E)$. If $\rho(v)$, $v \in V$, is a safe reversal, then $d(\pi \circ \rho(v)) = d(\pi) - 1$.

Discussion of solutions in tutorial on 10.01.2018 10:15-11:45 AM