Exercise 02, 09.01.2018

1. 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 $T_\pi$. 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

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

(a) use the Java program InversionVisualization provided on the course website to draw $BG(\pi^6)$. The file containing $\pi^6$ is included in the corresponding archive along with the software. Using $BG(\pi^6)$, construct the component tree $T_{\pi^6}$;

(b) find an optimal tree cover (i.e. a cover with minimum cost) for $T_{\pi^6}$.

2. Consider the following component tree $T$:

![Component Tree](image)

Find a permutation $\pi$ whose component tree is $T$.

3. Give an algorithm for computing optimal covers of a component tree $T_\pi$.

4. 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 $OV(\cdot)$.

5. Prove the following:

**Theorem 1** Given a permutation $\pi$ 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