Exercise Sheet 6 for Computational Biology (Part 1), WS 13/14

Hand In: *Until Monday, 03.02.2014, 10:00 am, email to* `s_wild@cs...` *or in lecture.*

Problem 15

4 points

Given the set of STS probes $\{\alpha, \beta, \gamma, \delta, \epsilon, \zeta, \eta, \theta\}$ and

$A = (A_{i,j}) =$

	α	β	γ	δ	ϵ	ζ	η	θ
I	1	0	0	0	1	0	0	1
II	0	0	1	1	0	1	0	0
III	1	0	0	0	0	0	1	0
IV	1	1	0	0	1	0	0	1
V	0	0	1	0	0	0	1	0

the matrix assigning the occurences of the probes to the fragments $\{\mathrm{I}, \mathrm{II}, \mathrm{III}, \mathrm{IV}, \mathrm{V}\}$. $A_{i,j}$, $i \in \{\mathrm{I}, \mathrm{II}, \ldots, \mathrm{V}\}$, $j \in \{\alpha, \beta, \ldots, \theta\}$, is equal to 1 iff probe j occurs in fragment i.

Use the algorithm from the lecture to determine the PQ tree representation of the permutations of the columns which transform the matrix to consecutive-ones form.

Start with the universal tree for $\{\alpha, \beta, \gamma, \delta, \epsilon, \zeta, \eta, \theta\}$ and show the reduction of all five restrictions. Draw all intermediate PQ trees following the convention introduced in the lecture and name the rule applied to transform one tree to the next. How many permutions are represented by the resulting tree?

Problem 16

2 points

Prove Lemma 16 (page 128) in the German lecture notes; restated here for convenience:

Let K_1 and K_2 be two cycles of a cycle cover $\mathcal{K}$ and let $w_1 \in K_1$ and $w_2 \in K_2$ be two elements of the cycles. It then holds

$$ov(w_1, w_2) < cost(K_1) + cost(K_2) .$$