Dr. Gunnar W. Klau
Abdelhalim Larhlimi
Institut für Mathematik II
AG Mathematik in den Lebenswissenschaften

Freie Universität Berlin

Discrete Mathematics WS 07/08

Homework 5 (due 23/11)

Exercise 1:

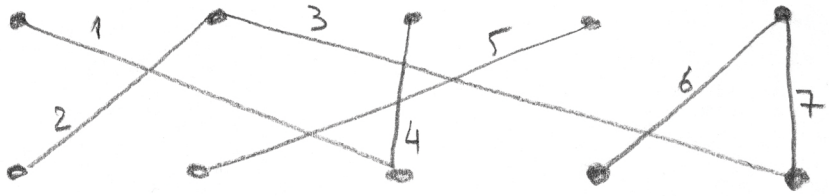
Let $G = (V, E, H)$ be an extended alignment graph (EAG), let $T \subseteq E$ and let $G' = (V, T, H)$ be the EAG induced by T. Prove that the follwing are equivalent:

a) T is a trace

b) G' does not contain a critical mixed cycle.

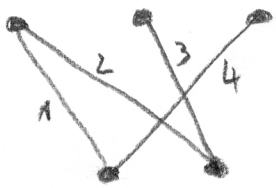
Exercise 2:

a) Lets consider the following alignment graph



Build a system of linear inequalities that define all possible legal traces.

b) The software PORTA drives from all enumerated solutions the facets of the polytope supported by the solutions. You could download PORTA from this page: http://www.zib.de/Optimization/Software/Porta/
For instance, in the following you have a graph alignment and all legal alignment edges:



x_1	x_2	x_3	x_4
1	0	1	0
1	0	0	0
0	1	0	0
0	0	1	0
0	0	0	1

For this example, you could find a suitable input file on the homepage.
Using PORTA, drive the facets of the polytope supported by the solutions of the problem given in a).

Exercise 3:

Given two sequences, compute an optimal alignment where a match scores 1 and a mismatch scores 0. Model this problem using ZIMPL and solve it with SCIP.