Assignment 6

Post Date: 30 May 2014   **Due Date:** 6 June 2014   **Tutorial:** 11 June 2014

You are permitted and encouraged to work in groups of two.

Problem 1: Dual to Max-Flow   5 Points

Let P be the linear program of a Max-s-t-Flow problem formulated as a Min-Cost-Flow problem by adding an additional edge (t, s) with costs -1 to a network (see the lecture notes).

(a) Build the dual problem D of P.

(b) Show that an optimum solution of D can be interpreted as a Min-s-t-Cut.

Problem 2: Soccer-League-Problem   7 Points

We are given a soccer league with n teams. At one point in time during the season, the matrix G indicates how many games between the teams are left to play, i.e. team i still has g_{ij} games to play against team j. The vector p indicates the scores of the teams at the given point in time, i.e. team i has p_i points. Contrary to the actual point-scheme of the *Bundesliga*, winning a match gives 2 points, a tie 1 point and loosing a match 0 points.

Consider now the following problem: How can we tell if team i has still a chance of winning the league (i.e. having the most points at the end)?

Reduce the problem to a maximum flow problem.

Problem 3: Goldberg-Tarjan   8 Points

Find the maximum flow in the network below using the algorithm of Goldberg and Tarjan $(s = v_1,\ t = v_6)$.