Universität Konstanz Fachbereich Mathematik und Statistik Prof. Dr. Stefan Volkwein Jianjie Lu, Sabrina Rogg

Numerische Verfahren der restringierten Optimierung

http://www.math.uni-konstanz.de/numerik/personen/volkwein/teaching/

Sheet 3

Deadline for hand-in: 13.12.2016 at lecture

Exercise 6

(2 Points)

Consider the following linear program, similar to (2.1) in the lecture notes, but with the additional variable y:

 $\min c^{\top} x + d^{\top} y$ subject to $A_1 x + A_2 y = b, x \ge 0$

First, write down the optimality conditions for this problem in an analogous fashion to (2.3). Then, formulate the primal-dual interior-point algorithm for the above problem (analogous to Algorithm 2.1 in the lecture notes).

Exercise 7

Prove that the coefficient matrix in (2.7) is nonsingular if A has full row rank.

Exercise 8

Take a look at the provided function **oneStep** which is performing one iteration of an algorithm from the lecture. Which algorithm is it? Implement a short main file for doing the following tests: Choose

A = [-6,1,2,3,1,0,0;3,-2,-1,-5,0,1,0;-2,1,0,2,0,0,1] b = [14;-25;14] c = [5;3;3;6;0;0;0] (x,lambda,mu) = (e,0,e)

and run the function oneStep 10 times consecutively for sigma = 0.5, sigma = 1/(k+1), sigma = $1/(k+1)^2$ (k: iteration index). What do you observe and conclude when regarding the decrease of eta?