MATH 652: Optimization II

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Homework assignment 4 – due Thursday 2/18/2010

Problem 1 (The example of Klee and Minty 1). Consider the following problem:

$$\begin{aligned} \min_{x\in\mathbb{R}^n} \; & -x_n \\ & 0 \le x_1 \le 1 \\ & \frac{1}{4}x_{k-1} \le x_k \le 1 - \frac{1}{4}x_{k-1} \qquad \forall k = 2,\dots,n. \end{aligned}$$

For $n = 3$, do the following steps: (i) visualize the feasible set, (ii) determine how many vertices it has, (iii) starting at $x = 0$ show the vertices that the simplex algorithm visits either by performing the iteration by hand on a piece of paper or using a computer program, (iv) determine how many vertices the simplex algorithm visits before terminating, (v) state the solution and the optimal value of the objective function. **(5 points)**

Problem 2 (The example of Klee and Minty 2). Solve the same problem as above using a computer program for $n = 10$ and $n = 20$. For both cases, compare the number of iterations you need for (i) Bland's rule, (ii) for a pivoting strategy where one computes all reduced costs $\bar{c}_j, j \notin H$ and chooses that index j for which $\bar{c}_j$ is the most negative. **(5 points)**

Problem 3 (Semester project). Write a one-page summary of an optimization related project you could imagine as your semester project. Ideally, it would be related to your graduate research and would be in support of your thesis. If you would like to discuss possibilities, feel free to come to my office to talk about them! **(2 points)**

If you have comments on the way I teach – in particular suggestions how I can do things better, if I should do more or less examples, powerpoint slides vs whiteboard, etc – or on other things you would like to critique, feel free to hand those in with your homework as well. I want to make this as good a class as possible, and all comments are certainly much appreciated!