Eidgenössische Technische Hochschule Zürich
Ecole polytechnique fédérale de Zurich
Politecnico federale di Zurigo
Swiss Federal Institute of Technology Zurich

Institute for Theoretical Computer Science
Dr. B. Gärtner, Dr. M. Hoffmann and Tobias Christ

19.11.2009

Computational Geometry — Exercise Set 10 — HS09

URL: http://www.ti.inf.ethz.ch/ew/courses/CG09/

Exercise 1

Show that the problem of finding a largest circle contained in a given convex polygon can be formulated as a linear program.

Exercise 2

Suppose that you have an algorithm $\mathcal{A}$ for solving *feasible* linear programs of the form

$$\text{(LP)} \quad \begin{array}{ll} \text{maximize} & c^T x \\ \text{subject to} & Ax \le b, \end{array}$$

where feasible means that there exists $\tilde{x} \in \mathbb{R}^d$ such that $A\tilde{x} \le b$. Extend algorithm $\mathcal{A}$ such that it can deal with arbitrary (not necessarily feasible) linear programs of the above form.

Exercise 3

Prove that all sets R of constraints that arise during a call to algorithm $\mathcal{LP}(H, \emptyset)$ are independent, meaning that the set

$$\{x \in \mathbb{R}^d : a_h x = b_h, h \in R\}$$

of points that satisfy all constraints in R with equality has dimension $d - |R|$.