Using Polynomial Inequalities in Combinatorial Optimization

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Abstract: A beautiful result of Bröcker and Scheiderer on the stability index of basic closed semi-algebraic sets implies, as a very special case, that every d-dimensional polyhedron admits a representation as the set of solutions of at most $d(d+1)/2$ polynomial inequalities. The proof is non-constructive. In a joint paper with Martin Henk, we give, for simple polytopes, an explicit construction of polynomials describing such a polytope. The number of used polynomials, though, is exponential in the dimension.

The aim of this talk ist to outline the results, speculate about possible uses in combinatorial optimization and to get nonlinear programmers interested in the subject. The results I will describe have no algorithmic implications yet, but the speaker believes that this approach may yield new approaches to combinatorial problems via nonlinear programming.

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