MATHEMATICS DEPARTMENT
North Carolina State University

ALGEBRA SEMINAR

Friday, March 30, 2007

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Solving polynomial optimization problems using real algebraic geometry and semidefinite programming, Part 2

ABSTRACT: Polynomial programming is the problem of optimizing a polynomial function subject to polynomial constraints which describe a semialgebraic set. The general problem is considered intractable and includes discrete and nonconvex problems arising in engineering applications as special cases.

In the first half of the talk, we will briefly review two recent approaches due to Lassere (based on moments) and Parrilo (a dual approach based on real algebraic geometry) for solving polynomial optimization problems. They have shown that these approaches yield a hierarchy of semidefinite programming approximations that converge (under certain assumptions) to a global optimal solution to the polynomial program. The semidefinite programming approximations are convex optimization problems that can be solved efficiently using interior point methods.

The polynomials arising in practical applications are typically very sparse (few nonzero coefficients) or possess some underlying symmetry (invariant under the action of a group). In the second half of the talk, we will illustrate (via simple examples) how one can exploit the symmetry/sparsity in the polynomial to obtain smaller/specially structured semidefinite programs. These semidefinite programs can be solved very quickly using decomposition approaches in a parallel computing environment. This enables one to solve larger instances of polynomial optimization problems.

The talk will be self contained and accessible to a general audience.

3:00 - 3:50 pm HA 335

Faculty and Students are invited to attend.