

CONTAINMENT PROBLEMS FOR POLYTOPES AND SPECTRAHEDRA

We study the computational question whether a given polytope or spectrahedron S_A is contained in another one S_B .

First we classify the computational complexity, extending results on the polytope/polytope-case by Gritzmann and Klee to the polytope/spectrahedron-case. For various restricted containment problems, NP-hardness is shown.

We then study in detail semidefinite conditions to certify containment, building upon work by Ben-Tal, Nemirovski and Helton, Klep, McCullough. It is shown that these sufficient conditions even provide exact semidefinite characterizations for containment in several important cases, including containment of a spectrahedron in a polyhedron. Moreover, in the case of bounded S_A the criteria will always succeed in certifying containment of some scaled spectrahedron νS_A in S_B .

(Based on joint work with T. Theobald and C. Trabant.)