Algorithmic and modeling insights via volumetric comparison of polyhedral relaxations.

Summary: This is mostly a survey on some mathematical results concerning volumes of polytopes of interest in non-convex optimization. Our motivation is in geometrically comparing relaxations in the context of mixed-integer linear and nonlinear optimization, with the goal of gaining algorithmic and modeling insights. We consider relaxations of: fixed-charge formulations, vertex packing polytopes, boolean-quadric polytopes, and relaxations of graphs of monomials on box domains. Besides surveying the area, we do give a few new results, and we provide many directions for further work.

MSC:
- 52B11  n-dimensional polytopes
- 52B12  Special polytopes (linear programming, centrally symmetric, etc.)
- 90C10  Integer programming
- 90C11  Mixed integer programming
- 90C26  Nonconvex programming, global optimization
- 90C27  Combinatorial optimization
- 90C57  Polyhedral combinatorics, branch-and-bound, branch-and-cut
- 52A38  Length, area, volume and convex sets (aspects of convex geometry)

Keywords:
- polytope; volume; global optimization; mixed-integer nonlinear optimization; fixed charge; facility location; vertex packing; Boolean quadric; monomial; spatial branch-and-bound

Software:
- SCIP; Bonmin; ANTIGONE; Sostools

Full Text: DOI

References:


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