Calculus of Convex Polyhedra and Polyhedral Convex Functions

Andreas Löhne *

Abstract

Given two convex polyhedra, we intend to compute, for instance, their Minkowski sum, intersection or convex hull of the union. Another basic problem is to compute the polar of a polyhedron. The talk surveys practically relevant methods for such operations. One method is based on a recent result saying that multiple objective linear programming is equivalent to the projection of a convex polyhedron into a lower dimensional space. We show how a multiple objection linear programming solver can be utilized for polyhedral calculus. Finally we discuss a method to represent polyhedral convex functions in a very general way. Given two polyhedral convex functions, we provide a practically relevant method to compute, for instance, their infimal convolution, pointwise maximum or lower convex envelope. Moreover, we compute a representation of the conjugate of a polyhedral convex function. The talk also discusses modelling techniques for optimization problems involving polyhedral convex functions.

*Friedrich Schiller University Jena, Faculty of Mathematics and Computer Science