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Structural Properties of the Directed Cut Polytope

While much is known about the structural properties of the cut cone and polytope and their relaxations the metric cone and polytope, little is known about the directed cut equivalents.

The directed cut polytope (resp. cone) is the convex hull (resp. positive hull) of the arc incidence vectors of the directed cuts of the complete digraph. We present some structural properties of the directed cut cone and polytope, and their natural relaxations, the directed metric cone and polytope. In particular, it is shown that the directed cut polytope (resp. cone) is the convex (resp. positive) hull of two cut polytopes (resp. cones). New facets of the directed cut polytope are presented based on bijections from well known facets of the cut polytope.

Structural results on the projection of the directed cut polytope and cone onto the arc set of an arbitrary digraph G will also be presented. In particular facet preserving operations will be discussed, including directed version of triangular elimination and zero-lifting.