Akshay Gupte* (agupte@clemson.edu), Clemson University, Clemson, SC 29634. New families of approximations for the integer hull of a compact set.

For a nonempty compact set $X \subset \mathbb{R}^n$, we are interested in its integer hull $X_I$, which is the convex hull of $X \cap \mathbb{Z}^n$. Compactness of $X$ means that $X_I$ is a polytope. We propose a novel scheme for generating inner and outer approximations of $X_I$ through the use of total orders over $\mathbb{Z}^n$. Each approximation is a polytope corresponding to a finite subset of total orders. We prove convergence guarantees of our approximations to $X_I$ under some structural assumptions on $X$. We also show that for some total orders, the best possible approximations can be as bad as $n$-approx in the general case. The outer approximations (relaxations) in our scheme suggest a new approach for generating strong valid inequalities to $X_I$. A key part of our constructs is the computation of minimal and maximal (under a total order) points in $X \cap \mathbb{Z}^n$. We present some complexity results in this regard. (Received September 25, 2018)