

1159-05-112

Jesus A De Loera* (deloera@math.ucdavis.edu), Dept. of Mathematics, University of California, Davis, Davis, CA 95616, and **Christos Athanasiadis** and **Zhenyang Zhang**. *On the CW-complex of Monotone Polyhedral Paths*. Preliminary report.

Given a polytope P and linear functional, we study the directed paths inside the oriented graph of P (oriented by the linear function). We are interested in the properties of these monotone paths. For example, how many are there?

The monotone paths have a metric space structure which can be used to count how many are there or to generate them randomly. This comes from a very natural graph (the flip-path graph) and CW complex structures (cellular-strings complex) on the set of monotone paths. These objects are important in topological combinatorics (they were introduced and by Billera, Sturmfels, Gelfand, Kapranov, Zelevinsky and others in the early 1990's) and in discrete optimization (In particular the complexity of the simplex method with work going back to Klee).

I will discuss bounds on the number of monotone paths, and on the the diameter of the space of monotone paths (how far are two monotone paths from each other?). The picture is fairly complete in dimension three, but plenty of open problems remain for high dimensional polytopes..

The new theorems presented in my talk come from a recent paper (in Arxiv), joint work with Christos Athanasiadis (U. Athens) and Zhenyang Zhang (UC Davis). (Received August 02, 2020)