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Permutohedral Complexes and Rational Curves With Cyclic Action

Although the moduli space of genus-zero curves is not a toric variety, it shares an intriguing amount of the combinatorial structure that a toric variety would enjoy. In fact, by adjusting the moduli problem slightly, one finds a moduli space that is indeed toric, known as Losev-Manin space. The associated polytope is the permutohedron, which also encodes the group-theoretic structure of the symmetric group. Batyrev and Blume generalized this story by constructing a "type-B" version of Losev-Manin space, whose associated polytope is a signed permutohedron that relates to the group of signed permutations. In joint work with C. Damiolini, D. Huang, S. Li, and R. Ramadas, we carry out the next stage of generalization, defining a family of moduli space of rational curves with $\mathbb{Z}_r$ action encoded by an associated "permutohedral complex" for a more general complex reflection group, which specializes when $r = 2$ to Batyrev and Blume's moduli space.