

1030-05-44

Stefan A. Forcey* (sforcey@tnstate.edu), Tennessee State University, Dept. of Physics and Mathematics, 3500 John A. Merritt Blvd., Nashville, TN 37209-1561. *Convex hull realizations of the multiplihedra.*

The multiplihedra were invented by Stasheff, described by Iwase and Mimura, and generalized by Boardman and Vogt. They represent the fundamental structure of a weak map between weak structures, such as weak n -categories or A_n spaces. They form a bimodule over the associahedra, and collapse to become the associahedra in the special case of a strict range structure.

Here we present an algorithm for finding the vertices in Euclidean space whose convex hull is the n^{th} multiplihedron, answering the open question of the existence of a convex polytope realization of the multiplihedra. The algorithm uses a bijection between vertices of the multiplihedra and certain painted binary trees, which we count with a recursive formula. It appears that this number is also given by the Catalan transform of the Catalan numbers.

This algorithm also involves a parameter q in $(0, 1)$ which at 1 or 0 yields the limiting polytopes which correspond to the respective cases of a strict range or strict domain. In the latter case the multiplihedra collapse to form a new family of polytopes which was noticed first in the study of the cocycle conditions of weak enrichment over a strict n -category. (Received July 02, 2007)