Mathematics > Combinatorics

Complete enumeration of small realizable oriented matroids

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Enumeration of all combinatorial types of point configurations and polytopes is a fundamental problem in combinatorial geometry. Although many studies have been done, most of them are for 2-dimensional and non-degenerate cases.
Finschi and Fukuda (2001) published the first database of oriented matroids including degenerate (i.e. non-uniform) ones and of higher ranks. In this paper, we investigate algorithmic ways to classify them in terms of realizability, although the underlying decision problem of realizability checking is NP-hard. As an application, we determine all possible combinatorial types (including degenerate ones) of 3-dimensional configurations of 8 points, 2-dimensional configurations of 9 points and 5-dimensional configurations of 9 points. We could also determine all possible combinatorial types of 5-polytopes with 9 vertices.

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