Random walks on complex hyperplane arrangements and self-organising libraries

The starting point is the pleasant fact that some much-studied random walks on permutations, such as the Tsetlin library, arise from walks on real hyperplane arrangements [Bidigare, Hanlon and Rockmore, 1998]. We explore similar walks on complex hyperplane arrangements. This is achieved by involving certain cell complexes that model the topology of the complement of the arrangement. In a particular case this leads to walks on dynamic Tsetlin-style libraries with several shelves.

These random walks belong to a family of Markov chains, best described in terms of semigroups, that have been studied by K. Brown, P. Diaconis, and others. They have the property that all eigenvalues of the transition matrices are non-negative real and given by a simple combinatorial formula. Background material needed for understanding the walks and the geometric constructions will be reviewed in rather great detail.

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