Abstract

A Markov chain on the solution space of edge-colorings of bipartite graphs

Letong Hong

Dept. Mathematics, Massachusetts Institute of Technology
clhong@mit.edu

The Latin squares L_n are $n \times n$ grids such that each row and column consist of numbers 1 to n. It is a family of important combinatorial objects but with no known easily computable formula for its quantity. A Latin rectangle is an $(n-k) \times n$ grid with each row consisting 1 to n and each column has no repeat. One may see that there is a natural bijection between all possible Latin square completions of Latin rectangles and the proper edge k-colorings of a regular equi-bipartite graph.

Counting and sampling are related problems. Motivated by the above, we exhibit an irreducible Markov chain M on the edge k-colorings of bipartite graphs based on certain properties of the solution space. We show that diameter of this Markov chain grows linearly with the number of edges in the graph. We also prove a polynomial upper bound on the inverse of acceptance ratio of the Metropolis-Hastings algorithm when the algorithm is applied on M with the uniform distribution of all possible edge k-colorings of G.

Joint work with István Miklós, Alfréd Rényi Institute of Mathematics. miklos.istvan@renyi.hu.

References

[1] L. Hong and I. Miklos. *A Markov chain on the solution space of edge-colorings of bipartite graphs*. Submitted. https://arxiv.org/abs/2103.11990