

Euler Tours of low-height toroidal grids

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Abstract

The problem of exactly counting the Euler tours (ETs) of an (undirected) 4-regular graph is known to be $\sharp\text{P}$ -complete, and to date no *fpras* exists for approximate counting. The natural “Kotzig moves” Markov chain converges to the uniform distribution on Euler tours of the given graph, but attempts to show rapid mixing (even for restricted classes of graphs) have been unsuccessful.

For the specific case of a *toroidal grid* with a constant number of rows k , a “transfer matrix” can be defined and used to exactly count Euler tours of that grid (details of the transfer matrix for ETs due to Creed, Astefanoaei, and Martinov).

We show that we can use some of the same structure to prove rapid mixing of the Kotzig moves chain on 2-rowed toroidal grids, and discuss the issues for higher number of rows.