

Chang, Shu-Chiuan; Shrock, Robert

Flow polynomials and their asymptotic limits for lattice strip graphs. (English) Zbl 1035.82011
J. Stat. Phys. 112, No. 3-4, 815-879 (2003).

Summary: We present exact calculations of flow polynomials $F(G, q)$ for lattice strips of various fixed widths $L_y \leq 4$ and arbitrarily great lengths L_x , with several different boundary conditions. Square, honeycomb, and triangular lattice strips are considered. We introduce the notion of flows per face fl in the infinite-length limit. We study the zeros of $F(G, q)$ in the complex q plane and determine exactly the asymptotic accumulation sets of these zeros \mathcal{B} in the infinite-length limit for the various families of strips. The function fl is nonanalytic on this locus. The loci are found to be noncompact for many strip graphs with periodic (or twisted periodic) longitudinal boundary conditions, and compact for strips with free longitudinal boundary conditions. We also find the interesting feature that, aside from the trivial case $L_y = 1$, the maximal point, q_{cf} , where \mathcal{B} crosses the real axis, is universal on cyclic and Möbius strips of the square lattice for all widths for which we have calculated it and is equal to the asymptotic value $q_{cf} = 3$ for the infinite square lattice.

MSC:

82B20 Lattice systems (Ising, dimer, Potts, etc.) and systems on graphs arising in equilibrium statistical mechanics Cited in 2 Documents
05C90 Applications of graph theory

Keywords:

flow polynomial; Potts model; Tutte polynomial

Software:

[OEIS](#)

Full Text: [DOI](#) [arXiv](#)