

A graph polynomial, a Markov chain and a counterexample

Mark Jerrum

Ge and Stefankovic recently introduced a novel two-variable graph polynomial. When specialised to a bipartite graphs G and evaluated at the point $(\frac{1}{2}, 1)$ the polynomial gives the number of independent sets in the graph. Inspired by this polynomial, they also introduced a Markov chain which, if rapidly mixing, would provide an efficient sampling procedure for independent sets in G . The proposed Markov chain is promising, in the sense that it overcomes the most obvious barrier to mixing. Unfortunately, by exhibiting a sequence of counterexamples, we can show that the mixing time of their Markov chain may be exponential in the size of the instance G .

I'll play down the complexity-theoretic motivation for this investigation, and concentrate on the combinatorial aspects, namely the graph polynomial and the construction of the counterexamples. This is joint work with Leslie Ann Goldberg (Liverpool). A preprint is available as arXiv:1109.5242.