The Tutte Polynomial on the Square Lattice

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Evaluations of Tutte polynomial in points of the plane range very wide and include such quantities as the chromatic and flow polynomials of a graph and the partition functions of Ising, Potts and random cluster models of statistical physics. The computation of most of those quantities are P-hard for the class of planar graphs. In spite of this fact it seems to be interesting to investigate for which classes of graphs the calculation of the Tutte polynomial can be done in polynomial time.

It is known that the Tutte polynomial of a graph of bounded tree width can be computed in polynomial time. In some sense, the smallest graph not bounded tree width is the grid. Here, we obtain the Tutte polynomial on the nxm section of the square lattice in polynomial time and some asymptotic results.