A Tutte-style Proof of Brylawski’s Tensor Product Formula

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Abstract

We provide a new proof of Brylawski’s formula for the Tutte polynomial of the tensor product of two matroids. Our proof involves extending Tutte’s formula, expressing the Tutte polynomial using a calculus of activities, to all polynomials involved in Brylawski’s formula. The approach presented here may be used to show a signed generalization of Brylawski’s formula, which may be used to compute the Jones polynomial of some large non-alternating knots. Our proof inspires a generalization of Brylawski’s formula to the case when the pointed element is a factor, yielding an unexpected connection to a well-known result on the uniqueness of minimum weight spanning trees in a weighted graph with distinct edge weights.

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