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Talk: An Ising-type formulation of the six-vertex model

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We show that the celebrated six-vertex model of statistical mechanics (along with its multistate generalizations) can be reformulated as an Ising-type model with only a two-spin interaction. Such a reformulation unravels remarkable factorization properties for row to row transfer matrices, allowing one to uniformly derive all functional relations for their eigenvalues and present the coordinate Bethe ansatz for the eigenvectors for all higher spin generalizations of the six-vertex model. The possibility of the Ising-type formulation of these models raises questions about the precedence of the traditional quantum group description of the vertex models. Indeed, the role of a primary integrability condition is now played by the star-triangle relation, which is not entirely natural in the standard quantum group setting, but implies the vertex-type Yang-Baxter equation and commutativity of transfer matrices as simple corollaries. As a mathematical identity the emerging star-triangle relation is equivalent to the Pfaff-Saalschuetz-Jackson summation formula, originally discovered by J. F. Pfaff in 1797. Plausibly, all vertex models associated with quantized affine Lie algebras and superalgebras can be reformulated as Ising-type models. (Based on the joint work with Sergey Sergeev, arXiv:2205.10708)

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