Generalized Loop Models and Affine Hecke Algebras

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We briefly review the Razumov-Stroganov (RS) conjectures which relate the $O(1)$-loop model to alternating sign matrices. Many research areas play important roles: alternating sign matrices in combinatorics, the XXZ spin chain and the six-vertex model in statistical mechanics, and the representation theory of the Temperley-Lieb and the Hecke algebras. We will discuss the A_k generalization of the $O(1)$-loop model on a cylinder by using representation theory of the Affine Hecke algebra and the qKZ equation. We introduce a class of the affine Hecke algebra which is characterized by the cylindric relation. We construct the states for this model through the correspondence among an unrestricted path, a rhombus tiling and a word. The RS sum rule for the A_k model and the relation with the spin chain model are also discussed.