Gorsky, A.; Vasilyev, M.; Zotov, A.
Dualities in quantum integrable many-body systems and integrable probabilities. I. (English)
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Summary: In this study we map the dualities observed in the framework of integrable probabilities into the dualities familiar in a realm of integrable many-body systems. The dualities between the pairs of stochastic processes involve one representative from Macdonald-Schur family, while the second representative is from stochastic higher spin six-vertex model of TASEP family. We argue that these dualities are counterparts and generalizations of the familiar quantum-quantum (QQ) dualities between pairs of integrable systems. One integrable system from QQ dual pair belongs to the family of inhomogeneous XXZ spin chains, while the second to the Calogero-Moser-Ruijsenaars-Schneider (CM-RS) family. The wave functions of the Hamiltonian system from CM-RS family are known to be related to solutions to (q)KZ equations at the inhomogeneous spin chain side. When the wave function gets substituted by the measure, bilinear in wave functions, a similar correspondence holds true. As an example, we have elaborated in some details a new duality between the discrete-time inhomogeneous multispecies TASEP model on the circle and the quantum Goldfish model from the RS family. We present the precise map of the inhomogeneous multispecies TASEP and 5-vertex model to the trigonometric and rational Goldfish models respectively, where the TASEP local jump rates get identified as the coordinates in the Goldfish model. Some comments concerning the relation of dualities in the stochastic processes with the dualities in SUSY gauge models with surface operators included are made.

MSC:
81U15 Exactly and quasi-solvable systems arising in quantum theory
81R12 Groups and algebras in quantum theory and relations with integrable systems
81R50 Quantum groups and related algebraic methods applied to problems in quantum theory
82B23 Exactly solvable models; Bethe ansatz
81T13 Yang-Mills and other gauge theories in quantum field theory
37K10 Completely integrable infinite-dimensional Hamiltonian and Lagrangian systems, integration methods, integrability tests, integrable hierarchies (KdV, KP, Toda, etc.)
37J35 Completely integrable finite-dimensional Hamiltonian systems, integration methods, integrability tests
17B80 Applications of Lie algebras and superalgebras to integrable systems

Keywords:
Bethe ansatz; lattice integrable models; quantum groups; stochastic processes

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