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New classical and quantum integrable systems related to the MKdV integrable hierarchy.
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Summary: A new finite-dimensional classical integrable system and a new quantum integrable system are generated from a spectral problem for the MKdV hierarchy through the nonlinearization technique of Lax systems. Our classical integrable system is an example of Gaudin magnet with boundary and relates to the finite band solutions of the MKdV hierarchy. Its Lax representation and $r$-matrix is given, and its separation of variables is performed. Based on a direct link between $r$-matrix formulas for classical systems and quantum problems, a quantum integrable system with separated variables is presented.

MSC:

37K10 Completely integrable infinite-dimensional Hamiltonian and Lagrangian systems, integration methods, integrability tests, integrable hierarchies (KdV, KP, Toda, etc.)
35Q53 KdV equations (Korteweg-de Vries equations)
37N20 Dynamical systems in other branches of physics (quantum mechanics, general relativity, laser physics)
82B23 Exactly solvable models; Bethe ansatz

Keywords:
integrable system; quantum integrable system; spectral problem; MKdV hierarchy; Gaudin magnet; Lax representation; $r$-matrix

Full Text: DOI