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Bäcklund Transformations as exact integrable time-discretizations for the trigonometric Gaudin model

O.Ragnisco, F.Zullo

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We construct a two-parameter family of B\"acklund transformations for the trigonometric classical Gaudin magnet. The approach follows closely the one introduced by E.Sklyanin and V.Kuznetsov (1998,1999) in a number of seminal papers, and takes advantage of the intimate relation between the trigonometric and the rational case. As in the paper by A.Hone, V.Kuznetsov and one of the authors (O.R.) (2001) the B\"acklund transformations are presented as explicit symplectic maps, starting from their Lax representation. The (expected) connection with the XXZ Heisenberg chain is established and the rational case is recovered in a suitable limit. It is shown how to obtain a "physical" transformation mapping real variables into real variables. The interpolating Hamiltonian flow is derived and some numerical iterations of the map are presented.

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