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Nonselfadjoint Operators, Triangular Models, and the Soliton Theory

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In this work we develop the idea of the connection between two mathematical theories–the soliton theory and the theory of commuting nonselfadjoint operators, established by M.S. Livšic and Y. Avishai in [2] and based on the Marchenko method for solving nonlinear differential equations and Livšic nonselfadjoint operator theory of triangular models and open systems. We obtain solutions of different nonlinear differential equations [1] using this connection in the case of n-tuples of commuting nonselfadjoint bounded linear operators, when one of them belongs to a larger class of nonselfadjoint nondissipative operators–couplings of dissipative and antidissipative operators with real absolutely continuous spectra. We introduce a generalized open system, corresponding to the collective motions. This allows to obtain solutions of the nonlinear Schrödinger equation, the Heisenberg equation, the Sine-Gordon equation, the Davey-Stewartson equation, using the matrix wave equations for appropriate pairs and triplets of commuting nonselfadjoint operators.

We also present the connection between Livšic theory of single operator colligations and Sturm-Liouville systems. An usefull representation of solutions of Sturm-Liouville systems is obtained using the resolvent of operators from a larger class of nonselfadjoint nondissipative operators–couplings of dissipative and antidissipative operators. These results show the connection with the inner state of the corresponding open system.

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References

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