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Complex isospectral deformations of conventional shape-invariant superpotentials

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Abstract

All additive shape-invariant superpotentials in nonrelativistic quantum mechanics can be classified into two categories: those that do not explicitly depend on \hbar and those that do. The latter category, known as the conventional superpotentials, forms a complete family. It has been demonstrated that the Schrödinger equation admits exact analytical solutions for this family, highlighting their significance in quantum mechanics due to this and other intriguing properties. This paper presents a mechanism for generalizing these superpotentials to the complex domain. The resulting complex non-Hermitian Hamiltonians possess real energy eigenvalues and are isospectral with their real counterparts.

Keywords: Superpotential, Complex Superpartners, Non-Hermitian Quantum Mechanics, Parity-Time Reversal Symmetric Quantum Mechanics, Supersymmetric Quantum Mechanics

For full article, refer to the Persian section