



Iranian Journal of Physics Research, Vol. 25, No. 2, 2025
DOI: 10.47176/ijpr.25.2.22029

Complex isospectral deformations of conventional shape-invariant superpotentials

T Koohrokhi* and A Izadpanah

Department of Physics, Faculty of Sciences, Golestan University, Gorgan, Iran

E-mail: tkoothrokhi@gmail.com

(Received 29 December 2024; in final form 21 January 2025)

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