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Non-Hermitian real operators in quantum mechanics

Generation of quantum systems has been a subject of interest since the early development of quantum mechanics, in view of understanding physics behind micro world that may deal atomic system, nuclear system, quantum field theory etc. In fact it gained momentum after the induction of supersymmetry in Hermiticity or PT - symmetry (space-time symmetry). In both the cases one can have only isolated systems satisfying the conditions

$$E = E_B + E_F \quad (1)$$

$$E_B \rightarrow E_n^{(+)}; E_F \rightarrow E_n^{(-)} \quad (2)$$

$$E_n^{(+)} = E_{n+1}^{(-)}; E_n^{(-)} = 0 \quad (3)$$

However, generation of two different bosonic and fermionic systems can hardly be achieved in simple supersymmetry. On the other hand if momentum operator is suitably incorporated in supersymmetry, one can generate twins satisfying the relation.

$$E = E_B^{(1,2)} + E_F^{(1,2)} \quad (4)$$

$$E_B^{(1)} \rightleftharpoons E_F^{(2)} \quad (5)$$

$$E_B^{(2)} \rightleftharpoons E_F^{(1)} \quad (6)$$

In fact, a close view reveals that corresponding complex PT -symmetry, T-symmetry and mixed symmetry operators are actually Real-Non-Hermitian- operators with well-defined spectra. The main question now come to our mind as to : if Real - Non - Hermitian operators exist in different symmetry, why they will not exist in ordinary complex- bounded operators involving PT - symmetry. Recent investigation reveals that simple complex PT - symmetry systems involving the term $(ix)^{K-odd}$ have equivalent Real – Non - Hermitian operators. Hence our new generation will find / visualize / generate only Real – Operators that may be Hermitian or non-Hermitian. Hope this platform will motivate to generate new Real-Non-Hermitian - atomic and nuclear systems.

Biography

Biswanath Rath is a Retired Reader in Physics, North Orissa University, Baripada, Odisha, India having 34 years of experience in teaching and research. His research interest includes spectral analysis in non-Hermitian -complex and non-Hermitian- real systems. He has published more than 60 research papers in theoretical physics.

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