

Different Facets of PT Symmetry

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By PT symmetry one means the combined parity and time reversal symmetries. In the last 25 years, PT symmetry has found application in unusually large number of areas starting from Classical mechanics, Acoustics, Electronic Circuits, Microwave Mechanics, Astrophysics, Anyons, Chern Simons Theories, Fractional quantum Hall Effect, topological quantum computing, Multiferroic Materials, Integrable and non-integrable Models, Dirac Equation, Quantum Mechanics and Optics. By Using the concept of balance loss and gain, several experiments have verified its predictions. After giving a brief introduction, I shall primarily focus on new insight offered by PT symmetry in quantum and classical mechanics. I will show that whereas Hamiltonian is not known for a system with friction, for a coupled system with balanced friction and anti-friction, one can write down the corresponding Hamiltonian. I will discuss few quantum mechanical models with complex but PT-invariant potentials and show that the spectrum is real if the PT-symmetry is unbroken while we get complex conjugate eigenvalues in case the PT-symmetry is spontaneously broken. Further, I will show that several integrable and non-integrable models which admit kink and/or pulse solutions, also admit complex but PT-invariant kink or the pulse solution as the case may be.
