THE PARAMETER-BASED FISHER INFORMATION OF RAKHMANOV-BORN DENSITY OF ORTHOGONAL POLYNOMIALS AND QUANTUM SYSTEMS

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Abstract

The ground and excited states of physical systems are described by means of the Born quantum-mechanical probability density $\rho(x \mid \theta)$, which for single-particle systems is equal to the squared wavefunction of the states. Often the physical wavefunctions are given by means of known special functions of the mathematical physics and applied mathematics, and particularly the orthogonal hypergeometric polynomials depending on the parameter θ. Then, the physical Born probability density reduces to the so-called Rakhmanov probability density of the orthogonal polynomials. Here, we calculate the explicit expression for the Fisher information with respect to the parameter θ (not necessarily of locality character) for all the classical orthogonal polynomials in a closed and explicit form. Applications to various specific quantum systems will be described in detail.

References:

[1] J.S. Dehesa, B. Olmos and R.J. Yáñez, *Parameter-based Fisher's information of orthogonal polynomials*, J. Comp. Appl. Math., Preprint (2006)

[2] J.S. Dehesa, S. López-Rosa, B. Olmos and R.J. Yáñez, *The Fisher information of D-dimensional hydrogenic systems in position and momentum spaces*, J. Mathematical Physics, (2006). Accepted