

Cooper, Fred; Dawson, John; Shepard, Harvey

SUSY-based variational method for the anharmonic oscillator. (English) Zbl 0941.81526
Phys. Lett., A 187, No. 2, 140-144 (1994).

Summary: Using a newly suggested algorithm of Gozzi, Reuter and Thacker for calculating the excited states of one-dimensional systems, we determine approximately the eigenvalues and eigenfunctions of the anharmonic oscillator, described by the Hamiltonian $H = \frac{1}{2}p^2 + gx^4$. We use ground state post-Gaussian trial wave functions of the form $\Psi(x) = N \exp(-b|x|^{2n})$, where n and b are continuous variational parameters. This algorithm is based on the hierarchy of Hamiltonians related by supersymmetry (SUSY) and the factorization method. We find that our two-parameter family of trial wave functions yields excellent energy eigenvalues and wave functions for the first few levels of the anharmonic oscillator.

MSC:

- 81Q05** Closed and approximate solutions to the Schrödinger, Dirac, Klein-Gordon and other equations of quantum mechanics Cited in 2 Documents
- 81-04** Software, source code, etc. for problems pertaining to quantum theory
- 81Q60** Supersymmetry and quantum mechanics

Full Text: [DOI](#)

References:

- [1] Schrödinger, E., (), 9
- [2] Infeld, L.; Hull, T.E., Rev. mod. phys., 23, 21, (1951)
- [3] Gozzi, E.; Reuter, M.; Thacker, W., Variational methods via supersymmetric techniques, INFN preprint, (1993)
- [4] Sukumar, C.V.; Sukumar, C.V., J. phys. A, J. phys. A, 18, 2917, (1986)
- [5] Adrianov, A.A.; Borisov, N.V.; Ioffe, M.V., Phys. lett. A, 105, 19, (1984)
- [6] F. Cooper, A. Khare and U. Sukhatme, Supersymmetry and quantum mechanics, Phys. Rep., to be published. · [Zbl 0988.81001](#)
- [7] Witten, E., Nucl. phys. B, 188, 513, (1981)
- [8] Cooper, F.; Freedman, B., Ann. phys., 146, 262, (1983)
- [9] Khare, A.; Sukhatme, U., J. phys. A, 21, L501, (1988)
- [10] Cooper, F.; Shepard, H.; Lucheroni, C.; Sodano, P., Physica D, 68, 344, (1993)
- [11] Hioe, F.T.; Montroll, E.W., J. math. phys., 16, 1945, (1975)

This reference list is based on information provided by the publisher or from digital mathematics libraries. Its items are heuristically matched to zbMATH identifiers and may contain data conversion errors. It attempts to reflect the references listed in the original paper as accurately as possible without claiming the completeness or perfect precision of the matching.