Reviewer: M. Znojil
Theory Group, Nucl. Phys. Institute ASCR, 250 68 Řež, Czech Republic
Authors: Bozang Li, S. Wang, L. Zhang and X. Zhang
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It is well known that even for a single particle moving in one dimension a transition from a classical to quantum Hamiltonian is ambiguous. Still, the ambiguity is not unlimited. Authors discuss this problem with a particular (loosely speaking, Lewis and Leach's time-dependent harmonic oscillator like) class of Hamiltonians in mind.

During the construction of the states in the unquantized, classical case a useful technical trick lies in the construction of certain invariants I(t). Their knowledge helps in the quantized case as well. At this point the authors notice that not all the "quantizations" [replacing, basically, the value of the momentum p by a (differential) operator] leave the new Hamiltonian (essentially) self-adjoint. In an opposite direction, the latter, purely physical requirement modifies the considerations which lead to the invariants I(t). In the new setting, the authors offer an extension of the Lewis and Leach's method of the systematic construction of I(t). For pragmatic reasons, they only deal with the linear and quadratic invariants in an explicit manner.