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Automatic hermiticity for mixed states

Thursday, 30 November 2023 17:15 (15 minutes)

We previously proposed a mechanism to effectively obtain, after a long time development, a Hamiltonian being Hermitian with regard to a modified inner product I_Q that makes a given non-normal Hamiltonian normal by using an appropriately chosen Hermitian operator Q. We studied it for pure states. In this talk we show that a similar mechanism also works for mixed states by introducing density matrices to describe them and investigating their properties explicitly. In particular, in the future-included theories, where not only a past state at the initial time T_A but also a future state at the final time T_B is given, we introduce a "skew density matrix"composed of both ensembles of the future and past states such that the trace of the product of it and an operator O matches a normalized matrix element of O. We argue that the skew density matrix defined with I_Q at the present time t for large $T_B - t$ and large $t - T_A$ approximately corresponds to another density matrix composed of only an ensemble of past states and defined with another inner product I_{Q_J} for large $t - T_A$. This talk is based on the collaboration with Holger Bech Nielsen [Prog. Theor. Exp. Phys. 2023 (3) 031B01] (arXiv:arXiv:2209.11619 [hep-th]).

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