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Adiabatic Evolution of Low-Temperature Many-Body Systems

mercredi 28 juin 2023 09:00 (45 minutes)

I will discuss the dynamics of short-ranged, weakly interacting fermionic lattice models, exposed to extensive perturbations slowly varying in time. We shall focus on the evolution of the expectation of local observables, starting from a positive temperature equilibrium state. At zero temperature, in the last years there has been important progress in the derivation of a many-body adiabatic theorem for gapped systems, uniformly in the size of the system. A corollary of this result is the validity of linear response. A limitation of the method is that it does not extend to positive temperatures, no matter how small. In this talk, I will discuss a representation via a convergent expansion for the evolution of the expectation of local observables, which implies the validity of a many-body adiabatic theorem for gapped systems at small positive temperature and the validity of linear response. "Small"means that the temperature has to vanish with the adiabatic parameter, uniformly in the size of the system. In particular, our setting covers the case in which the temperature is sent to zero after the thermodynamic limit. Our strategy is based on a rigorous version of the Wick rotation, that allows to represent the Duhamel expansion for the real-time dynamics in terms of Euclidean correlation functions, for which precise space-time decay estimates are proved using fermionic cluster expansion. Joint work with Rafael L. Greenblatt, Markus Lange and Giovanna Marcelli.

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