Adiabatic currents for interacting electrons on a lattice

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Abstract: Consider a system of interacting fermions on a discrete finite lattice in d-dimensions. The Hamiltonian of the system depends smoothly and adiabatically on time, and it is assumed to be uniformly gapped in time and in the system size. We derive an adiabatic theorem for such systems, which provides an effective superadiabatic unitary propagator tracking the dynamics of local observables in the space of instantaneous ground states up to any order in the adiabatic parameter; moreover, the error estimates are uniform in the system size, allowing the passage to the thermodynamic limit. This adiabatic theorem is then used to discuss charge transport in systems of interacting fermions, focusing in particular on the issue of quantization of conductance and conductivity in quantum Hall systems.

The talk is based on joint work with S. Teufel (Universität Tübingen), preprint arXiv:1707.01852.