

Abstract:

The Hubbard model has contributed greatly to our understanding of strongly correlated systems, and in particular of the metal-insulator transition that some such systems exhibit. A model related to the Hubbard model is the t-J model obtained via a canonical transformation on the Hubbard Hamiltonian. The t-J Hamiltonian originates from an expansion of the canonically transformed Hubbard Hamiltonian, and coincides with the Hubbard one in the limit of infinite interaction strength. It is shown that a generalized transformation leads to a modified model similar to the t-J, but whose convergence properties with respect to the expansion are more favourable than those of the original t-J model. An extended Gutzwiller approximation will also be discussed in which the Gutzwiller approximation is modified to include effects of the exchange hole.