Unified Solutions of the Hard-Core Fermi- and Bose-Hubbard Models

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Abstract: A unified algebraic approach to both the hard-core Fermi- and Bose-Hubbard models
is extended to both the finite- and infinite-site with periodic condition cases. Excitation
energies and the corresponding wavefunctions of both the models with nearest neighbor hopping
are exactly derived by using a new and simple algebraic method. It is found that spectra of
both the models are determined simply by eigenvalue problem of $N \times N$ hopping matrix, where N is
the number of sites for finite system or the period of sites for infinite system.

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