

Abstract

A one-dimensional Bose-Hubbard model with unidirectional hopping is shown to be exactly solvable. Applying the algebraic Bethe ansatz method, we prove the integrability of the model and derive the Bethe ansatz equations. The exact eigenvalue spectrum can be obtained by solving these equations. The distribution of Bethe roots reveals the presence of a superfluid-Mott insulator transition at the ground state, and the critical point is determined. By adjusting the boundary parameter, we demonstrate the existence of a non-Hermitian skin effect even in the presence of interaction, but it is completely suppressed for the Mott insulator state in the thermodynamical limit. Our result represents a new class of exactly solvable non-Hermitian many-body systems, which has no Hermitian correspondence and can be used as a benchmark for various numerical techniques developed for non-Hermitian many-body systems.