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Constructing an Exactly Solvable Model to test Many-body theories[1] NOUREDINE ZETTILI, Jacksonville State University, ABDELKRIM BOUKAHIL, Physics Department, University of Wisconsin - Whitewater — We deal with the construction of a simple many-body model that can be solved exactly. This model serves as a reliable tool for testing the validity and accuracy of many-body approximation methods such as mean field approximations in nuclear collective motion. The model consists of a system of two distinguishable sets of fermions interacting via a schematic two-body force. We construct the Hamiltonian of the model by means of vector operators that satisfy a Lie algebra and which are the generators of an SO(3,1) group. The Hamiltonian depends on an adjustable parameter that regulates the strength of the two-body interaction. The size of the Hamiltonian's matrix is rendered finite by means of a built-in symmetry. By diagonalizing this matrix, we obtain exact energy eigenvalues. Using this model, we test the accuracy of several many-body approximation methods by comparing their energy spectra with those obtained from the model.

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