

Title: Quasispin models in quantum physics

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Abstract: The use of symmetries in quantum physics helps in a deeper understanding of physical systems and simplifies numerical calculations. This thesis studies models based on the $SU(2)$ algebra, which, in spite of their apparent simplicity, show rather rich behavior and describe a wide spectrum of physical phenomena. We review various realizations of the $SU(2)$ algebra (namely the spin, boson, and fermion realization) and present the most general quantum hamiltonian with one- and two-body interactions, constructed from the $SU(2)$ generators. We perform the classical limit of the hamiltonian and show a numerical study of several particular examples.

Keywords: dynamical symmetries, Lipkin model, $su(2)$ algebra, quasispin