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Fermionic Representation of a Spin S chain Using subalgebra of SU(2S+1)[1] SOLOMON F. DUKI, YI-KUO YU, National Center for Biotechnology Information/NIH — Quantum mechanical spins behave neither as pure bosonic nor as pure fermionic operators. Over the years many different kinds of important mappings have been introduced that transform spins systems in to either multi-bosonic or multi-fermionic systems. These mappings have often successfully transformed some of the most difficult many body problems into simpler ones. Moreover, because symmetries that are hidden in one representation can be manifested in other representations, such mappings are also helpful in uncovering hidden symmetries in physical problems. Examples of such transformations include the Holstein-Primakoff, the Schwinger bosons, the Matsubara-Matsuda, and the Jordan-Wigner transformations. Despite their success for low dimensional systems and at smaller values of spins, these transformations become ineffective in reducing the degree of difficulty of correlated systems when the system dimension increase or when the underlying system has a higher spin values. In the context of a spin chain, we introduce a new spin fermion transformation for arbitrary spin S using the subalgebra of the bigger su(2S+1) algebra and discuss its potential applications in physical problems.

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