Title:	Accidental Degeneracy in Perturbed Systems of United Atoms by Symmetry
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Keywords:	Symmetry United Atoms Accidental Degeneracy
Issue Date:	28-Jul-2021
Publisher:	IISERM
Abstract:	Group theory is a helpful tool to understand the symmetry of quantum mechanical systems. The Hamiltonian is invariant under the symmetry operations of its symmetry group. These properties of a group and its representations provide the techniques to determine the extent of degeneracy in the quantum system. In general, the extent of degeneracy is linked to the dimension of irreducible representations of the underlying symmetry group. The presence of degeneracy higher than the one required by the symmetry group is known as accidental degeneracy. When accidental degeneracy is systematic, it can be explained that the underlying symmetry group is larger than the one assumed. When accidental degeneracy is not linked to an enlarged symmetry group, then it is regarded as truly accidental. Quantum systems such as particle-in-a three dimensional box and hydrogen atom are known to have systematic accidental degeneracies. The goal of the work is to check whether any such accidental degeneracy survives in presence of perturbations. Specifi- cally, we consider hydrogen atom system distorted by nuclei. We have considered geo- metric distortions restricted to various point groups such as D 3h , D 1h , D 4h , T d , O h , C 2v . We compute the spectrum using first-order degenerate perturbation theory to check whether any accidental degeneracies remain.
URI:	http://hdl.handle.net/123456789/3942
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