ALGEBRAIC APPROACHES AND THEIR CONNECTION WITH PHASE SPACE METHODS: APPLICATIONS TO SPECTROSCOPY

RENATO LEMUS, *Estructura de la Materia, Instituto de ciencias Nucleares, Mexico City, Mexico.*

First the salient features of the $U(\nu+1)$ algebraic approach associated to ν equivalent oscillators are presented. Then we introduce the 1D case through the connection of the $U(2)$ algebra with the Morse/Pöshl-Teller potentials with the goal of describing the vibrational degrees of freedom of non linear polyatomic molecules. The coordinates and momenta are then identified and generalized to any potential, providing the possibility to solve the 1D Schrödinger equation for general potentials by purely algebraic means using the concept of transformation brackets. A new procedure to calculate of Franck-Condon factors is presented. Because of their importance in linear molecules the $U(3)$ model is introduced, emphasizing its connection with configuration space. It is shown the application of the $U(2) \times U(3) \times U(2)$ algebraic approach to describe the Raman spectroscopy of the CO_2 molecule. The $U(3)$ model is applied to consider general potentials to describe linear-to-bend transition in triatomic molecules. Finally the $U(4)$ model is introduced to describe 3D systems for general potentials. The Hydrogen atom as well as the 3D Morse systems are analyzed by purely algebraic means as a benchmark to show how to apply the algebraic method for potentials with spectroscopic interest.