Energy Eigenvalue Level Motion with Two Parameters

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Z. Naturforsch. **56 a,** 565–567 (2001); received April 17, 2001

From the eigenvalue equation $\hat{H}_\lambda |\psi_n(\lambda)\rangle = E_n(\lambda)|\psi_n(\lambda)\rangle$ where $\hat{H}_\lambda = \hat{H}_0 + \lambda \hat{V}$ one can derive an autonomous system of first order ordinary differential equations for the eigenvalues $E_n(\lambda)$ and the matrix elements $V_{mn}(\lambda) := \langle \psi_m(\lambda)|\hat{V}|\psi_n(\lambda)\rangle$ where λ is the independent variable. We derive the partial differential equations for the extended case $\hat{H}_{\lambda_1,\lambda_2} = \hat{H}_0 + \lambda_1 \hat{V}_1 + \lambda_2 \hat{V}_2$, where λ_1 and λ_2 are the independent variables. Some applications of this system of partial differential equations are discussed.

Key words: Eigenvalue Level Motion; Partial Differential Equations.