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A New Algorithm for Diagonalizing Dynamical Matrices of Harmonic Oscillators. ERIC ASPLING, BRUCE WHITE, Binghamton Univ — The Harmonic Oscillator (HO) is used throughout many disciplines within physics. In this project we explore a robust algorithm that is used to diagonalize the Tridiagonal Matrix associated with the force equations of the HO. This matrix is also known as the Dynamical Matrix. This algorithm was designed to algebraically assess HO systems of condensed matter, where assuming plane waves proves to be inconvenient. These cases include having varying masses or potentials and evaluating these systems in higher dimensions. The Algorithm is a means to find the characteristic equation of smaller parts within these complex matrices. Then, through careful algebraic manipulations of the characteristic equations we can form the final characteristic equation describing the entire dynamical matrix of the system. The more traditional methods of diagonalizing the Dynamical Matrices tend to become algebraically exhaustive after a few degrees of complexity. While our algorithm does require some periodicity, the algebra remains manageable regardless of the system. Computational software proves to be detrimental not only for organizing the characteristic equations but also for taking the roots of these equations as they can be of a high order.

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