# Few-body physics with many processors

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We study the energy spectrum of the bound states in a three-body system consisting of one light and two heavy bosonic particles in two space dimensions. In the case of the $p$-wave resonant state in the heavy-light interaction potential, the discrete spectrum is close to the energy spectrum of a hydrogen atom with a cut-off determined by the mass ratio [1]. Applying the Data Vortex® computing system aims at checking the accuracy of the analytic results based on the well-known Born-Oppenheimer approximation [2].

By using the spectral method [3], we discretize the stationary four-dimensional Schrödinger equation in function space and represent the Schrödinger equation as an eigenvalue problem for a matrix of finite size. To obtain eigenvalues with small magnitude, we apply the Arnoldi method [4], where the multiplication of a structured sparse matrix by a vector has the largest cost of computation. Therefore, performing our calculations with the Data Vortex® computing system is expected to speed up computation and to obtain better accuracy in comparison with other computing clusters having the same number of processors.

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