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**Review text:**

Experimental physicists can measure the vibrational spectra of diatomic molecules with high precision. Good news is that these spectra can be described, with a fairly good precision, by the well known (and non-numerically solvable, so called Morse) potential. Bad news is that the experiments themselves already require a significantly higher precision. In this physical and phenomenological context one discovers that first of all, the popular Morse model suffers from a complete absence of any quasi-binding barrier at intermediate distances.

In the paper a generalized Morse model is suggested which tries to avoid this trap by splitting the real axis in (typically, three) subintervals where a (substantially) different choice of the parameters can be made. What is gained and preserved is the solvability of the new differential Schrödinger equations in terms of the known (i.e., confluent hypergeometric) special functions. What is lost and sacrificed is the non-numerical implementability of the physical boundary conditions.

What the paper really offers is a sample of numerical calculations of the energies and wave functions. The details of the standard technique which matches the logarithmic derivatives at the gluing points are described and discussed with particular attention paid to the xenon molecule. Several times (notably, in the title and abstract of the paper) the “analytic” aspects of the approach are emphasized, but one can reserve a certain doubt about the real reward of all the necessary effort.