

A new dynamical symmetry of the three body problem

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The motivation for a search for a three body dynamical symmetry comes from the quantum aspects of three quarks confined by the so-called Y- and Delta strings. After a brief review of the Y- and Delta string spectra and their degeneracies we introduce a set of permutation symmetric three-body variables that exposes the underlying exact dynamical $O(2)$ symmetry of the Y-string. Then we show that this is also an approximate symmetry of other permutation symmetric three-body systems, such as the Newtonian gravity one. We illustrate the role of the new variables by displaying the classical Newtonian periodic three-body orbits of Euler, Lagrange and Moore in these terms and consequently: a) show that the above string systems also have the same solutions; and b) find new solutions.