

The method of close returns in the restricted Kokoriev-Kirpichnikov problem

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The method of close returns is a simple qualitative tool providing the information about the evolution of a dynamical system with an arbitrary number of degrees of freedom. It can be seen as a simplified version of the frequency analysis approach. The method was invented by Mindlin and Gilmore (1992, *Physica D*, **58**, 229) but the only case of its application in celestial mechanics remains still the study of the Hyperion's rotation (Boyd et al., 1994, *Ap. J.*, **431**, 425). We test the performance of the method in the restricted problem of Kokoriev and Kirpichnikov, i.e. the orbital motion of a negligible point mass in the field of a rotating dumb-bell. In this three degrees of freedom problem, the method behaves very well; it allows to make a clear distinction between the chaotic and quasi-periodic orbits.