

Some special periodic solutions of the Newtonian N-body problem

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Abstract

We consider the motion of $N \in \{12, 24, 60\}$ equal particles subjected to Newton gravitational interaction. The numbers 12, 24, 60 are the orders of the rotation groups of the Platonic Polyhedra. By imposing both symmetry and topological constraints we define certain cones $\mathcal{K} \subset W^{1,2}(T, \mathcal{R}^{3N})$, $(W^{1,2}(T, \mathcal{R}^{3N})$ the set of T -periodic maps $u : \mathcal{R} \rightarrow \mathcal{R}^{3N}$), associated to Platonic Polyhedra and such that the hamiltonian action A is coercive on \mathcal{K} . We show that the corresponding minimizers are collision-free and therefore genuine periodic motions of the N -body problem with a rich symmetric structure.