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Searching for new nontrivial choreographies for the planar three-body problem

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In this work we consider the planar three-body problem with zero angular momentum symmetric initial configuration and bodies with equal masses. We are interested in special periodic orbits called choreographies. A choreography is a periodic orbit in which the three bodies move along one and the same trajectory with a time delay of $T/3$, where T is the period of the solution. Such an orbit is called trivial if it is a topological power of the famous figure-eight choreography, otherwise it is called nontrivial. A specialized numerical search for new nontrivial choreographies is made. The search is based on a modification of Newton's method used with high precision floating point arithmetic. With only 3 known so far nontrivial choreographies, we found over 150 new ones. The linear stability of all found orbits is investigated by a high precision computing of the eigenvalues of the monodromy matrices. The extensive computations are performed in the "HybriLIT" platform.

Summary

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