

Geometrodynamics of a system coupled oscillators with pendulum

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ABSTRACT

Lapunov's exponents in dynamical systems theory play an important role, namely they are a sort of chaos indicators. Unfortunately, there is no way to evaluate them analytically within the classical approach. The presented approach provides a way of finding Lapunov's exponents analytically. Moreover, it gives an alternative explanation of the onset of chaos, namely as parametric excitations of curvature along geodesics. The framework of the approach is the Riemannian geometry formalism. The main tool of this technique is the so-called Jacobi-Levi-Civita equation (JLC), which governs the evolution of the geometric spread along a given geodesic. The system under consideration is a chain of nonlinearly coupled oscillators with pendulum. The pendulum makes the corresponding metric tensor nondiagonal and coordinate-dependent. As a result, we show that the obtained geometric exponents are in a good agreement with the Lapunov ones obtained in a classical way.