FSM2S_11241

XXI International Congress of Theoretical and Applied Mechanics
Warsaw, Poland, August 15–21, 2004

Chaotic Attractors with Long Regular Sequences

Ugo Galvanetto

Department of Aeronautics, Imperial College London, London, UK

Dissipative dynamical systems are characterised by chaotic attractors, which exhibit sensitive dependence on initial conditions. The chaotic nature of an attractor can be established by examining the divergence of neighbouring orbits, usually quantified by the computation of Lyapunov exponents. The Lyapunov exponents, li, of an orbit measure the average long-term rate of divergence of all adjacent trajectories and are defined as the limit, as time goes to infinity, of li =(1/t)ln(dt/d0), where t is time, dt the separation between the orbits at time t and d0 the initial separation. The trajectory will visit all regions of the chaotic attractor and different regions will in general be characterised by different rates of divergence. This paper will present examples of chaotic motions in non-smooth mechanical systems affected by dry friction, in which the existence of zones of the attractor with different rates of divergence assumes unusually extreme characteristics. The mechanical system generates one-dimensional maps the orbits of which exhibit sensitive dependence on initial conditions only in an extremely small set of their field of definition. The Lyapunov exponent of the map will be computed to characterise the nature of the steady state motions.

View the extended summary