

Homoclinic structure of chaotic attractors

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The famous homoclinic structure of H. Poincaré initiated the fundamental investigations of the complex dynamical systems by G. Birkhoff, M.L. Cartwright, J.E. Littlewood, N. Levinson, S. Smale, and their followers. The results obtained proved to be universal and applicable as effective instruments of analysis.

We investigate the structure of the bounded solutions set of a special initial value problem, which initial moments of time are from a Cantor set. The set is an attractor and has chaotic properties. Particularly, we prove that there exist infinitely many periodic solutions. It is natural to expect that the attractor is a hyperbolic set, and there are homoclinic and heteroclinic points exist. We analyze the problem applying the functional approach. The method for differential equations with relay and for impulsive systems is realized. It deserves consideration as it may allow for a more rigorous treatment of the phenomenon, and help develop new methods of chaos investigation. Simulations of new chaotic attractors will be demonstrated.

Theoretical extensions as well as application possibilities will be discussed.