Vasiliy Ye. Belozyorov

A Novel Search Method of Chaotic Autonomous Quadratic Dynamical Systems without Equilibrium Points

Abstract

A wide class of autonomous real quadratic dynamic system without real (but with two complex conjugate or even imaginary) equilibrium points is considered. For any system of this class, a new idea of the uniquely definite degenerate autonomous real quadratic dynamic system having exactly one real double equilibrium point (there are no complex equilibrium points) is introduced. It is shown that if the degenerate system demonstrates the chaotic behavior, then for the original (not degenerate) system, a similar chaotic behavior also takes place. The idea of the degenerate system for researches of the real quadratic systems, for which number of complex conjugate equilibrium points more than two, is also used. The same idea can be adapted to research of any autonomous real quadratic system having at least one pair complex conjugate equilibrium points. An attempt to apply some derived results to a search problem of hidden chaotic attractors was undertaken. Examples are given.

Keywords: dynamical system without equilibriums, limit cycle, projection on subspace, degenerate system, 1D discrete map, chaotic attractor, double saddle focus.