Bifurcation Analysis and Dynamics of a Lorenz-type Dynamical System

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Abstract

In this paper we consider a continuous Lorenz-type dynamical system. Dynamical behaviors of this system such as computing equilibrium points, different bifurcation curves and computation of normal form coefficient of each bifurcation point analytically and numerically. In particular we derive sufficient conditions for existence of Hopf and Pitchfork bifurcations and determine criticality of these bifurcations. By means of numerical simulations, we show that the system may have chaotic behavior under some conditions. By employing numerical continuation method, we first compute bifurcation curves and then compute all codimension 1 and 2 bifurcation along these curves with determining of the corresponding normal form coefficient.

Keywords: T- system, Hopf bifurcation, Pitchfork bifurcation, Normal form, First Lyapunove coefficient

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