



Global Chaos Control of the Generalized Lotka-Volterra Three-Species System via Integral Sliding Mode Control

Sundarapandian Vaidyanathan

R & D Centre, Vel Tech University, Avadi, Chennai, Tamil Nadu, India

Abstract: Since the recent research has shown the importance of biological control in many biological systems appearing in nature, this research paper investigates research in the dynamic and chaotic analysis of the generalized Lotka-Volterra three-species biological system, which was studied by Samardzija and Greller (1988). The generalized Lotka-Volterra biological system consists of two predator and one prey populations. This paper depicts the phase portraits of the 3-D generalized Lotka-Volterra system when the system undergoes chaotic behaviour. Next, this paper derives biological control law via integral sliding mode control (ISMC) for achieving output regulation of the states of the generalized Lotka-Volterra three-species biological system so as to track constant reference signals (set-point controls). All the main results are proved using Lyapunov stability theory. Also, numerical simulations have been shown using MATLAB to illustrate all the main results for the three-species generalized Lotka-Volterra biological system and its output regulation.

Keywords: Chaos, chaotic systems, output regulation, biology, biological system, Lotka-Volterra system, etc.

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