A new hyper-chaotic system and its synchronization

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Abstract

This paper presents a new hyper-chaotic system obtained by adding a nonlinear controller to the third equation of the three-dimensional autonomous Chen–Lee chaotic system. Computer simulations demonstrated the hyper-chaotic dynamic behaviors of the system. Numerical results revealed that the new hyper-chaotic system possesses two positive exponents. It was also found that the structure of the hyper-chaotic attractors is more complex than those of the Chen–Lee chaotic system. Furthermore, the hybrid projective synchronization (HPS) of the new hyper-chaotic systems was studied using a nonlinear feedback control. The nonlinear controller was designed according to Lyapunov' direct method to guarantee HPS, which includes synchronization, anti-synchronization, and projective synchronization. Numerical examples are presented in order to illustrate HPS.