A new hyper-chaoic system and hyper-chaotic synchronization

陳俊宏,許隆結,陳獻庚,趙亦琦,林于凱
Mechanical Engineering
Engineering
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Abstract

a b s t r a c t
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’s direct
method to guarantee HPS, which includes synchronization, anti-synchronization, and
projective synchronization. Numerical examples are presented in order to illustrate HPS.

Keyword：Chen–Lee system
Hyper-chaos
Hybrid
projective synchronization