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Theoretic and Numerical Study of a New Chaotic System

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ABSTRACT
This paper introduced a new three-dimensional continuous quadratic autonomous chaotic system, modified from the Lorenz system, in which each equation contains a single quadratic cross-product term, which is different from the Lorenz system and other existing systems. Basic properties of the new system are analyzed by means of Lyapunov exponent spectrum, Poincaré mapping, fractal dimension, power spectrum and chaotic behaviors. Furthermore, the forming mechanism of its compound structure obtained by merging together two simple attractors after performing one mirror operation has been investigated by detailed numerical as well as theoretical analysis. Analysis results show that this system has complex dynamics with some interesting characteristics.

KEYWORDS
Chaotic System, Lyapunov Exponent, Poincaré Mapping, Fractal Dimension, Power Spectrum

Cite this paper

References
[1]   C. Sparrow, " The Lorenz equations: Bifurcations chaos and strange attractors," Springer, New York, 1982.

[2]   G. R. Chen and T. Ueta, " Yet another chaotic attractor," International Journal of Bifurcation and Chaos, Vol. 9, No. 7, pp. 1465– 1466, 1999.

[3]   J. H. Lü and G. R. Chen, " A new chaotic attractor coined," International journal of bifurcation and chaos, Vol. 12, No. 3, pp. 659– 661, 2002.

[4]   J. H. Lü, G. R. Chen, D. Cheng, and S. Celikovsky, " Bridge the gap between the Lorenz system and the Chen system," International Journal of Bifurcation and Chaos, Vol. 12, No. 12, pp. 2917– 2926, 2002.

[5]   G. Qi, G. R. Chen, and S. Du, " Analysis of a new chaotic system," Physica A, Vol. 352, No. 2– 4, pp. 295– 308, 2005.

[6]   C. X. Liu, L. Liu, and T. Liu, " A new butterfly-shaped attractor of Lorenz-like system," Chaos, Solitons & Fractals, Vol. 28, No. 5, pp. 1196– 1203, 2006.

[7]   X. Wang, " Chaos control," Springer, New York, 2003.

[8]   J. H. Lü, G. R.Chen, and S. Zhang, " Dynamical analysis of a new chaotic attractor," International Journal of Bifurcation and Chaos, Vol. 12, No. 5, pp. 1001– 1015, 2002.

[9]   A. Wolf, J. B. Swift, H. L. Swinney, and J. A. Vastano, " Determining Lyapunov exponents from a time series," Physica D, Vol. 16, No. 3, pp. 285– 317, 1985.

[10]   C. X. Liu, L. Liu, and K. Liu, " A new chaotic attractor," Chaos, Solitons & Fractals, Vol. 22, No. 5, pp.