Specific type of chaotic attractors with additional zero Lyapunov exponent in spectrum in flows

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Chaos is a typical attribute of nonlinear dynamical systems in various fields of science and technology [1-2]. One of the conventional indicator of chaotic dynamics is the largest Lyapunov exponent. Chaos is implemented in a situation when the spectrum of Lyapunov exponents have one positive, one zero and at least one negative exponents for a flow. In this work, we consider a somewhat different situation, when the spectrum of Lyapunov exponents of chaotic attractor contains an additional zero Lyapunov exponent, it means it includes one positive, two zero and several negative exponents [3].

As part of the work, examples of flow systems will be presented in which this type of chaotic dynamics is observed: modified Anishchenko-Astakhov generator, non-autonomous Rössler system, and coupled generators of quasi-periodic oscillations. A universal scenario such chaotic attractors occurrence associated with torus-doubling bifurcations and homoclinc bifurcation of unstable torus will be discussed.

References

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