

Emergence of the third type of chaos in a system of adaptively coupled Kuramoto oscillators

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Abstract: The report is devoted to the phenomenon of mixed dynamics, which is considered the third type of chaos, in a system of adaptively coupled Kuramoto oscillators. Mixed dynamics is characterized by the fundamental inseparability of conservative and dissipative behavior and in this case a chaotic attractor intersects with a chaotic repeller. The system under consideration is the first irreversible system with a new type of chaos. Mixed dynamics is present in the system when there is a small detuning of the natural frequencies of the phase oscillators or when one of the oscillators is forced by a harmonic external force of small amplitude. The properties of a reversible core, the set along which the chaotic attractor and the chaotic repeller intersect, were studied. In the nonautonomous case of mixed dynamics, the question of chaotic forced synchronization of the oscillations was considered. It was shown that mixed dynamics “prevents” forced synchronization of the oscillations. The influence of an external force on the properties of a reversible core formed due to a nonzero detuning of the natural frequencies of the oscillators was considered. The result can be interpreted as the phenomenon of forced synchronization of the reversible core by an external force.

Keywords: mixed dynamics, chaos, synchronization, fractal dimension