Cycles in integrable and chaotic fractional systems

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Abstract

The behavior of regular discrete nonlinear systems is defined by their periodic points. In the case of integrable systems, periodic points define asymptotic solutions, and in the case of chaotic systems, periodic points define the skeleton of fractional attractors. Fractional systems do not have periodic points except for the fixed points, but they have asymptotically periodic sinks. We derived the equations which define periodic sinks of a general class of systems defined as convolutions. All known fractional systems belong to this class. The derived equations open a prospect for the future investigation of the general properties of fractional systems which will include a description of asymptotic behavior, chaos, and the period-doubling route to chaos.

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