Sayed, Wafaa S.; Radwan, Ahmed G.; Fahmy, Hossam A. H.
Design of positive, negative, and alternating sign generalized logistic maps. (English)
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Summary: The discrete logistic map is one of the most famous discrete chaotic maps which has widely spread applications. This paper investigates a set of four generalized logistic maps where the conventional map is a special case. The proposed maps have extra degrees of freedom which provide different chaotic characteristics and increase the design flexibility required for many applications such as quantitative financial modeling. Based on the maximum chaotic range of the output, the proposed maps can be classified as positive logistic map, mostly positive logistic map, negative logistic map, and mostly negative logistic map. Mathematical analysis for each generalized map includes bifurcation diagrams relative to all parameters, effective range of parameters, first bifurcation point, and the maximum Lyapunov exponent (MLE). Independent, vertical, and horizontal scales of the bifurcation diagram are discussed for each generalized map as well as a new bifurcation diagram related to one of the added parameters. A systematic procedure to design two-constraint logistic map is discussed and validated through four different examples.

MSC:
39A12 Discrete version of topics in analysis
37D45 Strange attractors, chaotic dynamics of systems with hyperbolic behavior

Full Text: DOI

References:
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