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Nonlinear Sciences > Chaotic Dynamics

Differential Equations with Fractional Derivative and Universal Map with Memory

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(Submitted on 21 Jul 2011)

Discrete maps with long-term memory are obtained from nonlinear differential equations with Riemann-Liouville and Caputo fractional derivatives. These maps are generalizations of the well-known universal map. The memory means that their present state is determined by all past states with special forms of weights. To obtain discrete map from fractional differential equations, we use the equivalence of the Cauchy-type problems and to the nonlinear Volterra integral equations of second kind. General forms of the universal maps with memory, which take into account general initial conditions, for the cases of the Riemann-Liouville and Caputo fractional derivatives, are suggested.

Comments:	21 pages, LaTeX
Subjects:	**Chaotic Dynamics (nlin.CD)**; Mathematical Physics (math-ph)
Journal reference:	Journal of Physics A 42 (2009) 465102
Cite as:	**arXiv:1107.4205 [nlin.CD]**
	(or **arXiv:1107.4205v1 [nlin.CD]** for this version)

Submission history

From: Vasily E. Tarasov [view email]
[v1] Thu, 21 Jul 2011 09:06:41 GMT (11kb)

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