



On Construction and a Class of Non-Volterra Cubic Stochastic Operators

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Abstract: We give a construction of a cubic stochastic operator (CSO) on a finite dimensional simplex. This construction depends on a probability measure μ which is given on a fixed finite graph G . Using the construction of CSO for μ defined as product of measures given on components of G a wide class of non-Volterra CSOs is described. It is shown that the non-Volterra operators can be reduced to N number (where N is the number of components) of Volterra CSOs defined on the components. By such a reduction we describe behavior of trajectories of a non-Volterra CSO defined on the three dimensional simplex.

Keywords: *simplex; graph; cubic stochastic operator; Volterra cubic operator.*

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1 Introduction

There are many systems which are described by nonlinear operators. One of the simplest nonlinear case is quadratic operator (for a recent review on the theory of quadratic stochastic operators see [5]). Quadratic dynamical systems have been proved to be a rich source of analysis for the investigation of dynamical properties and modeling in different domains, such as population dynamics [1, 6], physics [11], economy [2], mathematics [10]. In modern scientific investigations non-linear operators of higher order arise. In particular, a cubic stochastic operator (CSO) can be obtained in gene engineering and free population with a ternary production. To study non-linear dynamical systems a method of Lyapunov functions is used (see [5, 9]).

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