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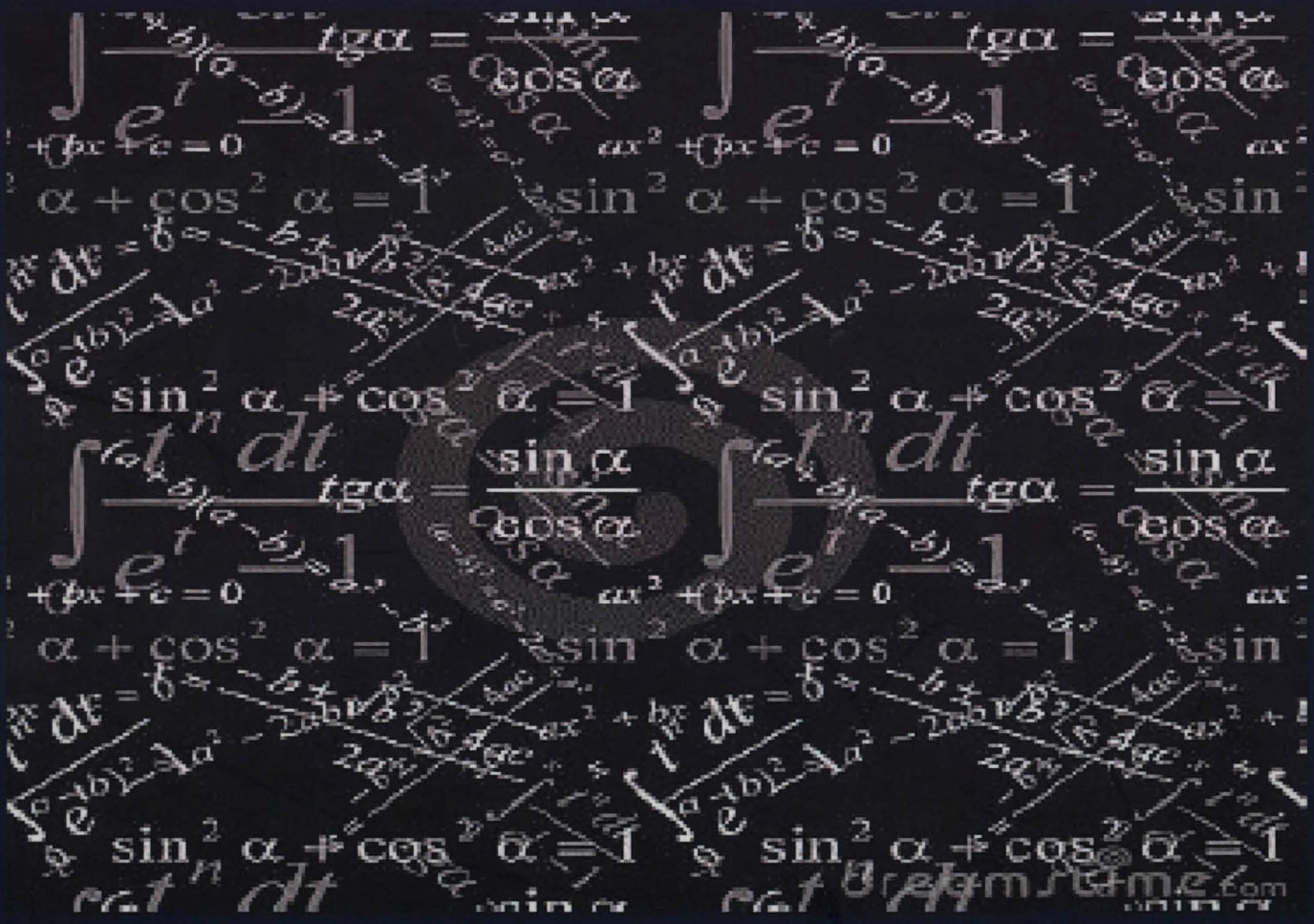

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Contents

Part I. Quadratic Operators and Their Dynamics

Part II. Dynamical Systems Arising From Physical Models

DYNAMICS OF ξ^s-QUADRATIC STOCHASTIC OPERATORS IN 2D-SIMPLEX

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Abstract

Based on our previous investigations we have six non-isomorphic classes of such operators. In this paper we investigate the behaviour of each operator from three classes and prove convergence of trajectories of these classes and study their certain properties. We showed trajectories of two classes converge to the equilibrium. For the third class, it is established only the negative trajectories converge to the equilibrium.

Keywords: *Quadratic stochastic operator; trajectory; dynamics*

Introduction

It is known that there are many systems which are described by nonlinear operators. One of the simplest nonlinear cases is quadratic one. Quadratic dynamical systems have been proved to be a rich source of analysis for the investigation of dynamical properties and modeling in different domains. One of such operators is quadratic stochastic operator which naturally arises in modeling of a population dynamics [1]. During many years this theory has developed and since then it has appeared in lots of papers [2-5]. In recent years it has again become of interest in connection with numerous applications to many branches of mathematics, biology and physics. One of the central problems of this theory is to study the limiting behavior of trajectories of such operators [6-9].

Recall that an evolutionary operator of a free population is a (quadratic) mapping of the simplex

$$S^{m-1}=\left\{x=(x_1,\cdots,x_m)\in\mathbb{R}^m : \sum_{i=1}^{m} x_i=1,\ x_i\geq 0,\ \forall i=\overline{1,m}\right\} \qquad (1)$$

into itself of the form

$$V: x'_k = \sum_{i=1}^{m} P_{ij,k}x_i x_j, k=1,2,\ldots,m \qquad (2)$$

where $P_{ij,k}$ are coefficient of heredity and