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REGULARITY OF POLYNOMIAL STOCHASTIC OPERATORS CORRESPONDING TO GRAPHS

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Abstract. In the present paper, we consider polynomial stochastic operators corresponding to graphs. We prove that independently on values of parameters and on initial point all trajectories converge, that is such operators have the property being regular.

Keywords. quadratic stochastic operator, polynomial stochastic operator, Cayley tree, regular operator, trajectory.

AMS (MOS) subject classification: Primary 37N25, Secondary 92D10.

1 Introduction

The notion of quadratic stochastic operator was first formulated by Bernshtein [1]. Several problems of physical and biological systems lead to necessity of study the asymptotic behavior of the trajectories and ergodic properties of quadratic stochastic operators (see e.g. [3, 4, 5, 8, 9, 17, 19, 20]). The QSOs were originally introduced as evolutionary operators describing the dynamics of gene frequencies for given laws of heredity in mathematical population genetics (see e.g. [9]), they are also interesting from a purely mathematical point of view.

We introduce infinite dimensional polynomial operators corresponding to graphs, and study their trajectories with respect to l_1-norm and pointwise convergence. For motivations of investigations of infinite dimensional operators and study site see [10, 11, 12] and references therein.

First following [13] we recall some properties of point-wise convergence in the space l_1. Let l_1 be the space of all absolutely summable sequences with the norm

$$\|\mathbf{x}\| = \sum_{k=1}^{\infty} |x_k|.$$

For a given $r > 0$ we denote

$$B_r^+ = \{\mathbf{x} \in l_1 : x_k \geq 0 \ \text{ for all } \ k \in N, \ \ \|\mathbf{x}\| \leq r\} \quad \text{and}$$