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INFINITE-DIMENSIONAL LYAPUNOV VECTOR FUNCTION AND STABILITY OF FIXED POINTS OF DISCRETE DYNAMICAL SYSTEMS IN SPACE conv $\mathbb{R}^n$

I.V. Atamas'[1] and V.I. Slyn'ko[2]

[1] Department of Algebra and Mathematical Analysis
Bohdan Khmelnytsky National University of Cherkasy, Cherkasy, Ukraine

[2] Department of Processes Stability
S.P. Timoshenko Institute of Mechanics of NAS of Ukraine, Kiev, Ukraine

Abstract. The stability of fixed points of the discrete dynamical systems in space conv $\mathbb{R}^n$ is investigated. A construction of the Lyapunov vector function with a countable number of components is proposed. Using the theorems on the embedding the space conv $\mathbb{R}^n$ into the Banach space $C(S^{n-1})$ and some results of the geometry of convex bodies, established in the papers of A.D. Aleksandrov, a difference equation in variations in the space $C(S^{n-1})$ is constructed. An example of the stability study of a discrete dynamical system in the space conv $\mathbb{R}^n$ is given.

Keywords. Lyapunov vector function, fixed point, discrete dynamical system, stability, mixed volume.

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1 Introduction

Method of Lyapunov vector functions [5, 7] is one of the most effective method for studying the stability of motion of complex dynamical systems. The set-valued dynamical systems, in particular, the differential equation with Hukuhara derivative (set differential equations) have been investigated in many papers, among which we note the monograph [6]. This monograph presents the results of the general theory of set differential equations (SDEs) and theorems of the direct Lyapunov method and comparison method. In monograph [13], relationship of solutions of SDEs with the solution of differential inclusions has been shown. We also note the role of dynamical systems in space conv $\mathbb{R}^n$ for the theory of controlled systems, since the evolution of attainability sets of linear controlled systems (integral funnels) is described by this class of dynamical systems (see [3]).

The aim of this work is to develop a method of Lyapunov vector functions with regard to the stability problem of fixed points of discrete dynamical