

PROPERTIES OF SOLUTIONS OF PERIODIC SWITCHED SYSTEMS

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Abstract. An important class of hybrid systems, called switched systems, in which the continuous process is regulated by discrete control between different subsystems, is considered. The concept of a T -periodic switched system is given. It is shown that a necessary and sufficient condition for the existence of a T -periodic solution of a T -periodic linear nonhomogeneous switched system is the existence of a bounded solution of such a system. Sufficient conditions for the existence of a T -periodic solution of a linear homogeneous T -periodic switched system are obtained. The orthogonality conditions of the fundamental matrix of a linear homogeneous T -periodic system are studied. In the case when the switched system (generally nonlinear) has a periodic solution, an estimate of the value of its period is obtained.

Keywords. switched systems; the existence of a periodic solution; periods of periodic solutions; fundamental matrix.

AMS (MOS) subject classification: 34C25; 34A34.

1 Introduction

Switched systems are an important class of dynamical systems widely used for modeling various interactions between subjects. By a switched system, we mean a family of continuous in time dynamical systems and a rule that determines at each time which dynamical system is responsible of the time evolution. Such systems have been of great interest for many years. Discretely controlled continuous systems represent an important class of hybrid systems in which the continuous process is regulated by discrete control [13, 21]. Many systems encountered in real life demonstrate switching between several subsystems [11, 14]. At the same time, the switching itself depends on various environmental factors. Examples of such systems can be found in [13, 23, 17, 2]. The study of switched systems is one of the actual problems of control theory. A switched system is a hybrid dynamic system consisting of a family of subsystems and a switching law that determines at each moment of time which of the subsystems is active. Systems of this kind are used in the modeling of mechanical, energy and technological processes.