Hopfield-type neural networks systems with piecewise constant argument

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Abstract. In this paper we consider Hopfield-type neural networks systems with piecewise constant argument of generalized type. Sufficient conditions for the existence of a unique equilibrium and a periodic solution are obtained. The stability of these solutions is investigated.

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1. Introduction and preliminaries

In recent years, dynamics of delayed neural networks have been studied and developed by many authors and many applications have been found in different areas such as associative memory, image processing, signal processing, pattern recognition and optimization (see [5, 7, 9, 10] and references cited therein). As is well known, such applications depend on the existence of an equilibrium point and its stability.

Differential equations with piecewise constant argument combine the properties of both the differential and difference equations. They play an important role in applications, see, for example, [11, 13]. Investigation of differential equations with piecewise constant arguments of delay and advanced type had been initiated in [6, 12], where the method of research was based on the reduction to discrete equations. Hence, qualitative properties of solutions which start at non-integer values can not be achieved. Particularly, one can not investigate the problem of stability completely, since only elements of a countable set are allowed to be discussed for initial moments. By introducing arbitrary piecewise constant functions as arguments, which can be interpreted...