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Stability Analysis of Impulsive Hopfield-Type Neuron System on Time Scale

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Abstract: Impulsive Hopfield-type neural systems on time scale are investigated. Sufficient conditions for the existence and uniqueness of the equilibrium state are obtained. Based on the generalized Lyapunov function method the sufficient conditions of global exponential stability are established for the neuron system under investigation. Efficiency of the obtained sufficient conditions is illustrated by a numerical example.

Keywords: *stability; time scale; Hopfield neural networks; impulsive system; exponential stability; Lyapunov function.*

Mathematics Subject Classification (2010): 92B20, 93D05, 93D30, 34K45, 34N05.

1 Introduction

Hopfield neural networks and their generalizations are important models of biological processes that are widely used now for solution of the applied problems in different areas of the modern technologies such as the optoelectronics, image reconstruction, speech synthesis, computer vision [1]– [6], and in the solution of different optimization problems, see also [7, 8].

Neural networks with impulses, both continuous and discrete ones, are widely used in the modeling of artificial intelligence, in robotics and electronics, and are intensively studied lately [9]– [13], with the most results obtained for neural networks with continuous time. Therefore, it makes sense to consider impulsive neural systems on time scale, which allows a simultaneous description of the system dynamics both in the discrete and the

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