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PERIODIC SOLUTIONS AND GLOBAL STABILITY OF DELAY COHEN-GROSSBERG SYSTEMS

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Abstract. In this paper, the problems of the existence and stability of periodic solution of Cohen-Grossberg neural networks with multiple delays are investigated, and several new sufficient conditions are established to ensure the existence and the global stability of the periodic solution. For the networks with constant input, a unique equilibrium point exists and all other solutions of the network converge to it under the same conditions. Our results are less restrictive than previously known criteria and easy to check in the design. Two examples are given to demonstrate the validity of our results.
Keywords. Cohen-Grossberg systems, Periodic solutions, Stability, Delay.
AMS (MOS) subject classification: 93B20, 34K13, 34K20.

1 Introduction

The existence of periodic solutions of neural networks is an interesting dynamic behavior. It has been found applications in learning theory [1], which is motivated by the fact that most learning systems need repetition. Many criteria for testing the existence and stability of periodic solutions of Hopfield neural networks with constant delays and without delays have been derived (see, e.g., [11,12,13]). Cohen-Grossberg neural networks are more common in practice than Hopfield neural networks. To the best of our knowledge, few authors have considered the periodic solution for Cohen-Grossberg neural network [3,4,5]. Therefore, techniques and methods for the existence and stability of periodic solutions of Cohen-Grossberg neural network should be developed and explored. Based on the obtained method [8,9], we shall give sufficient conditions for the existence and stability of periodic solutions of Cohen-Grossberg neural network with constant transmission delays. For the constant input, we prove that there exists a unique global stable equilibrium point of the networks without the boundedness of nonlinear activation functions [2]. Our results generalize the results in the references [8,11,12,13,14].