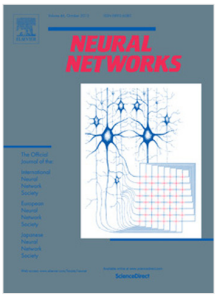
Accepted Manuscript



Bipartite synchronization in coupled delayed neural networks under pinning control

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PII: S0893-6080(18)30235-1
DOI: https://doi.org/10.1016/j.neunet.2018.08.009
Reference: NN 4013

To appear in: *Neural Networks*

Received date : 30 April 2018
Revised date : 2 August 2018
Accepted date : 7 August 2018

Please cite this article as: Liu, F., Song, Q., Wen, G., Cao, J., Yang, X., Bipartite synchronization in coupled delayed neural networks under pinning control. *Neural Networks* (2018), https://doi.org/10.1016/j.neunet.2018.08.009

Highlights of the paper

The traditional synchronization problem for coupled delayed neural networks has been investigated under the common assumption that network interactions are described by *unsigned graphs*, where all the edges are positive. To the best of our knowledge, the bipartite synchronization of coupled delayed neural networks with *a signed graph topology*, which contains negative edges, has rarely been considered up to present.

In this paper, we study the bipartite synchronization in a network of delayed neural networks under a signed graph topology, which consists of both positive and negative edges, based on the pinning control approach. The main novelties of this paper can be highlighted as follows.

1) A distributed pinning control algorithm is proposed to achieve bipartite leader-following synchronization in a network of delayed neural networks under signed graph topology. Some remarks are provided to discuss how to effectively select the pinned nodes for the signed network.

2) Under some assumptions on the interaction graph and node dynamics, by developing some tools from M-matrix theory and stability of delayed systems, some novel criteria in terms of low-dimensional linear matrix inequalities (LMIs) are derived to reach bipartite leader-following synchronization in the network when the node delay is differentiable and bounded. Furthermore, a simple algebraic condition is given to estimate an upper bound for the node delay.

3) When the node delay is only bounded but may not be differentiable, some bipartite synchronization conditions are established based on the descriptor method and the reciprocally convex approach. Hence, the results of this paper also improve some existing results for the synchronization of coupled delayed neural networks with unsigned graphs where the node-delay is usually assumed to be differentiable or a constant.