



Reconstructing directed networks for better synchronization

An Zeng, Linyuan Lü, Tao Zhou

(Submitted on 29 Jun 2011)

In this paper, we studied the strategies to enhance synchronization on directed networks by manipulating a fixed number of links. We proposed a centrality-based reconstructing (CBR) method, where the node centrality is measured by the well-known PageRank algorithm. Extensive numerical simulation on many modeled networks demonstrated that the CBR method is more effective in facilitating synchronization than the degree-based reconstructing method and random reconstructing method for adding or removing links. The reason is that CBR method can effectively narrow the incoming degree distribution and reinforce the hierarchical structure of the network. Furthermore, we apply the CBR method to links rewiring procedure where at each step one link is removed and one new link is added. The CBR method helps to decide which links should be removed or added. After several steps, the resulted networks are very close to the optimal structure from the evolutionary optimization algorithm. The numerical simulations on the Kuramoto model further demonstrate that our method has advantage in shortening the convergence time to synchronization on directed networks.

Comments: 7 pages, 5 figures

Subjects: **Physics and Society (physics.soc-ph)**; Data Structures and Algorithms (cs.DS); Chaotic Dynamics (nlin.CD)

Journal reference: New J. Phys. 14, 083006 (2012)

DOI: [10.1088/1367-2630/14/8/083006](https://doi.org/10.1088/1367-2630/14/8/083006)

Cite as: [arXiv:1106.5906](https://arxiv.org/abs/1106.5906) [physics.soc-ph]

(or [arXiv:1106.5906v1](https://arxiv.org/abs/1106.5906v1) [physics.soc-ph] for this version)

Submission history

From: An Zeng [[view email](#)]

[v1] Wed, 29 Jun 2011 11:20:34 GMT (433kb)

[Which authors of this paper are endorsers?](#)

Link back to: [arXiv](#), [form interface](#), [contact](#).

Download:

- [PDF](#)
- [PostScript](#)
- [Other formats](#)

Current browse context:

physics.soc-ph

[< prev](#) | [next >](#)

[new](#) | [recent](#) | [1106](#)

Change to browse by:

[cs](#)

[cs.DS](#)

[nlin](#)

[nlin.CD](#)

[physics](#)

References & Citations

- [NASA ADS](#)

Bookmark([what is this?](#))

