Flow-based Community Detection in Hypergraphs

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(Dated: May 21, 2021)

To connect structure, dynamics and function in systems with multibody interactions, network scientists model random walks on hypergraphs and identify communities that confine the walks for a long time. The two flow-based community-detection methods Markov stability and the map equation identify such communities based on different principles and search algorithms. But how similar are the resulting communities? We explain both methods' machinery applied to hypergraphs and compare them on synthetic and real-world hypergraphs using various hyperedge-size biased random walks and time scales. We find that the map equation is more sensitive to time-scale changes and that Markov stability is more sensitive to hyperedge-size biases.

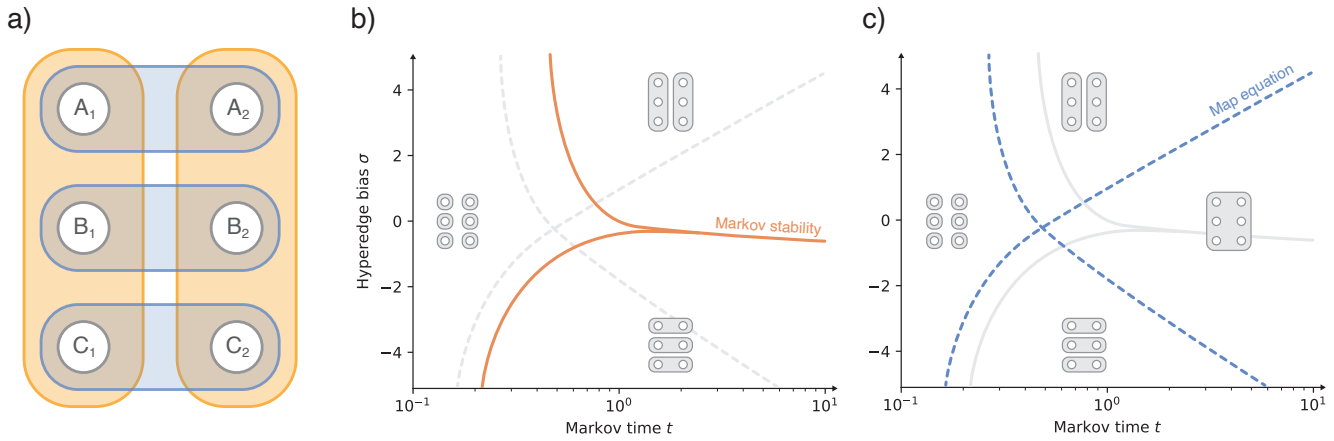

Fig. 1. A schematic hypergraph in (a) with optimal solutions for different hyperedge biases and Markov times (b-c). (b) The objective function Markov stability has three solutions. (c) For large Markov times, the map equation's regularising effect results in the trivial solution, with all nodes in one community.

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