

ABSTRACT

In this paper, we explore the application of a novel definition of information flow in network dynamical system. The proposed definition of information flow is used for understanding the conformation change in network dynamical systems. Information transfer between network components is used to determine relative contributions of various subsystems in the network to the collective or the emergent dynamics of the network. These relative contributions of information flow from individual subsystems to network collective dynamics allows us to determine which subsystem is most influential for the emergent dynamics of the network. Identification of such influential subsystem can be used to take appropriate local control action at the subsystem level for enhancing or suppressing the network collective dynamics. We provide both model-based and data-driven approaches involving operator theoretic methods for the identification of influential subsystem in the complex network.

The case studies in the IEEE 39-bus power system and I-80 transportation data, presented the potential applications of information transfer in predicting global instability phenomenon and identifying the dominant mode of traffic pattern. The future works focus on the nonlinear system and large scale data for the further application of information transfer.