

OSCILLATING SYSTEMS WITH COINTEGRATED PHASE PROCESSES

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I will present cointegration analysis [1, 2] as a method to infer the network structure of a linearly phase coupled oscillating system. By defining a class of oscillating systems with interacting phases, a data generating process is derived with a specified coupling structure of the network that resembles biological processes. In particular we study a network of Winfree oscillators [3], for which we present a statistical analysis of various simulated networks, where we conclude on the coupling structure: the direction of feedback in the phase processes and proportional coupling strength between individual components of the system. We show that we can correctly classify the network structure for such a system by cointegration analysis, for various types of coupling, including uni-/bi-directional and all-to-all coupling. I will also touch upon how to deal with high-dimensional systems. Finally, we analyze a set of EEG recordings and discuss the current applicability of cointegration analysis in the field of neuroscience. The talk is based on the papers [4, 5].

References

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