A preprocessing method of time series signals for the transfer entropy using the classical multi-dimensional scaling

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Real-world systems, including neural networks, can be described as coupled dynamical systems, which sometimes exhibit complex behavior due to the interactions between elements of which the system comprises. Thus, estimating network structure is a fundamental research issue. The transfer entropy (TE) is one method for estimating connections among elements only from state time series observed from the elements.In this study, focusing on the TE, we propose a pre-processing method of time series data to improve the estimation accuracy of connections by the TE, even when the time series length is insufficient to estimate connections by the TE. Using the classical multidimensional scaling (CMDS), we change the basis of two observed time series data simultaneously while preserving the inter-point distances of the time series data. Then, we extract a common basis of these time series data to capture common features of the time series data, show that the estimation accuracy of connections and can be improved by our method.

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