

Singular Spectral Analysis (SSA) and its application in Time Series Analysis

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Abstract

Singular spectrum analysis (SSA) is a powerful technique having the concept of 'separability'. The main aim of SSA is to decompose the original time series into a sum of number of additive components which can further be interpreted as a slowly varying trend, oscillatory components, and a structure less noise. The SSA algorithm provides understanding about unknown or partially known dynamics of the underlying system that generated the series by extracting information from short and noisy time series. It is a preferred choice for analyzing geophysical data for principal component identification, frequency filtering, noise suppression and data gap filling. The usage of data adaptive basis functions enables the selfsimilarity, a characteristic feature of many geophysical data sets, in denoising and data gap filling. The possible application areas of SSA are diverse: from mathematics and physics to economics and financial mathematics. Other areas may include meteorology and oceanology to social sciences, market research and medicine. SSA is a very useful tool which can be used for solving the different problems: finding trends of different resolution; smoothing; extraction of seasonality components; simultaneous extraction of cycles with small and large periods; extraction of periodicities with varying amplitudes; simultaneous extraction of complex trends and periodicities; finding structure in short time series. As it involves the eigen analysis for noise identification, it is considered as robust de-noising technique in Time series analysis.