



Nonlinear AR Modeling Using Second Order Volterra Filters

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Abstract

A non-linear autoregressive (AR) model for prediction of seismic data is presented. The method utilizes second order Volterra (SOV) series. The main objective of this paper is to study the feasibility of carrying out prediction error filtering using non-linear AR models. These models are implemented via Volterra series.

Although linear filter theory has an important place in many applications of signal and image processing, the use of linear filters does not often provide solutions for physical time series arising from non-linear phenomena. Our non-linear AR filtering scheme is constructed via Volterra series. In this case the prediction error filter is a combination of both linear and nonlinear (quadratic) terms of past samples of the signal. The nonlinearity can be obtained by cross products of the input signal. These properties of Volterra series make them unique to reconstruct nonlinear signals that arise in geophysical signal processing.

In particular, we investigate the possibility of using non-linear filtering for prediction error filtering of time-variant seismic signals and for FX noise reduction of seismic records.