Nonlinear dynamic system identification using Volterra series: Multi-objective optimization approach

Abstract:

In this paper, system identification of the non-linear dynamic system based on optimized Volterra model structure is considered. Model structure selection is an important step in system identification, which involves the selection of variables and terms of a model. The important issue is choosing a compact model representation where only significant terms are selected among all the possible ones beside good performance. An automated algorithm based on multi-objective optimization is proposed. The developed model should fulfil two criteria or objectives namely good predictive accuracy and optimum model structure. Genetic algorithm is applied to search the significant Volterra kernels among all possible candidate model combinations. The result shows that the proposed algorithm is able to correctly identify the simulated examples and adequately model the nonlinear discrete dynamic system.