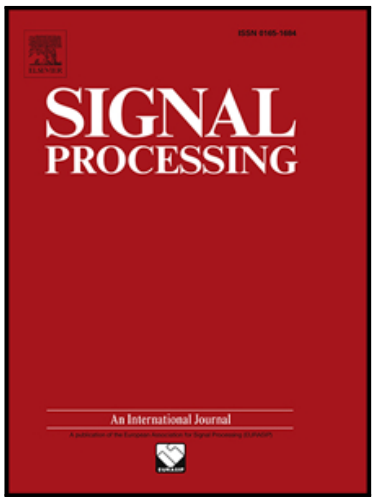

Modelling of multiple-input, time-varying systems with recursively estimated basis expansions

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HIGHLIGHTS

- We present novel computational schemes for estimating single- and multiple-input time varying (TV) systems, combining a Laguerre-Volterra model formulation with improved recursive schemes based on conventional Recursive Least Squares (RLS) and Kalman Filtering (KF).
- The proposed recursive estimators achieve superior performance, particularly in the case of TV systems with multiple-inputs or systems that exhibit mixed-mode variations.
- Model order selection and tuning of the estimator hyperparameters were implemented using Genetic Algorithms (GA), significantly improving performance and reducing computation time.
- We investigate rigorously, for the first time to our knowledge, the relationship between the hyperparameter values of the recursive estimators, the model order complexity and the TV characteristics of the true underlying system.
- We evaluate the performance of the proposed algorithms using simulations and we apply the proposed methodology to experimental data in order to detect changes in dynamic Cerebral Autoregulation (dCA) in patients suffering from Vasovagal Syncope (VVS) during a Head-Up Tilt (HUT) protocol. The main question that we address is whether loss of consciousness during HUT testing is an aftereffect of impaired dCA function.