Simultaneous computation of model order and parameter estimation for system identification based on opposition-based simulated Kalman filter

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Abstract: System identification is a technique used to obtain a mathematical model of a system by performing analysis on input and output behavior of the system. Simultaneous Model Order and Parameter Estimation (SMOPE) has been proposed to address system identification problem efficiently using optimization algorithms. The technique enables the computation of model order and parameters values to be done concurrently. The performance of SMOPE has been tested using particle swarm optimization (PSO) and gravitational search algorithm. However, the performance was worse than conventional ARX method. Current optimum opposition-based simulated Kalman filter (COOBSKF) is an improved version of simulated Kalman filter (SKF) which employs the concept of current optimum opposition-based learning (COOBL). Therefore, the objective of this paper is to test the effectiveness of the COOBSKF in solving system identification problem throughout SMOPE. Experiments are conducted on six system identification problems. The obtained outcomes showed that the performance of the SMOPE using COOBSKF is better than other SMOPE-based approaches.

Keywords: Simulated Kalman filter, opposition-based learning, system identification.