A new system identification method for Hammerstein-Wiener processes

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We propose a new system identification method for Hammerstein-Wiener type processes composed of the input/output nonlinear static functions and the linear dynamic subsystem. A special test signal is designed to completely separate the identification problems of the linear dynamic subsystem and the output nonlinear static function from that of the input nonlinear static function. Then, the system identification procedure can be significantly simplified: the identification problems of the linear dynamic subsystem and the output nonlinear static function can be solved independently without considering the input nonlinear static function. Also we can estimate the model parameters of the input nonlinear static function analytically without any iterative nonlinear optimization. Furthermore, we develop a new estimation algorithm to identify the linear dynamic subsystem and the output nonlinear static function more efficiently. It reduces the number of the adjustable parameters as many as those of the output nonlinear static function, resulting in more robust/faster convergence and easier initialization in the nonlinear optimization compared to previous approaches.