Multiobjective Evolutionary Algorithm Approach in Modeling Discrete-Time Multivariable Dynamics Systems

Abstract

Multiobjective evolutionary algorithms are robust tool in solving many optimization problems. Model structure selection is a procedure in system identification procedures. This procedure counters two contradicting objective functions which are minimizing mean square error and complexity of the selected model. This paper investigates the effectiveness and the performance of multiobjective evolutionary algorithm using elitist nondominated sorting genetic algorithm (NSGA-II) in identifying the model structure for discrete-time multivariable dynamic systems. Two simulated multivariable systems and a real multivariable system, which is a jacketed continuous stirred tank reactor, were used to investigate the effectiveness of NSGA-II. The identified model is validated using one-step-ahead prediction. The results indicate that NSGA-II is able to optimize the model structure of the multivariable systems with good predictive accuracy and adequate model structure.

Keywords; Multiobjective evolutionary algorithm; NSGA-II; Model structure selection; Multivariable system; System identification