

A multiobjective simulated Kalman filter optimization algorithm

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ABSTRACT

This paper presents a new multiobjective type optimization algorithm known as a Multiobjective Optimization Simulated Kalman Filter (MOSKF). It is a further enhancement of a single-objective Simulated Kalman Filter (SKF) optimization algorithm. A synergy between SKF and Non-dominated Solution (NS) approach is introduced to formulate the multiobjective type algorithm. SKF is a random based optimization algorithm inspired from Kalman Filter theory. A Kalman gain is formulated following the prediction, measurement and estimation steps of the Kalman filter design. The Kalman gain is utilized to introduce a dynamic step size of a search agent in the SKF algorithm. A Non-dominated Solution (NS) approach is utilized in the formulation of the multiobjective strategy. Cost function value and diversity spacing parameters are taken into consideration in the strategy. Every single agent carries those two parameters in which will be used to compare with other solutions from other agents in order to determine its domination. A solution that has a lower cost function value and higher diversity spacing is considered as a solution that dominates other solutions and thus is ranked in a higher ranking. The algorithm is tested with various multiobjective benchmark functions and compared with Non-Dominated Sorting Genetic Algorithm 2 (NSGA2) multiobjective algorithm. Result of the analysis on the accuracy tested on the benchmark functions is tabulated in a table form and shows that the proposed algorithm outperforms NSGA2 significantly. The result also is presented in a graphical form to compare the generated Pareto solution based on proposed MOSKF and original NSGA2 with the theoretical Pareto solution.

KEYWORDS:

Simulated Kalman Filter; Non-dominated Sorting; Multiobjective algorithm