

A Modified Simulated Kalman Filter Optimizer with State Measurement, Substitution Mutation, Hamming Distance Calculation, and Swap Operator

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ABSTRACT

The simulated Kalman filter (SKF) is an algorithm for population-based optimization based on the Kalman filter framework. Each agent in SKF is treated as a Kalman filter. The SKF utilizes a Kalman filter process that includes prediction, measurement, and estimation to determine the global optimum. However, the SKF can only operate in the numerical search space. Numerous approaches and modifications have been used in the literature to enable numerical meta-heuristic algorithms to operate in a discrete search space. This paper presents modifications to measurement and estimation in the SKF by utilizing mutation and Hamming distance technique to accommodate the discrete search space. The modified algorithm is called Discrete Simulated Kalman Filter Optimizer (DSKFO). Additionally, the DSKFO algorithm incorporates the swap operator as an extension to improve the solution in solving the travelling salesman problem (TSP). The DSKFO algorithm was compared against four other combinatorial SKF algorithms and outperformed them all.

KEYWORDS: Combinatorial, Simulated Kalman Filter, Swap Operator, Travelling Salesman Problem

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