A Modified Simulated Kalman Filter Optimizer with State Measurement, Substitution Mutation, Hamming Distance Calculation, and 2-Opt 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. To find the global optimum, the SKF employs a Kalman filter mechanism that includes prediction, measurement, and estimate. However, the SKF is limited to operating in the numerical search space only. Numerous techniques and modifications have been made to numerical meta-heuristic algorithms in the literature in order to enable them to operate in a discrete search space. This paper presents modifications to measurement and estimation in SKF to accommodate the discrete search space. The modified algorithm is called Discrete Simulated Kalman Filter Optimizer (DSKFO). Additionally, the DSKFO algorithm incorporates the 2-opt operator 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.

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