Levy tunicate swarm algorithm for solving numerical and real-world optimization problems

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ABSTRACT
The proposed Levy Tunicate Swarm Algorithm (LTSA) is a novel metaheuristic algorithm that integrates the Levy distribution into a new metaheuristic algorithm called Tunicate Swarm Algorithm (TSA) to solve numerical and real-world optimization problems. TSA has been newly designed to mimic the propulsion of jets and swarm behaviour of tunicates during navigation and feed processes. However, in solving a variety of optimization problems, TSA like metaheuristics is often trapped in local optima. Therefore, we used the Levy distribution rather than the conventional uniform distribution in the candidate selection procedure to solve the TSA algorithm local optima problem. We took advantage of Levy flight, which solved the local optima problem and improved traditional TSA efficiency. The proposed LTSA algorithm performance was evaluated using 23 well-known benchmark test functions, namely unimodal benchmark functions, multimodal benchmark functions, and fixed-dimension multimodal benchmark functions, as well as compared with the traditional TSA. The effectiveness is tested by identifying one real-world engineering application known as the twin-rotor system. The performance is evaluated based on the mean, best, worst and Std. value and the convergence curve. Experimental findings have shown that the proposed LTSA algorithm delivers better performance with 23 benchmark test functions and successfully modelled the twin-rotor system.

KEYWORDS
Levy flight; Metaheuristic; Optimization; Tunicate Swarm Algorithm

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