Hybrid manta ray foraging—particle swarm algorithm for PD control optimization of an inverted pendulum

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ABSTRACT

This paper presents a hybrid Manta ray foraging—particle swarm optimization algorithm. Manta Ray Foraging Optimization (MRFO) algorithm is a recent algorithm that has a promising performance as compared to other popular algorithms. On the other hand, Particle Swarm Optimization (PSO) algorithm is a well-known and a good performance algorithm. The proposed hybrid algorithm in this work incorporates social interaction and elitism mechanisms from PSO into MRFO strategy. The mechanisms help search agents to determine their new search direction. The proposed algorithm is tested on various dimensions and fitness landscapes of CEC2014 benchmark functions. In solving a real world engineering problem, it is applied to optimize a PD controller for an inverted pendulum system. Result of the benchmark function test is statistically analyzed. The proposed algorithm has successfully improved the accuracy performance for most of the test functions. For optimization of the PD control, result shows that the proposed algorithm has attained a better control performance compared to MRFO.

KEYWORDS

Manta ray foraging optimization; Particle swarm optimization; PD control; Inverted pendulum system

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