

Spiral-based manta ray foraging optimization to optimize PID control of a flexible manipulator

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ABSTRACT

This paper proposes an extension of Manta Ray Foraging Optimization (MRFO) using Oppositional-based Learning (OBL) technique called Quasi Reflected Opposition (QRO). MRFO is a new algorithm that developed based on the nature of a species in cartilaginous fish called Manta Ray. Manta ray employs three foraging strategies which are chain, cyclone and somersault foraging. Nonetheless, MRFO is tends to getting trap into local optima due to the redundant of intensification of the search agents in the search space. On the other side, OBL is a prominent technique in reducing chance of local optimum while increasing the convergence speed. Thus, QRO is synergized into MRFO to form QR-MRFO, in objective to improve MRFO in term of finding better accuracy of solution and faster convergence rate. Latter, QR-MRFO was performed on a series of benchmark functions and analyzed using statistical non-parametric test of Wilcoxon to measure the significant level of improvement. Results from the test shows that MRFO is undoubtedly defeated by QR-MRFO in term of accuracy.

KEYWORDS

Accuracy; Convergence; Manta ray; Optimization; Quasi-opposition-based Learning; Single-objective; Spiral

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