

Gradient-Based Mutation Manta Ray Foraging Optimization (GbM-MRFO) for Solving Constrained Real-World Problems

Ahmad Azwan Abdul Razak and Ahmad Nor Kasruddin Nasir

Faculty of Electrical and Electronics Engineering Technology, Universiti Malaysia Pahang, 26600 Pekan, Pahang Malaysia.

*Corresponding author: ahmadazwan.ar@gmail.com, kasruddin@ump.edu.my

Abstract

In this paper, a new variant of Manta Ray Foraging Optimization (MRFO) algorithm is introduced to deal with real parameter constrained optimization problem. Gradient-based Mutation MRFO (GbM-MRFO) is derived from basic strategy of MRFO and synergized with the Gradient-based Mutation strategy. MRFO is a recently new introduced algorithm that consists of strategy of foraging adopted by Manta Ray while Gradient-based Mutation (GbM) is a feasibility-and solution repair strategy adopted from ϵ -Matrix-Adaptation Evolution Strategy (ϵ -MAES). MRFO is proven to solve artificial benchmark-function test by relatively good performance compared to several state-of-the-art algorithm while GbM is a productive approach to repair solution which led to improve the feasibility of the solution throughout the search by using Jacobian approximation in finite differences. GbM-MRFO turn out to be a competitive optimization algorithm on solving constrained optimization problem of Three-bar Truss problem. The performance of GbM-MRFO is proven to be efficient in solving the problems by providing lighter weight of truss with better accuracy of solution.

Keywords: Manta ray foraging Optimization; Constrained optimization problem; Gradient-based Mutation; Three-bar truss; Accuracy.