Multi-objective chicken swarm optimization for continuous optimization

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ABSTRACT

Many optimization problems from the industrial world (telecommunication, environment, transportation, etc.) are multidimensional in nature [1, 2, 3]. Indeed, the optimization problems encountered in practice are rarely single-objective and need to satisfy several contradictory criteria or objectives simultaneously. However, the complexity of multi-objective optimization problems increases according to the problem size, as well as the number of objective. Recently, Meng [4] has proposed a new swarm intelligence algorithm, called chicken swarm optimization (CSO). The first studies have proven that the CSO algorithm provides better results compared to well-known evolutionary for solving global optimization problems. In this paper, we propose a Multi-Objective Chicken Swarm Optimization (MOCSO) to optimize multi-objective problems with the following five majors' contributions:

- We integrate an archive into CSO for saving and retrieving the Pareto optimal solutions.
- We use an aggregate function to define the social hierarchy and simulate the behavior of chickens during the search for food in the multi-objective search spaces.
- We adapt the different movements of the chickens to explore a multi-criteria search space
- We use the epsilon distance and the crowding distance to manage efficiently the archive population that contains the best non-dominated solutions during the exploration of the space search.
- We use the operator 'repair diversity' to avoid the premature convergence in case of a large number of local optima.

We validate the proposed algorithm on twelve test functions and compare our results with five well-known meta-heuristics. The results show clearly the ability of MOCSO algorithm to provide a better spread of solutions with better convergence behavior.

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