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Authors: Farid Mohammadi, Hamdi Abdi

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A Modified Crow Search Algorithm (MCSA) for Solving Economic Load Dispatch Problem

Farid Mohammadi, Hamdi Abdi*

Department of Electrical Engineering, Faculty of Engineering, Razi University, Kermanshah, Iran.

* Corresponding Author, hamdiabdi@razi.ac.ir

Highlights:

- Applying a novel evolutionary optimization algorithm namely MCSA to ELD problem.
- Proposing two modification methods for improving the CSA performance.
- Applying the MCSA to five well-known ELD test systems.
- Employing four well-known benchmark functions to verify the MCSA.
- Addressing the MCSA as a highly competitive with some previous algorithms.

Abstract

This paper presents a novel evolutionary optimization algorithm namely the modified crow search algorithm (MCSA) for solving the non-convex economic load dispatch (ELD) problem which improves the crow search algorithm (CSA) by an innovative selection of the crows and adaptive adjustment of the flight length. MCSA is a population-based technique based on the intelligent behavior of the crows in finding food sources. In MCSA, each crow saves its food in hiding-places for the time it needs. Also, each crow searches environment to find the better foods by stealthily following other crows to discover their hiding-places. The proposed MCSA develops the search capability of crows in the original CSA and introduces a new way by which a destination is selected by a crow to follow. To indicate the applicability of MCSA in the ELD problem, it is applied on three different well-known test systems. The results are compared in terms of the solution quality, robustness, and computing time with other methods implying that the proposed method has a superior performance than the other techniques.

Keywords: Economic Load Dispatch (ELD), Evolutionary Algorithms, Modified Crow Search Algorithm (MCSA), Optimization.

Nomenclature

a_i, b_i, c_i	cost curve coefficients of the i th unit	N_c	number of crows in the flock
e_i, d_i	valve-point effects coefficients of the i th unit	itr_{max}	maximum number of iteration of the algorithm
P_i	generating output power of the i th unit	$X^{i,itr}$	position vector of i th crow at the iteration itr
p_i^{min}, p_i^{max}	minimum and maximum generation capacities of the i th unit, respectively	d	the number of decision variables

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