Conference Proceedings 2023 Innovations in Power and Advanced Computing Technologies, i-PACT 2023

Optimization of Distribution System Reliability Using Dandelion Optimizer

Abstract

This study proposes the Dandelion Optimizer (DO), a novel nature-inspired algorithm based on dandelion plant life cycles, for optimizing lightning protection system (LPS) placement in radial distribution networks with 81 buses. The objective is to minimize System Average Interruption Frequency Index (SAIFI) and Momentary Average Interruption Frequency Index (MAIFI). The DO offers a user-friendly approach to determining optimal solutions and excels in pinpointing optimal LPS deployment locations within distribution systems, concurrently fastening the calculation of SAIFI and MAIFI. Validation involves comprehensive numerical simulations, considering lightning flashover rate, distribution feeder attributes, and LPS configuration. Comparative analysis with Grey Wolf Optimizer (GWO) and Dragonfly Algorithm (DA) affirms DO's superior performance. Notably, DO showcases better capability in finding local optima and faster convergence than GWO and DA. Applying DO to optimise the optimal placements of LPSs yields a commendable 6.16% reduction in reliability indices, surpassing GWO and DA's 6.14% and 5.14% reductions. DO also exhibits heightened convergence speed over GWO and DA.

Keywords

Dandelion Optimizer (DO); Dragonfly Algorithm (DA); Flashover rate; Grey Wolf Optimizer (GWO); Lightning protection system; MAIFI; SAIFI