Genetic Algorithm vs Fireworks Algorithm in Solving the Renewable Energy Integration Problem

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Abstract

This paper solves the Renewable Energy Integration Problem (REIP) by finding the optimum component configuration of a hybrid microgrid, as a system constituted of solar panels, wind turbines, electric batteries, converters and diesel generators to provide electricity in an off-grid scenario in the Middle East region. The work operates a Monte-Carlo simulation to allow the random changes in weather to be considered in the evaluation of any predetermined set of components, which are in turn encoded as a sequence of values compatible with a Genetic Algorithm and Firework Algorithm. Furthermore, a Genetic Algorithm is implemented to optimize the component configuration of the hybrid microgrid, and consecutively a Firework Algorithm is also applied to benchmark the solution to the same problem. The paper compares the solutions and performance achieved by the 2 heuristic optimization algorithms for finding the optimal component configuration in 3 versions of the Renewable Energy Integration Problem: Version A the micro-grid is restricted to use fossil fuel sources only: diesel generators, converters and batteries. In version B the microgrid is restricted to use renewable sources only: solar panels, wind turbines, electric batteries and converters. And version C allows for a mix of renewable and fossil fuel electricity sources, namely a hybrid micro-grid.

Keywords
Renewable Energy, Optimization, Microgrid, Firework Algorithm, Genetic Algorithm.

Biographies

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