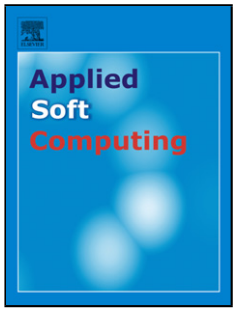

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Voltage and frequency regulation in autonomous microgrids using Hybrid Big Bang-Big Crunch algorithm

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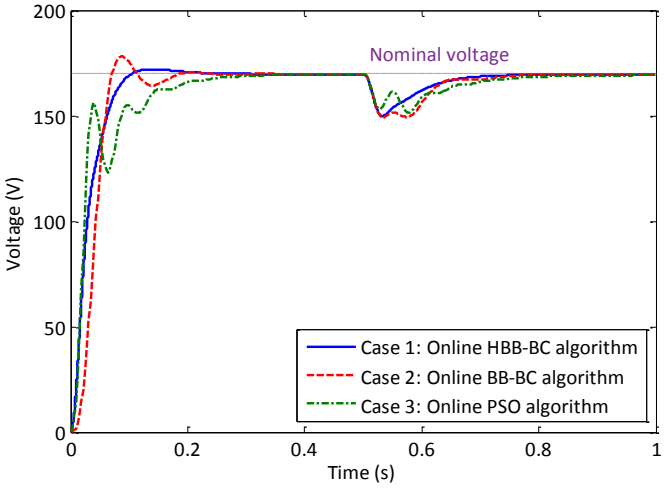
Graphical abstract



Highlights

- Hybrid Big Bang-Big Crunch algorithm is applied to microgrid voltage regulation.
- A mutation operator is used to improve the exploration capability of HBB-BC method.
- The HBB-BC has a better convergence rate than the compared algorithms.

Abstract –This paper proposes an optimal power control strategy for inverter-based Distributed Generation (DG) units in autonomous microgrids. It consists of power, voltage, and current controllers with Proportional-Integral (PI) regulators. The droop concept is used for the power control strategy. Static parameters in PI regulators may not ensure the most optimal solution due to inevitable changes happening in microgrid configuration and loads. In the proposed method, after occurring a load change in a standalone microgrid, parameters of the PI controller are dynamically adjusted to get the most optimal operating point that satisfies objective functions. The optimization problem is formulated as a multi-objective programming with objective functions of minimizing overshoot/undershoot, settling time, rise time, and Integral Time Absolute Error (ITAE) in the output voltage. These objective functions are combined using fuzzy memberships. The Hybrid Big Bang-Big Crunch algorithm (HBB-BC) is used to