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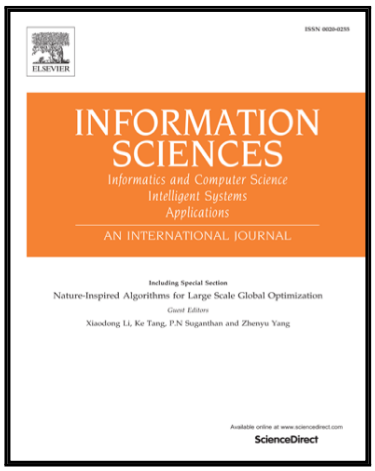

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Reconfiguration-based Methodology for Improving Recovery Performance of Faults in Smart Grids

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Abstract

This paper aims to enhance the reliability and quality of service (QoS) of power smart grids by searching and applying reconfiguration oriented solutions. A novel definition of recovery performance is provided in terms of automatic recoverability and unavailability rates. The proposed approach is based on a hierarchical and distributed multi-agent system (MAS). It involves static and mobile agents respectively dedicated to search for new feasible reconfigurations and to identify the consumers which may play the role of feeders over smart grids. An automatic reconfiguration corresponds to the addition of a new pertinent line in a smart grid to allow further recoveries. This paper provides the implemented communication protocol for negotiating (CPN) the resources allocation which is performed by the deployed agents. The management and assignment of the energy resources are modeled as a combinatorial optimization multiple-knapsack problem (MKP) to reach a better configuration with a higher possible recovery performance rate. To decrease the cost of automatic actions, which increases the smart grid performance and reduces the costs of the human interventions, a short list of failures is identified based on proposed relations of dominance and equivalence between observed failures. Furthermore, this work investigates the effectiveness of the designed and implemented software tool for off-line assistance-design, simulation and modeling of reconfigurable smart grids. The efficiency of the proposed strategy is validated through an experi-

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