Abstract

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A Multi-Objective Optimal Power Flow Control of Electrical Transmission Networks Using Intelligent Meta-Heuristic Optimization Techniques

Optimal power flow (OPF) is considered one of the most critical challenges that can substantially impact the sustainable performance of power systems. Solving the OPF problem reduces three essential items: operation costs, transmission losses, and voltage s. An intelligent controller is needed to adjust the power system’s control parameters to solve this problem optimally. However, many constraints must be considered that make the design process of the OPF algorithm exceedingly tricky due to the increased number of limitations and control variables. This paper proposes a multi-objective intelligent control technique based on three different meta-heuristic optimization algorithms: multi-verse optimization (MVO), grasshopper optimization (GOA), and Harris hawks optimization (HHO) to solve the OPF problem. The proposed control techniques were validated by applying them to the IEEE-30 bus system under different operating conditions through MATLAB simulations. The proposed techniques were then compared with the particle swarm optimization (PSO) algorithm, which is very popular in the literature studying how to solving the OPF problem. The obtained results show that the proposed methods are more effective in solving the OPF problem when compared to the commonly used PSO algorithm. The proposed HHO, in particular, shows that it can form a reliable candidate in solving power systems’ optimization problems.