

Enhancing fuzzy logic MPPT controller with metaheuristic mechanism in photovoltaic system

ABSTRACT

The conventional fuzzy logic is a deterministic algorithm which means that it will always give the same output when given a particular input. Due to this inherent characteristics, the conventional fuzzy logic might be trapped at local optimum when dealing with a global optimization problem that consists of several maximum points. As such, this paper aims to explore the potential of improving the fuzzy logic by integrating a greedy or metaheuristic mechanism into it. With the greedy mechanism, the improved fuzzy logic or known as greedy fuzzy logic is given a probability to have a random search for the optimum solution without following the deterministic computation. This mechanism is introduced to prevent the proposed algorithm to be trapped at the local optimum point. The robustness of the proposed algorithm is tested in optimizing a 5x5 photovoltaic (PV) array because the PV array will exhibit multiple peaks when illuminated under a non-uniform irradiance. The existence of multiple peaks will lead to additional difficulties for the conventional maximum power point tracking (MPPT) algorithm in tracking the global maximum power point (MPP) or known as global optimum point. The simulation results show the proposed fuzzy logic with greedy mechanism is able to track the global MPP.