

Metaheuristic Optimization Algorithm for PI Control Buck-Boost Converter Based on Wind Turbine

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Abstract— Wind energy is one of the widely used alternative energy sources. The wind turbines can convert kinetic energy in the wind through the blades to generate mechanical energy for driving the permanent magnet synchronous generators (PMSG) into AC power. Subsequently, the rectifiers transform the AC power to DC power for grid connected. The DC-link voltage is constant at 400 V. Nevertheless, the input voltage of the system depends on the speed of the wind, which is not constant and also the AC power from PMSG. In this paper, the buck boost converter is integrated into the proposed system, the wind turbine with PMSG including inductive load on grid connected, to maintain the DC-link voltage. In addition, the buck boost converter is controlled by PI controller. In tuning the gains of PI controller, the metaheuristic optimization algorithms are applied namely, Tabu search and Firefly algorithms. In the experiments, the AC voltage of rectifier is set in the range of 200-600 V. The simulation results show that the buck boost converter controlled by PI controller can regulate the DC-link voltage at 400 V. As a result, the proposed system is able to transfer the power to the grid connected system, continuously and effectively.

Keywords: Metaheuristic Optimization Algorithm, Buck Boost Converter, Wind Turbine, PI controller

