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Maximum Power Point Tracking of Wind Energy Conversion System Using Multi-objective grey wolf optimization of Fuzzy-Sliding Mode Controller

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Abstract: Ongoing electricity demand and the increasing growth of population have become necessary to provide alternative and clean sources of energy. Wind energy is one of the most important sustainable energies but the irregular characters of the primary source, which is characterized by a random wind speed variation, makes the process of control is difficult in order to maximize the power. This paper presents a multi objective grey wolf optimization (MOGWO) of fuzzy sliding mode controller in order to maximize the power captured by wind turbine; meanwhile, the mechanical loads are alleviated for variable speed wind energy conversion system (VS-WECS); firstly, Fuzzy logic theory based sliding mode control is developed by collecting the sliding surface data to reduce the chattering effect caused by the SMC, then the Grey Wolf Optimization is introduced to solve multi-objectives functions of WECS which are extracting the maximum power and alleviation the mechanical loads in order to find the optimal parameters of Fuzzy-Sliding mode controller to drive the conversion system to the optimal operating point. The obtained results are compared with those given by Sliding mode controller and Fuzzy-Sliding mode controller in which our proposed method can ensure a better dynamic behavior of the WECS.

Keywords : Wind Energy Conversion System WECS, Maximum Power Point Tracking MPTT, Sliding mode control, fuzzy logic control, MO-GWO