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## Augmented Grey Wolf Optimizer for Grid-connected PMSG-based Wind Energy Conversion Systems

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### Highlights

- We present a new improvement to the grey wolf algorithm.
- The new improvement is tested with twenty-three benchmark functions.
- The new improvement is compared with four published algorithms.
- The new improvement is applied to grid-connected wind power plants.
- The new improvement is verified by simulation results.

### Abstract

The grey wolf optimizer (GWO) is a new meta-heuristic algorithm inspired from the leadership and prey searching, encircling, and hunting of the grey wolves' community. The GWO algorithm has the advantages of simplicity (less control parameters), flexibility, and globalism. In this paper, a simple and efficient augmentation for the GWO (AGWO) algorithm is proposed for better hunting performance. The AGWO algorithm focuses on increasing the possibility of the exploration process over the exploitation process by modifying the behavior of the control parameter ( $a$ ) and position updating. The AGWO is suitable to the low number of search agents such as the electric power system application. The proposed AGWO algorithm is verified using twenty-three benchmark test functions and is applied to the grid-connected permanent magnet synchronous generator driven by variable speed wind turbine (PMSG-VSWT). The obtained results of the AGWO algorithm are compared with the results of the original GWO and other algorithms. The comparisons verified that the proposed AGWO is significantly augmented the performance of the original GWO algorithm without affecting its simplicity and easy implementation.

**Keywords:** Grey wolf optimizer; Exploration; Exploitation; wind energy conversion; proportional integral controller.

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