A fault diagnosis algorithm for wind turbine blades based on BP neural network

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Abstract

Wind turbine blades are one of the most critical components of wind power generation and play a key role in wind power generation. Aiming at the problem that the wind turbine blades are subjected to multiple loads in combination, the crack problem is easy to occur. Through the analysis of the macroscopic expansion mechanism and microscopic damage mechanism of short cracks and main cracks, the hidden relationship between crack appearance and damage nature is deeply explored. A fault diagnosis algorithm for wind turbine blades based on BP neural network is proposed[1]. On the multi-discriminator fusion network structure, BP neural network algorithm is used to train the multi-feature sample data including wind turbine blades, so that the network parameters tend to convergence and gradually approach the real label[2][3]. The experimental analysis shows that the algorithm effectively diagnoses and evaluates the damage degree of the blade structure, and has a high recall rate and accuracy, which proves the effectiveness and robustness of the algorithm.

This text makes a deep research and analysis on the failure and prediction of the wind turbine blades of wind power generating unit, and proposes a set of fault diagnosis algorithms relying on the advanced scientific algorithm technology, on the one hand, the research of this algorithm can guide the wind power generating unit to monitor and distinguish the wind turbine blades intelligently in real time, so as to effectively prevent the loss of economic property of the wind power generating unit and improve the national economic benefits of wind power generation, on the other hand, it will be of reference value to industrial inspection and control system within the sector.

Keywords: wind turbine blade；troubleshooting；multiple discriminator fusion network；BP-neural network；effectiveness；robustness

Acknowledgement

This paper is supported by 2018 the Inner Mongolia Science & Technology Plan Project (No.

102-510001), 2018 the Inner Mongolia Science and Technology Achievement Conversion Project(No. CHZH2018130) and Inner Mongolia Autonomous Region Science &Technology Innovation to Guide the Reward Project (No. 102-413128) .

References

[1] Zhao, Zhuanzhe; Xu, Qingsong; Jia, Minping, Improved shuffled frog leaping algorithm-based BP neural network and its application in bearing early fault diagnosis, 27 (2) (2016) 375-385.

[2] Wang Yingmin; Zhang Fujun; Cui Tao, Fault Diagnosis for Manifold Absolute Pressure Sensor(MAP) of Diesel Engine Based on Elman Neural Network Observer, 29 (2) (2016) 386-395.

[3] Li, Ke; Su, Lei; Wu, Jingjing, A Rolling Bearing Fault Diagnosis Method Based on Variational Mode Decomposition and an Improved Kernel Extreme Learning Machine, 7 (10) (2017).