AN INTELLIGENT ONLINE SCHEME BASED K-NEAREST NEIGHBOR CLASSIFIER FOR GEAR SYSTEM FAULT DIAGNOSIS AND CLASSIFICATION

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Abstract: Gear system faults in all sorts of rotating machines can result in partial or total breakdown, destruction and even catastrophes. By implementation of an adequate fault detection system, the reliability, productivity, safety and availability of the gearboxes that are used to transfer the rotating powersource to other devices, provide speed, and torque conversions can be improved. In this paper, a specific interest is carried to correctly identify type, location, and class of different defects that can appear in the gear and bearing in a gear system with various combinations under different speeds and loads. The solution is based on a three-step algorithm. The first step, based on the Wavelet Packet Transform WPT and FFT algorithms, is used to extract the features of the different sub-bands frequencies in the vibration signal from a gear system. Then, in the second step, a dimensionality reduction based Linear Sequence Discriminant Analysis LSDA algorithm is conducted to reduce computational overhead for diagnosis and to improve classification performance. Finally, the reduced features were used as the input to a k-nearest neighbor classifier to evaluate the system diagnosis performance. Based PHM Data Challenge, the experimental results obtained from real gear system vibration signals for eight different health gearbox conditions demonstrated that the proposed method is effective in both feature extraction, feature reduction, and also fault classification.

Keywords: Data Analysis, Gear System, Fault Diagnosis, classification, Linear Sequence Discriminant Analysis.