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Rolling element bearing fault diagnosis using wavelet transform

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Abstract

This paper is focused on fault diagnosis of ball bearings having localized defects (spalls) on the various bearing components using wavelet-based feature extraction. The statistical features required for the training and testing of artificial intelligence techniques are calculated by the implementation of a wavelet based methodology developed using *Minimum Shannon Entropy Criterion*. Seven different base wavelets are considered for the study and Complex Morlet wavelet is selected based on minimum Shannon Entropy Criterion to extract statistical features from wavelet coefficients of raw vibration signals. In the methodology, firstly a wavelet theory based feature extraction methodology is developed that demonstrates the information of fault from the raw signals and then the potential of various artificial intelligence techniques to predict the type of defect in bearings is investigated. Three artificial intelligence techniques are used for faults classifications, out of which two are supervised machine learning techniques i.e. support vector machine, learning vector quantization and other one is an unsupervised machine learning technique i.e. self organizing map. The fault classification results show

machine learning technique i.e. self-organizing maps. The fault classification results show that the support vector machine identified the fault categories of rolling element bearing more accurately and has a better diagnosis performance as compared to the learning vector quantization and self-organizing maps.



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Keywords

Wavelets; Support vector machine (SVM); Learning vector quantization (LVQ); Self-organizing maps (SOM); Shannon Entropy

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