Parallel classification of rolling element bearing faults based on fuzzy logic and Kohonen’s Self-Organising Maps

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Abstract

This paper described a development of the rolling element bearing fault identification system using the vibration signal and fuzzy logic inference in parallel with Kohonen’s Self-Organising Feature Maps for an experimental platform. The proposed system consisted of a combination of signal feature extraction using a combination of the FFT (linear frequency spectrum) and 1/3 Octaves (logarithmic frequency spectrum) and the parallel fault classification was based on fuzzy-logic inference and Kohonen’s Self-Organising Feature Maps. The feature extraction of FFT and 1/3 Octaves in parallel is used to create an input data set to both fuzzy logic inference and an unsupervised neural network to monitor, identify and classify defects is utilised. Self-Organizing Feature Maps, enables parallel processing of multiple features in the input data set. Traditionally, the technique for fault diagnosis in rotating machinery and rolling element bearings depends on the experience of the technician or vibration analyst. To assist the technician, a parallel diagnosis system is proposed and comparisons on the fuzzy-logic inference and Kohonen’s Self-Organising Feature Maps are performed. The experimental results indicated that the proposed parallel classification system, the fuzzy logic inference is supported by a visualized classification of Kohonen’s Self-Organising Feature Maps, which proves to be effective for increased accuracy and improved accountability in rolling element bearing fault identification.