Clustering of frequency spectrums from different bearing fault using principle component analysis

M.F.M. Yusof, C.K.E. Nizwan, S.A. Ong and M.Q.M. Ridzuan

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In studies associated with the defect in rolling element bearing, signal clustering are one of the popular approach taken in attempt to identify the type of defect. However, the noise interruption are one of the major issues which affect the degree of effectiveness of the applied clustering method. In this paper, the application of principle component analysis (PCA) as a pre-processing method for hierarchical clustering analysis on the frequency spectrum of the vibration signal was proposed. To achieve the aim, the vibration signal was acquired from the operating bearings with different condition and speed. In the next stage, the principle component analysis was applied to the frequency spectrums of the acquired signals for pattern recognition purpose. Meanwhile the mahalanobis distance model was used to cluster the result from PCA. According to the results, it was found that the change in amplitude at the respective fundamental frequencies can be detected as a result from the application of PCA. Meanwhile, the application of mahalanobis distance was found to be suitable for clustering the results from principle component analysis. Uniquely, it was discovered that the spectrums from healthy and inner race defect bearing can be clearly distinguished from each other even though the change in amplitude pattern for inner race defect frequency spectrum was too small compared to the healthy one. In this work, it was demonstrated that the use of principle component analysis could sensitively detect the change in the pattern of the frequency spectrums. Likewise, the implementation of mahalanobis distance model for clustering purpose was found to be significant for bearing defect identification.