Autoregressive Modeling and PCA Preprocessing to Support Vector Machines Based on PSO for Bearing Fault Diagnosis

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Abstract : In this paper a method for fault diagnosis of rolling bearings is presented. It consists of two major parts: vibration signal feature extraction and condition classification for the extracted features. In this paper Autoregressive Modeling followed by Principal Components Analysis (PCA) was introduced for feature extraction from faulty bearing vibration signals. After extracting feature vectors by AR-PCA, the support vector machine (SVM) was applied to automate the fault diagnosis procedure. To improve the classification accuracy for bearing fault prediction, particle swarm optimization (PSO) is employed to simultaneously optimize the SVM kernel function parameter and the penalty parameter. The results have shown feasibility and effectiveness of the proposed approach.

Keywords : Autoregressive Modeling, Principal Components Analysis, Support vector machine, Particle Swarm Optimization, Wavelet Packet, Fault Diagnosis, Roller Bearing.