Rolling Bearing Fault Diagnosis Method Based on Faster Dictionary Learning

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Introduction

Rotating machinery plays an increasing role in electric manufacturing, transportation, power, and other industries. As the core component of rotating machinery, rolling bearings directly affect the operation of the entire equipment. However, the damage of rolling bearings is inevitable, which may cause serious economic losses and even safety accidents.

Thus, it is of great significance to detect bearing faults in time and take appropriate maintenance measures according to the diagnosis results

Purpose

Boost the speed and accuracy of recognition.

Address the problem that it is difficult to extract the features of vibration signal and diagnose the fault of rolling bearing.

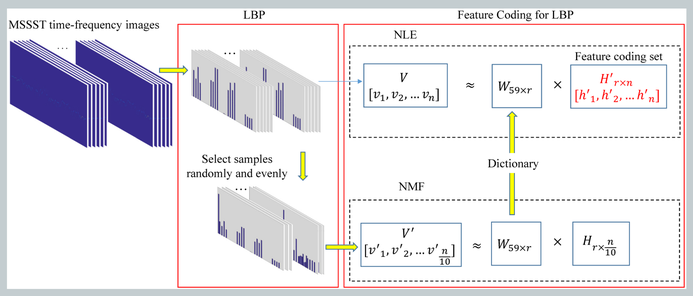
Verify that time-frequency images with higher energy concentration can improve the quality of fault diagnosis.

Verify that the dictionary learning and feature coding of low dimension feature vectors.

Meet the real-time and high precision requirement of fault diagnosis.

Methods

- Multisynchrosqueezing S Transform is adopted to transform vibration signals into high-resolution time-frequency images. .
- Local Binary Patterns of Uniform Pattern operator is introduced to extract the low-dimensional texture features of time-frequency images
- Nonnegative matrix factorization (NMF) with only one hyperparameter and nonnegative linear equation are used to solve the dictionary learning and feature coding

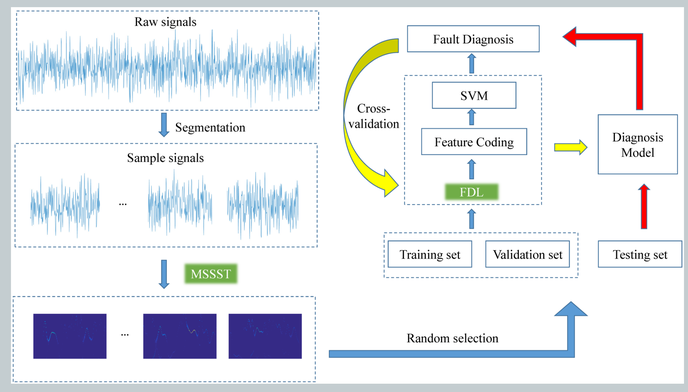


Tools

Experimental Procedure

Natoque penatibus er Nulla facilisi Checklist

- Collect raw vibration signals of rolling bearing under different working conditions and note their states.
- Segment the raw signals and ensure that each sample signal contains one complete period at least.
- Perform MSSST for sample signals to obtain the time-frequency images with high resolution.
- FDL is used to process the time-frequency images and we can get the effective feature coding of each sample quickly.
- Divide the feature coding set into the training, validation, and testing sets. Then the diagnosis model is obtained by cross-validation on the training set and the validation set.
- Input testing set into the diagnosis model for fault diagnosis.



Expected Results

Time-frequency analysis can meet higher energy concentration improve the quality of fault diagnosis.

Faster Dictionary Learning algorithm can improve the speed of feature extraction from time-frequency images and further improve the speed of fault diagnosis.

Personal Profile

My name is Hu Ye. My current research interests are machine learning and imaging processing.

Research Content

Fault Detection for Freight Trains

Rolling Bearing Fault Diagnosis

Academic Publication

Rolling Bearing Fault Diagnosis Method Based on Multisynchrosqueezing S Transform and Faster Dictionary Learning

Fine-Grained Fault Diagnosis Method of Rolling Bearing Combining Multisynchrosqueezing Transform and Sparse Feature Coding Based on Dictionary Learning

Study on Instrument Ghosting Character Recognition Method for Predicting Binarization Threshold by BP Network