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基于形态分量分析与阶次跟踪的齿轮箱复合故障诊断方法

Compound fault diagnosis method for gearbox based on morphological component analysis and order tracking

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作者	单位	E-mail
陈向民	湖南大学 汽车车身先进设计制造国家重点实验室, 长沙 410082	
于德介*	湖南大学 汽车车身先进设计制造国家重点实验室, 长沙 410082	djyu@hnu.edu.cn
李蓉	湖南大学 汽车车身先进设计制造国家重点实验室, 长沙 410082	

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中文摘要:

针对变转速下齿轮箱复合故障的故障特征提取, 提出了基于形态分量分析与阶次跟踪的齿轮箱复合故障诊断方法. 该方法根据齿轮箱复合故障振动信号中齿轮和滚动轴承故障成分的形态差异性, 先用形态分量分析将其分解为包含齿轮局部故障信息的谐振分量、包含滚动轴承局部故障信息的冲击分量和随机噪声分量, 再根据实测转速信号分别对谐振分量和冲击分量进行包络阶次分析, 根据各包络阶次谱诊断齿轮箱复合故障. 算法仿真和应用实例表明: 该方法能有效分离变转速下齿轮和滚动轴承的故障特征, 且其故障特征提取效果要优于传统的包络阶次谱方法.

英文摘要:

In view of the problem of extracting fault characteristics from rotating speed changing gearbox with compound faults, a compound fault diagnosis method for gearbox based on morphological component analysis(MCA) and order tracking was proposed. According to the morphological diversity of the fault signals of gear and rolling bearing, the vibration signals of gearbox with compound fault could be decomposed into the harmonic component containing the fault information of gear, the impulse component containing the fault information of rolling bearing and the random noise component by using MCA. And according to the measured rotating speed, the harmonic component and the impulse component were then analyzed respectively by the envelope order analysis, and the compound fault diagnosis was carried out based on the envelope order spectra. Simulation and application examples indicate that the proposed method can effectively separate the fault characteristic signals of gear and rolling bearing under changing rotating speed, and it is superior to traditional envelope order spectrum method according to the effect of fault characteristic extraction.

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