基于经验模态分解和Duffing振子的轴承故障诊断　Fault Diagnosis of Bearing Based on EMD and Duffing Oscillator

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关键词：　轴承 故障诊断 混沌振子 经验模态分解

摘　要：　针对齿轮箱轴承振动信号故障信息容易被噪声淹没，且具有非线性、非平稳特性的问题，提出了基于经验模态分解（EMD）和Duffing振子的轴承故障诊断方法。首先对原始振动信号进行经验模态分解，找到包含轴承故障信息的固有模态函数（IMF），然后利用Duffing振子的分岔图找到混沌振子相轨迹发生变化的内部激励力分界值，并将Duffing 振子的内部激励力频率设定为轴承故障特征频率，最后从混沌振子输出相轨迹的变化来检测齿轮箱轴承故障信息。实验结果表明，基于EMD和Duffing振子的故障诊断方法能够检测轴承故障信息。　Aiming at detecting bearing fault information, which is easily to be submerged in heavy noise and whose characteristics is nonlinear and non-stationary, a method of fault diagnosis based on empirical mode decomposition (EMD) and Duffing oscillator was put forward. This method decomposed the original signals using EMD to find intrinsic mode function (IMF) of containing the fault information, then the dividing value of force making the Duffing oscillator phase orbit changed was got, the inner motivation force frequency was set to the same frequency as the bearing fault, at last the fault was determined according to the change of Duffing oscillator's phase orbit. The results of experiments show that this method can detect the fault of bearing successfully.

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