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基于隐马尔科夫模型的故障诊断系统研究

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Condition Monitoring of Rotating Machinery Using Hidden Markov Models

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摘要

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摘要 在制造行业中,机械设备的状态检测技术能提供关于设备运行状态的实时信息,为避免生产损失和减少设备的致命故障提供保障。提出了一套基于小波变换和隐马尔科夫模型(Hidden Markov Models,HMMs)的故障检测系统。提出了小波模极大值分布(Wavelet Modulus Maxima Distribution),并将之定义为诊断系统的观察量加以验证。同时该系统采用在线模型参数估计和培训算法,通过选取能最大化对数似然度的HMM模型,确定设备所处状态。

关键词: 状态检测 小波模极大值分布 Lipschitz指数 隐马尔科夫模型

Abstract: Condition monitoring of machinery can provides real time information regarding machine status on-line,thus avoiding the production losses and minimizing the chances of catastrophic machine failures.In this paper,we present a fault classification system with an on-line model training and estimating algorithm.It is based on the wavelet transform and Hidden Markov Models (HMMs).The machinery condition is identified by selecting the HMM which maximizes the probability of a given observation sequence.The observation sequence is based on the wavelet modulus maxima distribution,which was proved to be effective in fault detection in previous research.Using observation sequences obtained from real vibration signals the developed classification system is validated.

Keywords: condition monitoring wavelet modulus maxima distribution Lipschitz exponent hidden Markov model

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