

<<机械监测诊断中的理论与方法>>

图书基本信息

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前言

屈梁生是中国工程院院士、西安交通大学教授、博士生导师。

他于1952年毕业于交通大学机械系，留校任教；后随校迁往西安，长期任教于西安交通大学。

屈梁生院士长期从事机械质量控制与监测诊断领域的基础性与开拓性研究。

他把信息论、系统论的原理融入到机械故障诊断和状态监测中去，从整体上提升了这一传统学科。

屈梁生院士的研究课题来自生产实践，在提升为理论后，再放回到实践中去考验，然后又反过来再推动理论进一步完善提高。

这种不断反复的精神贯穿在他整个科研工作中。

他在科研方法论中不受传统与成见的束缚，独具慧眼，不断开拓出新的领域。

典型的一个实例是，在已成熟并已广泛应用的FFT技术中加入相位信息，将多个传感器的振动信号在频域中合成，提出了这个由中国人始创的“全息谱”理论，大大地提高了FFT的水平，扩大了其工作范围。

屈梁生教授在注意提高学生的理论知识与独立工作能力的同时，也十分注意培养他们的道德修养。

他认为，作为新一代的科技人员，首先应该是一个具有高尚品德的人。

记得有一次我与他谈起科研工作中出现的浮躁情绪及带来的种种弊端时，都感到不断提高自身的修养，才能耐得住寂寞，长期坚持，出真正的成果。

由此还谈到李叔同的名言：“事能知足心常乐，人若无求品自高”，咏之感叹再三，相互勉励。

这本论文集是屈梁生教授一生科研工作的总结，是留给后人的一笔财富。

科技发展无止境，在他的基础上进一步发展提高，才是出本论文集的更高期望。

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内容概要

《机械监测诊断中的理论与方法（屈梁生论文集）》全文收录了中国工程院院士屈梁生的166篇高水平论文。

内容涉及全息谱、全息动平衡、独立分量 / 主分量、质量保障与优化、小波分析、遗传算法、贝叶斯网络、支持向量机、模糊理论、神经网络、专家系统、监测预报、Wigner分布、噪声抑制、回归分析、信息化生产、粗糙集、决策表 / 决策树、循环统计、统计模拟、EMD、故障诊断理论与方法等。另附有345篇论文的总篇目、论文主题索引和研究对象索引三个附录。

《机械监测诊断中的理论与方法（屈梁生论文集）》适合大学相关专业的教师、研究生，以及从事机械故障诊断研究的科研人员阅读。

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书籍目录

屈梁生院士简介序机床自动停刀机构精度的研究热变形对导轨磨削精度的影响计量光栅的几何、光学特性评几项超微米技术的进展自回归谱在机器故障诊断中的应用时间序列分析在机器状态识别中的应用On—line Surveillance of Process Equipment Using Autoregressive Feature Extraction and Walsh Transformation KULLBACK—LEIBLER信息数在识别机器振动信号功率谱中的应用An Experimental Research on Optical Fiber Sensor and Its Application to the Grinding Process Supervision 机器故障诊断技术及其现状与展望The Evaluation of Low—Frequency Knock of Precise Gearbox Via Spectra Distance Measure Autoregressive Cepstrum and Its Application in Noise Diagnosis of Gearboxes On—line Surveillance of a Grinding Process Via a Kullback—Leibler Information Number Statistical Control of Low Frequency Knock in Machine Tool Gearbox Production 光纤传感器及其在磨削过程监测中的应用The Thermal Behavior of Machine Tool Guideways The Application of Maximum Entropy Spectrum in Analysis of the Accuracy of Precision Gear Transmission The Evaluation of Low—frequency Knock in the Gearbox of Modern Machine Tools Friction Failure Diagnosis of Steam Turbine—Generator Sets Via Principal Components and Autoregressive Technique Grinding Process Supervision Via Information Distance Measure A New Approach to Computer—aided Vibration Surveillance of Rotating Machinery Discovering the Hologram The H010 spectrum : A New Method for Rotor Surveillance and Diagnosis 专家系统中知识一致性和完备性检验的一种方法The Hologram : A New FFT Based Rotor Diagnostic Method A New Method Evaluating Operating Condition for Rotating Machinery Time—frequency Distributions of Vibration Signals in Rotating Machinery A Rule—based Expert System for Real—Time Gear—manufacturing Process Control 回转机械振动频谱的模糊分类及应用The Phase Information in the Rotor Vibration Behaviour Analysis Investigation of the Special Trending Method for Rotating Machinery Monitoring Rotating Machinery Fault Diagnosis Using Wigner Distribution 全息谱分析方法的原理和应用神经网络在大型回转机械故障诊断中的应用全息谱技术用于化工厂机械故障诊断机械监测诊断中的谱距分类与预报大型机组诊断信息的深层次处理问题 Intelligent Control of the Gear—Shaving Process 转子径向摩擦故障诊断技术的研究 Homosource ANC and Its Application to the Machinery Diagnosis Study and Performance Evaluation of Some Nonlinear Diagnostic Methods for Large Rotating Machinery Orbit Complexity : A New Criterion for Evaluating the Dynamics of Rotating Systems 齿轮联轴节对中不良振动信息研究 Fault Prognosis for Large Rotating Machinery Using Neural Network 基于二维全息谱的回转机械亚同步振动分析 Vibrational Diagnosis of Machine Parts Using the Wavelet Packet Technique 转子横向裂纹振动诊断技术的研究 谈谈机组故障的可诊断性问题 谈谈机组故障的可诊断性问题(续) 小波包原理及其在机械故障诊断中的应用 Some Analytical Problems of High Performance Flexible Hinge and Micro—motor Stage Design The Prognosis of Vibration Condition for a 200 MW Turbine—Generator Set Using Artificial Neural Network The Noise Suppression Chain—A New Approach to Time Series Preprocessing 共轭梯度神经网络的研究 机械故障诊断技术与当代前沿科学(一)机械故障诊断技术与当代前沿科学(二)机械故障诊断技术与当代前沿科学(三)小波分析的工程理解及其在机械诊断中的应用 小波包的移频算法与振动信号处理 柔性转子键相信号初始相位及振动信号相位的确定 Test Sequencing and Diagnosis in Electronic System with Decision Table 大型回转机械故障的组合网络识别方法基于神经网络的喘振早期发现 Predicting Grinding Burn Using Artificial Neural Networks 非线性动力系统理论在机械故障诊断中的应用 基于信息优化的前馈神经网络及其应用 人工神经网络与机械工程中的智能化问题 全息谱的分解及其在机械诊断中的应用 多分辨小波网络的理论及应用 小波分析及其在机械诊断中的应用 The Fault Recognition Problem in Engineering Diagnostics Fractal Geometry Used for Characterization of Grinding Wheel Profiles 全息动平衡技术 : 原理与实践 多平面平衡中平衡面相关问题的处理 全息谱力、力偶分解法在全息动平衡中的应用 Optimization of the Measuring Path on a Coordinate Measuring Machine Using Genetic Algorithms 机械诊断中的故障识别问题 平稳熵 : 一种新的机组运行瞬时稳定性量化监测指标 转子横向裂纹故障的诊断信息提取 大机组振动信号复杂性的定量描述 截尾奇异值分解技术在动平衡中的应用 三维全息谱分解在回转机械诊断中的应用 研究回转机械诊断信息的集成 : 全息谱技术十年 基于主分量分析的噪声压缩技术研究 全息谱十年 : 回顾与展望 转子动平衡中的相关平衡面问题 基于扭振信号的齿轮

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故障诊断研究 Intelligent Method for Online Vibration Monitoring A Soft Computing Based Approach for Multisensor Data Fusion Feature Extraction Using Continuous Wavelet Transform and Its Application for Mechanical Fault Diagnosis 基于概率神经网络的机组状态多步预报方法 A Difference Resonator for Detecting weak Signals A Synergetic Approach to Genetic Algorithms for Solving Traveling Salesman Problem A Genetic Algorithm Based Balancing Framework for Flexible Rotors One Decade of Holographic Technique : Review and Prospect 小波分析及其在压缩机气阀故障检测中的应用 研究改进的决策树生成算法及条件决策表的创建 基于概率神经网络的大机组组合故障识别 一种改进的随机减量信号提取方法 Feature Extraction Based on Morlet Wavelet and Its Application for Mechanical Fault Diagnosis 机械诊断中的几个基本问题 遗传算法进化截止代数分布规律的研究 非对称转子的全息动平衡技术 The Optimization Technique - Based Balancing of Flexible Rotors Without Test Runs 基于影响系数法的柔性转子无试重平衡法 研究遗传算法优化效率的定量评价 A Reduction Method of Rough Set Model 遗传算法在故障特征选择中的应用 研究应用连续小波变换提取机械故障的特征 基于连续小波变换的信号检测技术与故障诊断神经网络在转子动平衡中应用的几个关键问题 A New Practical Modal Method for Rotor Balancing 柔性弯曲转子的特征识别与诊断 Instantaneous Purified Orbit : A New Tool for Analysis of Nonstationary Vibration of Rotor System Using Continuous Wavelet Transform to Detect Impact Component in Machine Fault Diagnosis 机器振动诊断中信号处理方法的研究 Extracting the Characteristic Frequency from Vibration Signal of Rolling Bearing with Self—Organizing Method Partially Blind Source Separation of the Diagnostic Signals with Prior Knowledge 提高故障诊断质量的几种方法 Machine Diagnosis with Independent Component Analysis and Envelope Analysis 应用 Bootstrap 方法构造机械故障特征库 机械信号连续小波系数的统计特征研究 提取机械信号中弱冲击成分的研究 遗传编程在无量纲指标构建中的应用 Some Applications of Statistical Simulation in Engineering Diagnostics 基于小波变换和支持向量机的人脸检测系统 自适应阈值选择和小波消噪方法 研究应用独立分量分析提取机器的状态特征 汽车发动机诊断的统计模拟方法 故障诊断中多传感器信息冗余性的研究 循环统计量方法在滚动轴承故障诊断中的应用 Application of Wavelet Packet Analysis for Fault Detection in Electro—Mechanical Systems Based on Torsional Vibration Measurement 基于冗余信息量的设备行为可预测性的研究 Enhanced Diagnostic Certainty Using Information Entropy Theory Cyclic Statistics in Rolling Bearing Diagnosis 一种贝叶斯诊断网络的拓扑结构 贝叶斯网络推理的一种仿真算法 基于遗传编程和支持向量机的故障诊断模型 二代小波消噪在数字信号处理器中的实时实现应用 全息谱技术诊断热变形不均匀引起的振动故障 回转机械故障诊断中的三维全息谱技术 机械产品的信息化——面向机械装备的信息技术 全息谱技术在现场动平衡前故障诊断中的应用 机械故障诊断的推理规律研究 Translation—Invariant Based Adaptive Threshold Denoising for Impact Signal 基于混沌和符号序列统计的滚动轴承故障诊断 Discussion Authors Reply A Rapid Response Intelligent Diagnosis Network Using Radial Basis Function Network Application of Adaptive Neuro—Fuzzy Inference System in Field Balancing A nonlinear Diagnosis Method of Gear Early Fatigue Crack Sigmoid Model : A Simulation for Inference Process of Engineering Diagnosis 齿轮早期疲劳裂纹的混沌检测方法 An Improved Independent Component Analysis algorithm and Its Application in Preprocessing of Bearing sounds A New Time Series Forecasting Approach Based on Bayesian Least Risk Principle A genetic Algorithm Based Balancing Framework for Flexible Rotors Applications of Chaotic Oscillator in Machinery Fault Diagnosis 息动平衡原理 A New Field Balancing Method of Rotor Systems Based on Holographic and Genetic Algorithm Diagnosis of Subharmonic Faults of Large Rotating Machinery Based on EMD..... 附录

章节摘录

插图：INTRODUCTION Nowadays, the grinding operation is one of the most important metal processing methods. The performance and reliability of modern machine products are seriously influenced by the surface perfection, dimensions!

and geometrical accuracies of their elements, the majority of which are finished by different kinds of grinding operations. In modern automatic grinders it is quite necessary to adopt the on-line surveillance via dynamic signal recognition in order to prevent the degradation and deterioration of workpieces as the result of wheel wear and loss of its cutting ability. In general, the wheel life between two succeeding turning operations is characterized by the variation of grinding sound, increase of grinding forces and the violence of grinding chatter,

which can be easily recognized by experienced operators. But with regard to the automatic in-process recognition of these signals the closest attention is now solicited in order to monitor the performance of wheel and grinder under different grinding conditions and to prognosticate the remaining wheel life. In this paper, a new criterion called the Kullback-Leibler information number based on time-series analysis and information theory is suggested to monitor the performance of wheel

and grinder under different working conditions and to prognosticate the remaining wheel life. The computer flow chart for supervision of the grinding cycles is also designed and tested. PROCEDURE The main aspects for on-line surveillance of a grinding process by means of the Kullback-Leibler information number are as follows: (1)

(1) measurement of the dynamic signals emitted in different stages of grinding process between two succeeding turning operations; (2) A/D conversion of each signal to form the corresponding discrete time series; (3) establishment of the reference models. These models can be autoregressive moving average (ARMA) models or simplified autoregressive (AR) models [1]; (4) storage of the information about these reference models in computer memory, i.e. the values of model coefficients as well as the residual

variance of each model. The more reference models are stored, the better recognition capability the computer will possess; (5) modelling the current tested signal in grinding operation and calculation of the Kullback-Leibler information numbers between this new model and each reference model already stored in computer; (6)

(6) assignment of the tested signal to the category of one of the reference models with minimum values of the Kullback-Leibler number. The computer flowchart is shown in Fig. 1. Its performance is to decide which reference model the tested sequence should belong to, and to establish new reference models. That is to say, the software possesses the self-learning ability and can improve the recognition capability of computer. EXPERIMENTATION

The experiments were carried out using an ordinary cylindrical grinder with hydrostatic main bearings. The materials taken for test pieces were hardened carbon steels marked 45.55 and T8 with hardness from $R=40$ to 60 and diameters from 0.35 to 85 mm. A grinding wheel of GB46ZR2SP. $\phi 500 \times 40 \times 305$ mm and ordinary emulsion fluid were selected. In experiments, the test pieces were fed radially to the wheel without transverse feed. The normal and tangential grinding forces

, vibrational displacement of a special

designed dead centre and grinding sound were measured by the eddy current transducer, dynamic strain gauges and precision sound level meter accordingly as shown in Fig.

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编辑推荐

《机械监测诊断中的理论与方法》适合大学相关专业的教师、研究生，以及从事机械故障诊断研究的科研人员阅读。

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