

# **2021 7th International Conference on Condition Monitoring of Machinery in Non-Stationary Operations (CMMNO 2021)**

**Guangzhou, China  
11 – 13 June 2021**



**IEEE Catalog Number: CFP21AR8-POD  
ISBN: 978-1-6654-3387-7**

**Copyright © 2021 by the Institute of Electrical and Electronics Engineers, Inc.  
All Rights Reserved**

*Copyright and Reprint Permissions:* Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

***\*\*\* This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP21AR8-POD
ISBN (Print-On-Demand):	978-1-6654-3387-7
ISBN (Online):	978-1-6654-3386-0

**Additional Copies of This Publication Are Available From:**

Curran Associates, Inc  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: (845) 758-0400  
Fax: (845) 758-2633  
E-mail: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

CURRAN ASSOCIATES INC.  
**proceedings**  
.com

## Table of Contents

<b>Comparative Study on Energy Efficiency Testing Methods of Different Types of Elevators</b>	1
<i>Zhongxing Li, Guojian Huang, Haixia Ma, Zhenya He</i>	
<b>Vibration Characteristics of Defected Sun Gear Bearing in Planetary Gearbox</b>	5
<i>Yanfei Zhou, Xin Xiong, Jiashuo Zhang, Kezhen Wang</i>	
<b>Study on Gait Stability of Gait With Limitation of Dorsiflexion Based on Wavelet Transform</b>	10
<i>Xinhui Yin</i>	
<b>Experimental Study on Surface Temperature Measurement of IGBT Module</b>	15
<i>Jiancong Mai, Shuai Zhang, Pingyu Zhu, Qi Zhu, Ru Yang</i>	
<b>Dynamic Investigation of Traction Motor Bearings Considering Rotor Eccentricity in a Locomotive</b>	19
<i>Yuqing Liu, Zaigang Chen, Xia Hua, Wei Li</i>	
<b>Application of boundary layer theory to enhanced heat transfer design of clean gas bus cabin</b>	23
<i>Jiajie Ou, Lifu Li</i>	
<b>A New Feature Extraction for Rolling Bearing Using Sparse Representation Based on Improved K-singular Value Decomposition and VMD</b>	27
<i>Jialing Zhang, Jimei Wu</i>	
<b>A novel approach of welding condition monitoring based on pressure signal similarity comparison</b>	32
<i>Ke Fu, Hongcheng Ji, Jiaqi Hao, He Li</i>	
<b>Research on the design of FPGA-based radar signal processing system</b>	36
<i>Hao Wang, Tao Shan, Xingshuai Qiao, Hongyan Cheng</i>	
<b>Simulation of the dynamic cutting force loading on a rotating and feeding spindle</b>	40
<i>Ruijun Liang, Wenfeng Ran, Wenlong Hao, Yang Li</i>	
<b>A Rolling Element Bearing Diagnosis Method Based on Singular Value Decomposition and Squared Envelope Spectrum</b>	47
<i>Lang Xu, Steven Chatterton, Paolo Pennacchi</i>	
<b>Optimization of trajectory planning based on loading robot</b>	52
<i>Houyao Zhu, Qingwen Deng, Wenqiang Wu, Hui Lin, Shuai Li, Chunliang Zhang</i>	
<b>Machinery Fault Detection Using Autoencoder and Online Sequential Extreme Learning Machine</b>	58
<i>Zhe Yang, Jianyu Long, Xiaoman Cai, Jianheng Li, Chuan Li</i>	
<b>Remaining Useful Life Prediction of Aero-Engine Based on PCA-LSTM</b>	63
<i>Hao Li, Zhuojian Wang, Yuan Li, Zhe Li</i>	

<b>A nonlinear dynamic model for the skidding and the over-skidding in industry scale angular contact ball bearing</b>	67
<i>Gao Shuai, Steven Chatterton, Paolo Pennacchi</i>	
<b>Active IR Thermography for Bonding Interface Damage of Glass Curtain Walls</b>	72
<i>Xiaobin Hong, Jinfan Lin, Zeming Ren</i>	
<b>A Hybrid Multivariate Calibration Optimization Method for Visible Near Infrared Spectral Analysis</b>	76
<i>Lina Li, Dengshan Li</i>	
<b>Double microphone blind source separation based on improved joint diagonalization</b>	82
<i>Wenlin Hu, Manlu Huang, Qiaohe Yang, Xun Lu, Xuhong Hu, Jie Wang, Minmin Yuan</i>	
<b>Pseudo-Label Generation Method Based on Wind Turbine SCADA Data</b>	90
<i>Chao Zhang, Yue Wu, Guanghan Zhao</i>	
<b>Signal set expansion based on GAN</b>	95
<i>Guangyao Duan, Luyong Zhang</i>	
<b>System Characteristics Analysis of the Rotor in Axial Piston Pump</b>	99
<i>Fengtao Chen, Xin Xiong, Kezhuang Jiang, Guiqin Li</i>	
<b>Research on thermal imager video recording software for elevator brake wheel</b>	103
<i>Shuangchang Feng, Yanchun Liang, Wang Chen, Wenhao Shen</i>	
<b>The finite element analysis of elastic-plastic contact of single asperity with different materials</b>	108
<i>Zhaoning Sun, Xiaopeng Li, Xiaohai Li</i>	
<b>Study on Interference Method of Fuze Anti - Chaff Based on Electrostatic Characteristics</b>	115
<i>Liping Wang</i>	
<b>Design of the mechanism of power generation side discharge under multi period coupling</b>	122
<i>Zhiyuan Cai, Jiangyan Liu, Dunnan Liu, Tianyi Jin</i>	
<b>Design and Application of HMI System for Robot Based on Vision</b>	126
<i>Lingyun Feng, Yuehua Xu</i>	
<b>Speed tracking of Brushless DC motor based on deep reinforcement learning and PID</b>	130
<i>Puwei Lu, Wenkai Huang, Junlong Xiao</i>	
<b>Testing Method and Experimental Research on Energy Efficiency of Aerostatic Restrictor</b>	135
<i>Qin Luo, Dongsheng Li, Jing Yu, Xiaoyan Shen, Keyan Bai</i>	
<b>Effect of Microstructure Cutting Edge Tool on CFRP Hole Making Quality</b>	141
<i>Xiaonan Jiang, Pingyu Zhu, Shuaibin Wang, Marcelo A. Soto</i>	
<b>Research on Predicting Remaining Useful Life of Equipment Based on Health Index</b>	145
<i>Gengzhe Zheng, LiMing Wu, Tengteng Wen, Chuntao Zheng, Chunpeng Wang, Gengxuan Lin</i>	

<b>Warpage Measurements of Metal Plate Based on Machine Vision</b>	150
<i>Haoyu Zhang, Shun Liu, Nan Zhang, Pingyu Zhu</i>	
<b>Research on the Control of Fatigue Loading System of Wind Turbine Blade Biaxial Hydraulic Actuator</b>	154
<i>Yalong An, Hanbin Xu, Jinguang Zhang</i>	
<b>Modelling of a Novel Compound Screw Mechanism based on Analysis of Dynamics and Faults in Machinery</b>	162
<i>Guiping Lu, Zhensheng Zhong, Zhiyong Xiao, Jiaran Liang, Zhili Xiang, Xindan Qiao</i>	
<b>The separation method of nonlinear blind source for mechanical faults based on kernel parallel factor</b>	167
<i>Zedong Li, Zhinong Li, Shuyang Li, Cheng Yang, Junyong Tao</i>	
<b>Fault diagnosis of aircraft fuel pump based on transfer learning</b>	171
<i>Zaihui Qiu, Yang Miao, Wei Hong, Yuncheng Jiang, Yi Liu, Jun Pan, Xin Li</i>	
<b>Sensor Failure Identification in Industrial Big Data</b>	176
<i>Zhe Li, Cornelius Grieg Dahling, Jingyue Li, Wei Xu</i>	
<b>An experimental investigation on reliability of CFRP packaged FBG sensors with different bonding methods</b>	180
<i>Yongjie Li, Nan Zhang, Zheng Liu, Pingyu Zhu, Zhongwei Liang, Fangyi Li</i>	
<b>Intelligent Diagnosis of Gearbox Based on Spatial Attention Convolutional Neural Network</b>	184
<i>Pengxin Wang, Changkun Han, Liuyang Song, Huaqing Wang, Lingli Cui</i>	
<b>Research on Fault Diagnosis Technology of Non-intrusive Current Detection Electromagnetic valve</b>	190
<i>Dong Ma, Qinhe Gao, Zhihao Liu, Tong Huang</i>	
<b>Research on a new type of shared escort bed based on intelligent manufacturing</b>	195
<i>Kexin Ji, Jiajie Xiong</i>	
<b>Hybrid Modeling and Spectrum Analysis of Helicopter Planetary Gearbox Fault Based on Dynamics</b>	199
<i>Jiao Hu, Niaoqing Hu, Bozheng Wang, Ling Chen, Yang Zhou</i>	
<b>Finite Element Analysis of Microbending Losses for Plain-weave GFRP Packaging Optical Fiber Sensor</b>	205
<i>Pan Liu, Zhecong Lin, Pingyu Zhu, Marcelo A.Soto</i>	
<b>An experimental investigation on reliability of FBG sensors packaged with CFRP</b>	209
<i>Yongjie Li, Nan Zhang, Zheng Liu, Pingyu Zhu, Zhongwei Liang, Fangyi Li</i>	
<b>Design of activation function in speech enhanced deep neural network</b>	213
<i>Xun Lu, Weiyong Li, Minmin Yuan, Yi Zuo, Wenlin Hu, Jie Wang, Zhihao Yan</i>	
<b>Detection and diagnosis of fault roller bearings under variable speed conditions</b>	219
<i>Chao Wang, Kewei Wu, Zhansi Jiang, Zhongyi Song, Shuanhu Wu</i>	

<b>A Novel Assessment Metric for Intelligent Fault Diagnosis of Rolling Bearings with Different Fault Severities and Orientations</b>	225
<i>Bo Zhao, Xianmin Zhang, Zhenhui Zhan, Qiqiang Wu</i>	
<b>Test mass pose measurement using laser displacement sensor</b>	229
<i>Yueqiao Ma, Zongfeng Li</i>	
<b>Deep Residual Shrinkage Networks with Self-Adaptive Slope Thresholding for Fault Diagnosis</b>	236
<i>Zhijin Zhang, He Li, Lei Chen</i>	
<b>An improved cepstrum analysis method to diagnose faults in bearings</b>	240
<i>Jianchun Guo, Yanting Li, Jiawei Xiang</i>	
<b>Simulation Analysis and Quantitative Detection based on Laser Welding Seam Defects with PEC Technique</b>	244
<i>Kuanfang He, Yin Si, Zixiong Xia, Jiangfeng Yong, Jiahe Liang, Wenqing Shi</i>	
<b>Surface Modification of Sensor Packaging Composites with the Dielectric Barrier Discharge in Air</b>	251
<i>Jingjing Liu, Zehui Ding, Shun Liu, Pingyu Zhu</i>	
<b>Research on Intelligent Detection Method of Generalized Relay Box</b>	255
<i>Pu Li, QiuHong Wang, Junjie Chen, Xuesi Li, Yufei Dou</i>	
<b>Experimental Study on Enhancing Thermal Conductivity of Cured GFRP Through Plasma</b>	259
<i>Shun Liu, Zehui Ding, Pingyu Zhu, Jingjing Liu, Meng Lu, Marcelo A.Soto</i>	
<b>Human Reliability Analysis of Virus Detection Equipment Based on Entropy Weighting Method and GRA</b>	263
<i>Ziyu Xie, Xin Liu, Zheng Liu, Pengqing Chen</i>	
<b>Bearing fault diagnosis based on CS-VMD and SSAE</b>	267
<i>Kewei Wu, Chao Wang, Zhansi Jiang, Yang Huang</i>	
<b>Design and Implementation of a New Intelligent Compression Trash Tank</b>	272
<i>Dongqing Wang, Xia Song, Bin Tang</i>	
<b>Attention-based long short-term memory network temperature prediction model</b>	278
<i>Kun Xiao, Shan Tian, Yi Tan, Chao Chen</i>	
<b>Rotor Eccentric Diagnosis of High-Voltage Motor in Nuclear CRF Pump Using Vibration Signals</b>	282
<i>Jiashuo Zhang, Xin Xiong, Yanfei Zhou, Kezhen Wang</i>	
<b>A nonlinearity evaluation based crack location identification for cantilever beam-like structures using different excitation force levels</b>	287
<i>Mian Jiang, Yingwei Kuang, Kuanfang He, Yong Chen</i>	

<b>Research on the design of a data processing-based buzzword mining system for the times</b>	293
<i>Mingxin Wang</i>	
<b>Visual analysis of industrial knowledge graph research based on Citespace</b>	297
<i>Weihua Yang, Dong Xu</i>	
<b>Influence of Adhesive Layer on Performance Parameters of CFRP Packaged FBG Sensors in Use</b>	301
<i>Nan Zhang, Yongjie Li, Pingyu Zhu, Zheng Liu, Pan Liu, Haoyu Zhang</i>	
<b>Research on Indicator Extraction Method for Fault Diagnosis and Prognosis</b>	305
<i>Peng Luo, Niaoqing Hu, Lun Zhang, Yi Yang</i>	
<b>Speech Enhancement using Convolution Neural Network-based Spectrogram Denoising</b>	310
<i>Xuhong Hu, Linhuang Yan, Xun Lu, Yuansheng Guan, Wenlin Hu, Jie Wang</i>	
<b>Evaluation of the Improved Envelope Spectrum via Feature Optimization-gram (IESFOgram) for bearing diagnostics under low rotating speeds</b>	319
<i>Mahsa Yazdanianasr, Alexandre Mauricio, Konstantinos Gryllias</i>	
<b>Author Index</b>	325