## **Table of Contents**

**Preface, Committees, Sponsors** 

## **Chapter 1: Advanced Mechatronics Devices and Systems**

| Thermal Stability Analysis and Optimal Design for a Two-Dimensional Angle Sensor R.J. Li, P. Xu, S.T. Tang, K.C. Fan, Q.X. Huang and P.H. Hu   | 3   |
|--|-----|
| Error Sensitivity Analysis of a Novel A/B Bi-Rotary Head L.J. Fang and L.F. Sun  | 9   |
| Simulations of Engagement Control in Actuated Dry-Clutch: Influence of Frictional Response of Facing Materials   |     |
| A. Senatore, C. D'Auria and M. Pisaturo  | 15  |
| Improve the Performance of Micro Heat Pipe by Surface Modification Y. Luo, S.D. Li, Z.C. Yu and X.D. Wang  | 21  |
| A Research and Design of Intelligent Detecting and Controlling System for Automatic Assembly Force   | 27  |
| X.D. Tan, L.C. Qin and Y.Y. Wu Influence of Parallel and Trapezoidal Wick Structures to the Heat Transfer Capability of  | 21  |
| MHPs   |     |
| Y. Luo, Z.X. Li, Z.C. Yu and X.D. Wang   | 33  |
| Nonlinear Friction Compensation of a Flexible Robotic Joint with Harmonic Drive P.F. Zeng, G.D. Jiang, C. Zou, X. Zhang and C.X. Xie   | 39  |
| Online Prediction Control Model of CO <sub>2</sub> Concentration for <i>Pleurotus eryngii</i> in the Sporocarp Period Based on Matlab and LabVIEW X.Q. Tian, K. Zhang, N. Bai and X.J. Zhu | 45  |
| The Analysis and Design of Closed-Loop Control System for MEMS Vibratory Gyroscopes J.X. Yu, Q. Shi, G.M. Xia, A.P. Qiu, X.H. Yu and Z.H. Pei  | 51  |
| Study on the Slip of Induction Motor in Gasoline Pumping System Y.J. Liu, J.K. Ye, S.Y. Zhan and W.H. Xie  | 58  |
| Numerical Analysis of Thermal Error for a 4-Axises Horizontal Machining Center Y.B. Huang, W. Sun, Q.C. Sun, Y. Ma and H.F. Wang   | 64  |
| Development and Experimental Study of the Online Dynamic Balance System for Grinding Machine   |     |
| X.L. Yun, Z.B. Hu, X.B. Ma, X.S. Mei and G.D. Jiang  | 69  |
| New Designs in Fuel Dispensing System to Control Maximum Flow of Volatile Liquid Y.J. Liu, S.Y. Zhan, J.K. Ye and W.H. Xie   | 75  |
| A Novel Design of Musculoskeletal Bipedal Robot Applied with Bio-Inspired Elastic  |     |
| Actuation F.B. He, R. Bortoletto, Y.D. Liang and E. Pagello  | 81  |
| Integration of Cutting Robot with CAD/CAM System Based on STEP-NC L.J. Fang, L. Li and G.X. Wang   | 93  |
| A Simplified Self-Calibration Method for Cylindrical Grating W.Y. Zhang, W.H. Zhou, D.B. Lao and H.R. Zhu  | 99  |
| <b>Design and Development of Remote Virtual Maintenance Training System</b> W. Hao, L.N. Hao, J.M. Wang, Z.M. Yu and Z.X. Tian   | 105 |
| <b>Designing the Partially Porous Journal Bearings of an Aerostatic Spindle</b> T.Y. Huang, S.C. Shen and S.Y. Hsu   | 110 |
| Application of Hydraulic Transformer on Energy Saving for Boom System of Hybrid Hydraulic Excavator  | 110 |
| Y.X. Yu and K.K. Ahn  Dynamic Thermal-Structure Coupling Analysis and Experimental Study on Ball Screw   | 118 |
| Feed Drive System of Precision Machine Tools C. Ma, J. Yang, X.S. Mei, L. Zhao, H. Shi and D.S. Zhang  | 124 |
|  |     |

## **Chapter 2: Precision Manufacturing**

| Z.X. Xu and H.Y. Guo  | 139 |
|---|-----|
| Fabrication of Functional Gradient Materials Electrode and its Application in Micro-EDM X.P. Li, Y.G. Wang, F.L. Zhao and M.H. Wu   | 151 |
| Machining Allowance Optimal Distribution of Thin-Walled Structure Based on Deformation Control Y.Z. Chen, W.F. Chen, R.J. Liang and T. Feng                                 | 158 |
| Comparative Analysis of Flow Field in Mixed and Non Mixed Gas Electrochemical Machining for Aero-Engine Turbine Blade Cooling Holes Z.Y. Li, X.T. Wei, W.W. Lu and Q.W. Cui | 166 |
| Experimental Evaluation of Cutting Quality of Carbon Fibre Reinforced Polymer with Pulsed Laser   |     |
| L.J. Yang, X.L. Cheng, G.W. Wang, Q.M. Xue, Y. Ding and Y. Wang   | 172 |
| Research on the Machining Error Control and Simulation of the Motor Frame in Vertical Lathe Machining   | 170 |
| X.R. Wang, X. Zhang, H.Z. Lu and D. Wang  | 178 |
| Numerical Optimization of Shrinkage and Warpage on the Injection Molding Process Parameters of Electrical Connector   | 102 |
| Y. Wang, L.Y. Chen, X.M. Yang, Y. Zhao, Z.Y. Xu and X.P. Wang   | 183 |
| Experiments on Electrochemical Micromachining with Ultra-Short Pulse Current X.H. Li, B.B. Xue, S.M. Wang and L.J. Zhao   | 192 |
| Chapter 3: Materials and Machinery  |     |
| The Trapezoid Counterweight Method in Dynamic Balance of Symmetric Flexible Rotor H. Hui, L.N. Hao, Z. Qi and G. Xiang  | 201 |
| Analysis on High-Speed Spindle Online Dynamic Balancing Regulation Characteristics Z. Wang and F.L. Zhu   | 207 |
| Dynamic Modeling and Complexity Analysis of Human Lower Limb under Various Speeds J. Yu, J.Y. Cao and C.G. Li   | 212 |
| Analysis of Imbalance Calculation Method in Dynamic Balancing Machinery J.X. Pian, C.Y. Pu, Z. Wang and Y.W. Qi   | 218 |
| Analysis and Optimum Structure of Deformation Coordination of Crankshaft-Bearing System   |     |
| X.M. You, X.T. Shi, X.G. Ma, G.Y. Chai and G.C. Yang  | 224 |
| High Performance Electrodes for All-Solid-State Supercapacitor Prepared by Using E-Jet Deposition Technique   |     |
| J.S. Liang, S.C. Xu, T.Q. Ren and D.Z. Wang   | 230 |
| Electrohydrodynamic Atomization of Graphene Nano-Suspension<br>D.Z. Wang, L. Feng, Y.L. Wei, J.C. Cao, X.Y. Chen and F. Yu  | 236 |
| Interactive Experience across Modern Age and Tradition: Application of Arduino in Shadow Play   |     |
| K. Yin, Y.H. Ge, H.S. Liu and Y.Q. Yin  | 242 |
| Effects of Imidization Process on the Electric Breakdown Strength of Polyimide Thin Film J.S. Liang, X. Fang, J.H. Yang, T.Q. Ren and D.Z. Wang                             | 248 |
| The Research on the Performance of Gear Lubrication Based on Romax M.W. Xu, W.D. He, F. Zhou and H.J. Li  | 254 |
| Research on Distribution of Internal Load of Tapered Roller Bearing Used in Axle Box of   |     |
| <b>High Speed Train</b><br>Y.G. Wei, G.L. Zhang and K. Xu   | 260 |
| Research on Intelligent Optimization Algorithm for the Hot Press Insulation of Generator<br>Stator Bar  |     |
| X D. Tan, L.H. Kong and D.R. Li   | 265 |

| Dynamic Modeling and Optimal Design of a Horizontal Machining Center Based on Experimental Modal Analysis  V.B. Hung, V. Ma. O.C. Sun, W. Sun, W. D. Yun and V. Sun, W. Sun, W | 271  |
|--|------|
| Y.B. Huang, Y. Ma, Q.C. Sun, W. Sun, W.B. Yue and X. Sun   | 271  |
| Optimization of Gear Modification for Boom and Crowing Mechanism Used in Large Mining Excavator W.D. He, Y.H. Zhang, F.L. Zhang, F. Zhou and G. Hou  | 277  |
| Theoretical and Experimental Study on Mechanical Force of Transformer Coil Short   |      |
| Circuit<br>J. Zhao, Y. Li, S.J. Wang and M.Y. Yan  | 283  |
| Concurrent Topology Optimization of Lightweight Cellular Materials and Structures H.T. Qiao, S.J. Wang and X.R. Lv   | 291  |
| Chapter 4: Measurement Technologies, Data and Signal Processing  |      |
| Preliminary Study of PHM System Based on Data Driven Z.X. Tian, Z. Wei, L.N. Hao, S.B. Liu and B.Y. Qu   | 299  |
| Non-Stationary Signal Purification and Rotor Axis Orbit Feature Extraction under Machine Tool Spindle Cutting Process  |      |
| Z.B. Hu, X.L. Yun, G.D. Jiang, C.J. Chen and X.S. Mei  | 305  |
| Research on Data Acquisition Scheme in PHM System Based on Data Driven Z. Wei, Z.X. Tian, N. Xin, L.N. Hao, S.B. Liu and B.Y. Qu   | 311  |
| Synchronous Measurement of Three-Dimensional Deformations Using Tri-Channel Spatial-Carrier Digital Speckle Pattern Interferometry   | 21.6 |
| Y. Fang, S.J. Wu and L.X. Yang   | 316  |
| Damage Monitoring and Analysis of Fiber-Metal Laminates with an Open Hole Using Digital Image Correlation  |      |
| A.S. Tong, L.Y. Xie, X. Bai, M. Li and W.Y. Meng   | 323  |
| Microdroplet Detection of Precision Dispensing for Miniature Parts Assembly Technology Q.Q. Zhang, X.D. Wang, Z. Xu and P. Zhu   | 328  |
| The Precise Measurement Technology for Manufacturing Error of Cycloidal Gear Used in   |      |
| RV Reducer<br>Y.H. Zhang, X.Y. Wang, W.D. He, F. Zhou and L.Y. Hao   | 334  |
| Handheld, One-Step, and Rapid Electrochemical Biosensor Platform with Smartphone   | 334  |
| Interface  |      |
| J.A. Wang, Z.L. Xia, Y. Su, M.C. Lu, Y. Wan and Y. He  | 340  |
| Simulation for the Separation of VDR Voice Signal Base on the Local-Wave Method C.L. Xu, X.T. Wang and Q. Gai  | 345  |
| A Study on Polarization Pattern of Full Moonlight Based on the Neutral Points and the  |      |
| Meridian<br>Y. Cui, J.Y. Zhao, J.K. Chu, L. Guan and R. Zhang  | 350  |
| A Portable Environmental Detection System Based on Multi-Parameter Integration and   |      |
| Virtual Instrument<br>X.H. Du, Y.H. Liu, X.F. Wu, C.P. Yang and Q.Y. Zhu   | 357  |
| Feature Extraction of Rolling Bearing Based on LMD Energy Feature B.S. Xing and L. Xu  | 363  |
| Online Dynamic Balance Detection Method of High Speed Motorized Spindle Based on   |      |
| LabVIEW Z. Wang and W. Tu  | 369  |