

# Table of Contents

## Guest Editorial

## Chapter I: Machining Technologies and Materials Engineering

|                                                                                                                                                                                                                                     |     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Modeling and Optimization of Laser Direct Joining Process Parameters of Titanium Alloy and Carbon Fiber Reinforced Nylon Based on Response Surface Methodology</b><br>Y. Cai, C. Huang, H.X. Liu, D.D. Meng, Y.W. Wu and X. Wang | 3   |
| <b>Modeling and Optimization of Mask Assisted Laser Transmission Micro Joining Process</b><br>Z.G. Zhao, H.X. Liu, Y. Cai, Y.W. Wu and X. Wang                                                                                      | 10  |
| <b>Experimental Research on Laser Transmission Micro-Joining Based on the Mask</b><br>C.L. Fan, H.X. Liu, Z.G. Zhao, Y.W. Wu and X. Wang                                                                                            | 17  |
| <b>Molten Depth Modeling of Laser Transmission Welding Based on Temperature Distribution of Moving Point Heat Source</b><br>Z. Yan, Y.Y. Lin, H.X. Liu, P. Li and Y. Cai                                                            | 23  |
| <b>Numerical Investigation on Laser-Assisted Flow Forming Process</b><br>L.Y. Sun and C. Yang                                                                                                                                       | 29  |
| <b>Impact Analysis of the Force Environment on the KDP Crystal Harmonic Loss Considering the Frame Surface Topography</b><br>H.R. Wang, H.T. Liu and Y.C. Liang                                                                     | 35  |
| <b>Experimental Study of Laser Direct Joining of Metal and Carbon Fiber Reinforced Nylon</b><br>C. Huang, X. Wang, Y.W. Wu, D.D. Meng and H.X. Liu                                                                                  | 42  |
| <b>Study of Form Control Algorithm in Atmospheric Pressure Plasma Processing</b><br>D. Li, B. Wang, J. Wang and Q. Xin                                                                                                              | 49  |
| <b>Influence of Cracking Damage on Deflection Basin Test Data of FWD</b><br>X. Qiu, X.H. Luo and Q. Yang                                                                                                                            | 55  |
| <b>Molecular Dynamics Simulation of Surface Effect on Tensile Deformation of Single Crystalline Copper</b><br>Q. Gao, Y.B. Guo, Y.C. Liang and Q.C. Zhang                                                                           | 61  |
| <b>Mechanical Properties Comparison of Different La Content in AZ91</b><br>Y.Y. Zhang, C.X. He, H. Yang and J.X. Liu                                                                                                                | 67  |
| <b>Experimental Study on Dry Finishing of Low-Speed WEDM</b><br>T. Wang, Y.M. Lu, S.F. Wang, H.S. Yin and J. Ge                                                                                                                     | 73  |
| <b>Research on Laser-Driven Flyer Microforming in Warm Condition</b><br>Y.J. Ma, X. Wang, P.H. Xu, Q. Zhang, H.X. Liu and Y.X. Gu                                                                                                   | 83  |
| <b>Safety and Reliability of High-Speed Milling Cutter's Evaluation and Control Methods</b><br>B. Jiang, S.Z. Sun, M.H. Zhang, G.L. Cao and B. Sun                                                                                  | 90  |
| <b>Frequency Domain Error Analysis in Ultra-Precision Flycutting</b><br>G.D. Chen, Y.C. Liang, H.R. Wang, Y.Z. Sun and J.X. Chen                                                                                                    | 96  |
| <b>3D Finite Element Simulation of Inclined Cutting of Hardened 45 Steel</b><br>G.H. Li, Y.J. Cai and H.Y. Li                                                                                                                       | 104 |
| <b>Oil Film Flow-State Analysis of Hydrostatic Vertical Guideway of CNC Vertical Lathe Rail Head</b><br>Y.Q. Zhang, Z.Y. Yu, W.W. Li, X.D. Yang, J.P. Shao and X.D. Yu                                                              | 110 |
| <b>Melted Characteristics Effects of Shielding Gas on Laser Deep Penetration Welding</b><br>Q. Wu, L.Y. Xu and Y. Mao                                                                                                               | 116 |
| <b>Control of Solidification Process and Surface Microstructure of Large Size Ingot ZALCu5MnA Alloy</b><br>L.Y. Xu, Q. Wu and Y. Tang                                                                                               | 122 |
| <b>Experimental Study on Ultrasonic Assisted Grinding of C/SiC Composites</b><br>K. Ding, Y.C. Fu, H.H. Su, T. He, X.Z. Yu and G.Z. Ding                                                                                            | 128 |
| <b>Experimental Study on Tertiary Piezoelectric Effect of X-Cut Quartz Crystal</b><br>H.B. Zhang, Z.H. Zhang, Y.D. Jin, H.L. Jiang, L.J. Fan and X.C. Yu                                                                            | 134 |

|                                                                                                                              |     |
|------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Acoustic Properties of Materials for Vibration Reduction and Resistance on Ultra-Precision Machine</b>                    |     |
| D. Huang and Y. Wang                                                                                                         | 140 |
| <b>Research on Ultrasonic Propagation at the Contact Interface in Ultrasonic Machining</b>                                   |     |
| M. Zhang, F. Jiao and Y.Q. Wang                                                                                              | 146 |
| <b>Design and Simulation Analysis of Low Temperature Air Deep Hole Processing System</b>                                     |     |
| H. Peng and Q. Wang                                                                                                          | 154 |
| <b>Experimental Study on a Piezoelectric Energy Generator Excited by Rotating Magnets under Different Holding Conditions</b> |     |
| X.F. Jin, S.Y. Wang, J.W. Kan, F.S. Huang, J. Yu and J. Qian                                                                 | 160 |
| <b>Design of a Detecting System for the Welding Surface of Forging Steel Structure Piston Based on Ultrasonic</b>            |     |
| H.Y. Zhang, S.P. Zhai, M.M. Qu and P. Zhai                                                                                   | 166 |
| <b>A Highly-Efficient Method of Manufacturing Metal Fiber</b>                                                                |     |
| Z.F. Chen, L. Zhang and B.Y. Ye                                                                                              | 173 |

## **Chapter II: Mechanical Engineering and Engineering Design**

|                                                                                                                                               |     |
|-----------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Face 3D Modeling Based on Projective Rectification</b>                                                                                     |     |
| K. Zhang and Z. Gao                                                                                                                           | 181 |
| <b>Parametric Design of Key Components in Downhole Motor</b>                                                                                  |     |
| S.Z. Zhou and H.Y. Zeng                                                                                                                       | 187 |
| <b>Research and Application of PV Intelligent Control System of Sustainable Supply</b>                                                        |     |
| Z.X. Wang, Y.G. Wei and Y.L. Song                                                                                                             | 193 |
| <b>Study on the Influences of the Structural Parameters of Hydraulic Engine Mounts on their Vibration Isolation Characteristics</b>           |     |
| Q. Li, Y. Sun, Y.Y. Huang, G. He and D.L. Zhu                                                                                                 | 200 |
| <b>Strength Calculation Method and Parametric Method of the Turbine Shaft</b>                                                                 |     |
| S.Z. Zhou and W.J. Yi                                                                                                                         | 206 |
| <b>The Study on the Effect of Driving Parameters on the Movement of the Stick-Slip Driving Stage</b>                                          |     |
| B.W. Zhong, Z.H. Wang, Z.Q. Jin and L.N. Sun                                                                                                  | 212 |
| <b>Research of Matching Power for Photovoltaic Charging Control System</b>                                                                    |     |
| X.S. He, Z.C. Dai, C.F. Gao and S.T. Deng                                                                                                     | 220 |
| <b>The Theoretical Analysis and Experimental Study on the Distribution Characteristics of Motion Parameters in the Process of Honing Gear</b> |     |
| C. Zhang, G.X. Liang, M. Lv and S.Y. Wang                                                                                                     | 225 |
| <b>Analysis of a 3-DOF Micro-Positioning Stage</b>                                                                                            |     |
| D.D. Zhai, S.X. Fan and D.P. Fan                                                                                                              | 234 |
| <b>Research on Elastic Damping Control Strategy at High Speed for a Vehicle Electronic Power Steering System Stability</b>                    |     |
| X.L. Ma, Y.F. Guo, P. Shi and Y. Guo                                                                                                          | 240 |
| <b>Experiment and Optimization of Settling Effect of Drip Streaming Filter</b>                                                                |     |
| S.Z. Wu and H. Yang                                                                                                                           | 246 |
| <b>Comparison of Several Common Types of Grease Performance Based AR 2000ex Remoter</b>                                                       |     |
| C.X. He, S.Z. Wu, H. Yang and J.X. Liu                                                                                                        | 254 |
| <b>The Connector Blanking Fracture Surface Quality Prediction in Progressive Stamping Based on Support Vector Machine</b>                     |     |
| L.Z. Gu, L. Wang and T.Q. Zheng                                                                                                               | 263 |
| <b>Diamond-Bead Wire Classification and Spectrum with POS Part I: Classification with Process and Object</b>                                  |     |
| L.Z. Gu and S.J. Wei                                                                                                                          | 269 |
| <b>Study on Geometrical and Working Properties of the Parabolic Moldboard</b>                                                                 |     |
| P. Li and L.Z. Gu                                                                                                                             | 275 |
| <b>The Optimal Design of Composite Bead Wire Saw Frame Based on SUMT</b>                                                                      |     |
| L.Z. Gu, P. Li and T.M. Xiang                                                                                                                 | 282 |

|                                                                                                                                      |     |
|--------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Model Construction and Finite Element Simulate Based on Experiment Study of Magneto Rheological Finished Machine</b>              | 288 |
| H. Yang, P. Li, L.Z. Gu and H.J. Guo                                                                                                 |     |
| <b>Research on Nonlinear Driving Control and Driving Force Calibration of Pure Electric Vehicle</b>                                  | 297 |
| H.B. Zhou, J.B. Cao, Z.X. Zhou, T. Wang, L.L. Jin and X.L. Yu                                                                        |     |
| <b>How Coupler-Knuckle's Surface S Angle Impact on Coupler Operation Performances</b>                                                | 306 |
| B.H. Lu, W.Y. Wei and B.Z. Qu                                                                                                        |     |
| <b>Research on Energy Recovery Damping Device of Vehicle Based on E-ACE</b>                                                          | 312 |
| Y.Q. Cai, J.B. Cao, Z.Y. Liu, S.J. E, Z.Y. Wu and H.B. Zhou                                                                          |     |
| <b>Research on Brake Shoe Eccentric Wear Mechanism by Analytical Method and Virtual Experiment</b>                                   | 318 |
| B.Z. Qu, H.B. Zhang, B.H. Lu and Z.M. Liu                                                                                            |     |
| <b>Chaotic Particle Swarm Optimization for Automatic Surface or Curve Localization</b>                                               | 324 |
| J.F. Wu and D.L. Qin                                                                                                                 |     |
| <b>Control System Design of New Nanoelectric Boiler</b>                                                                              | 329 |
| J.F. Shen, H.P. Luo, J.B. Cao, R.K. Wang, S.J. E and C. Xu                                                                           |     |
| <b>Design of Body Structure for New Type Lightweight Electric Vehicle</b>                                                            | 335 |
| L.X. Wang, T.F. Zhao, J.B. Cao, J.F. Shen, Y.B. Xiao and Z.X. Zhou                                                                   |     |
| <b>Design of Experimental Apparatus for Asynchronous Motor Principle</b>                                                             | 341 |
| Y. Shen, J.B. Cao, X.H. Zhu, X.J. Lei, Q.L. Ye, M.J. Yan, K. Chen and Z. Gao                                                         |     |
| <b>Research on MRF Shear Stress Measurement Method under Non-Uniform Magnetic</b>                                                    | 347 |
| S.Q. Ren, C.F. Gao, P. Huang, X.S. He, H.Y. Wang and W.Z. Chen                                                                       |     |
| <b>Diamond-Bead Wire Classification and Spectrum with POS Part II: Classification with Structure and Spectrum with POS</b>           | 351 |
| L.Z. Gu and S.J. Wei                                                                                                                 |     |
| <b>Research on Non-Circular Gear Hobbing Simulation Based on Piecewise Cubic Spline Fitting</b>                                      | 357 |
| D.Z. Li, L. Xia, Y.Y. Liu and J. Han                                                                                                 |     |
| <b>Linear Motor Control Algorithm and Experimental Research Based on Feedforward Fuzzy PID</b>                                       | 363 |
| L. Xia, J. Qiu and J. Han                                                                                                            |     |
| <b>Design on Measuring System of New Type Electrical Resistivity Imaging Exploring Ground Instrument</b>                             | 369 |
| Y. Jiao, J. Wang and G. He                                                                                                           |     |
| <b>Design and Experiment of Hand-Push Vibration Picking Machine of Lowbush Blueberry</b>                                             | 375 |
| Y.D. Bao and Y.L. Guo                                                                                                                |     |
| <b>Research on the Kinematic Characteristics of Digging Tree Mechanism of Tree Transplanter</b>                                      | 381 |
| D.J. Zhao, Y.L. Guo and W.L. Song                                                                                                    |     |
| <b>Study on Modal Change Dual Planetary Composite Transmission System</b>                                                            | 388 |
| X.Z. Zhao, X.G. Wang and Y.M. Wang                                                                                                   |     |
| <b>Modal Analysis around the Sun Wheel Non Equidistant Arrangement of Double Branch</b>                                              | 395 |
| X.Z. Zhao, X.G. Wang and Y.M. Wang                                                                                                   |     |
| <b>Project Decision-Making for Conceptual Design Based on Rough Set</b>                                                              | 402 |
| M.H. Yuan, S. Cheng, Z.Y. Dai and A.M. Ji                                                                                            |     |
| <b>Capture Process Simulation for a Prone-Cone Microsatellite Docking Mechanism</b>                                                  | 411 |
| Y. Dai, R.D. Ma, Y.T. Yu and B.C. Xie                                                                                                |     |
| <b>Numerical Research on High-Strength Rectangular Section Steel Tube in Rotary-Draw Bending</b>                                     | 417 |
| Z.W. Xing, Z.W. Xu, H.L. Yang and C.X. Lei                                                                                           |     |
| <b>Modeling of Harmonic Drive System with Low-Frequency Resonance</b>                                                                | 424 |
| M. Hei, Q.K. Zhou, H.B. Liao, S.X. Fan and D.P. Fan                                                                                  |     |
| <b>The Strength Reliability Analysis at Connecting Region of Cylinder and Skirt of Coke Tower Based on Stochastic Finite Element</b> | 431 |
| Y.X. Zhang, Q. Gao and X.Z. Xu                                                                                                       |     |
| <b>Rotational Velocity Influence Research on Pressure Field of Hydrostatic Bearing with Constant Flow</b>                            | 437 |
| C.X. Dai, J.P. Shao, Y.Q. Zhang, X.D. Yu and B. Wu                                                                                   |     |

|                                                                                                                                                                                                                          |     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Research on the Adaptive Zero Phase Error Tracking and Proportion Composite Controller of Continuous Rotary Electro-Hydraulic Servo Motor</b><br>X.J. Wang, G.T. Sun, C.F. Xian, S. Li, J. Cao, C.L. Wan and L.W. Xiu | 443 |
| <b>Fractional Order PID Control of Railway Rescue Crane Leveling System</b><br>J.P. Shao, L. Zhang, Z.H. Jin and X.D. Yang                                                                                               | 449 |
| <b>Study on Control of Automatic Feeding in Condom Detection Line</b><br>Z. Ying and Y.L. Fu                                                                                                                             | 456 |

### **Chapter III: Industrial Robot Technology**

|                                                                                                                                               |     |
|-----------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>A sEMG Recording System</b><br>Y.S. Gao, J. Bai, S.X. Wang, J. Zhao and X.Y. Li                                                            | 465 |
| <b>Design of Fruit Picking Device Based on the Automatic Control Technology</b><br>D.H. Zhao, H. Zhang and J.X. Hou                           | 471 |
| <b>Design of New-Style Book Trolley Based on Electric Drive for Library</b><br>Z. Liu, T.F. Zhao, J.B. Cao, L.L. Jin, J.J. Chen and J.W. Tang | 478 |
| <b>Design of Underwater Welding Robot Used in Nuclear Plant</b><br>X.M. Lv, Y.F. Liu, H.B. Gao, L. Ding, J.G. Tao, K.R. Xia and Z.Q. Deng     | 484 |
| <b>Kinematics of a 6-DOF Feeding and Unloading Manipulator</b><br>D.X. Zhao, E.C. Di, G.Z. Shou and Y.Q. Gu                                   | 490 |
| <b>Modeling and Motion Control of Hydraulic Biped Robot</b><br>J.P. Shao, B.W. Gao and J.Y. Li                                                | 496 |
| <b>Motion Control for a Stingray-Like Robotic Fish with Undulating Pectoral Fins</b><br>Y.W. Wang, B.T. Gu, J.B. Tan and P.F. Sang            | 502 |

### **Chapter IV: Computer Integrated Manufacturing System and Contemporary Integrated Manufacturing System**

|                                                                                                                                                  |     |
|--------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>A Kind of Active Control Damping Shock Absorber</b><br>H. Yang, P. Li, L.Z. Gu and H.J. Guo                                                   | 511 |
| <b>Adaptive Video Image Enhancement Algorithm Based on FPGA Design</b><br>L.M. Wu, S.L. Yang, F.J. Li, X. Luo and B.J. Li                        | 516 |
| <b>Application Analysis of Machining Simulation and Post-Processing of NC Turning Center</b><br>S.Y. Ge, X.H. Qiao, Y. Ye, H.H. Chen and Y.X. Li | 522 |
| <b>Bearing Check Analysis for Automobile Transmission Based on the Software MASTA</b><br>Y.X. Li, L.H. Jin, J.L. Sheng and F.J. Yu               | 528 |
| <b>Cross Language Query Expansion Approach for CIMS Based on Weighted D-S Evidence Theory</b><br>X.B. Wang, F. Zhao, X. Li and R.H. Zhang        | 534 |
| <b>Cutting Data Modeling Based on Artificial Neural Network</b><br>J. Wang, F.Q. Yu and F.H. Wu                                                  | 544 |
| <b>Design and Implementation of Keyboard Module in V-Groove CNC System Based on LPC1343</b><br>J.B. Luo, J.Q. Liu, W.Q. Gao and X.D. Chen        | 550 |
| <b>Design of Virtual Machine Assembly Simulation System in Single-Channel Immersion</b><br>J. Li, S.S. Bai, Y.L. Wang, P. Xi and B.Y. Li         | 556 |
| <b>Development of Interface Card Drivers Based on Matlab/xPC Target</b><br>Y.L. Bi and D. Yang                                                   | 563 |
| <b>FRACAS Based Failure Information Management for High-Speed Train</b><br>B.Z. Qu, B.H. Zhang and B.H. Lu                                       | 569 |
| <b>Hardware Development of CNC System Based on OMAPL138 and FPGA</b><br>J.J. Li, J.Q. Liu, P. Zhang and W.Q. Gao                                 | 575 |
| <b>Intelligent Testing System for AC Load Based on PLC</b><br>Y.X. Chu, Y.L. Zou and J. Zhang                                                    | 581 |

|                                                                                                                                |     |
|--------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Precision Measurement and Error Evaluation of Connecting Rod Standard Gauge Block Based on CMM</b>                          | 587 |
| W.M. Pan, N.N. Kong and X. Ye                                                                                                  |     |
| <b>Prediction of Surface Roughness Based on Least Square Support Vector Machine in Low-Frequency Vibration Cutting Process</b> | 592 |
| W.W. Du, L.Z. Gu and J.T. Wang                                                                                                 |     |
| <b>Fuzzy Self-Tuning PID Controller for Pressure Control in VCM</b>                                                            | 598 |
| Y.Y. Liu, F.P. Wan, H.G. Zhang, Z.Y. Zhang and Q.X. Hu                                                                         |     |

## **Chapter V: Other Related Topics**

|                                                                                                                 |     |
|-----------------------------------------------------------------------------------------------------------------|-----|
| <b>A Probability Distribution Model for Optimal Selecting Cooperators in Supply Chains</b>                      | 607 |
| G.R. Chen and J.L. Deng                                                                                         |     |
| <b>A Resilient Novel Compressed-Domain Audio Recognition Method for Anti-Linear Speed Change</b>                | 613 |
| L.M. Wu, W. Han, Y.F. Li, S.B. Zhou and S.C. Chen                                                               |     |
| <b>A Sequential Numbering Power Flow Calculation Method for Distribution Network</b>                            | 619 |
| A.B. Meng and Q.Y. Huang                                                                                        |     |
| <b>A Study on Energy Consumption Optimization for Cooperative Beamforming in Wireless Sensor Networks</b>       | 625 |
| G.Y. Yang, X. Gan, T. Zheng and Z.Y. Ma                                                                         |     |
| <b>Analysis and Evaluation of Artillery Fire Simulation Test</b>                                                | 632 |
| T. Gao, C. He, Z.J. Fan and H.L. Guo                                                                            |     |
| <b>Conceptual Design of Mobile Phone Based on TRIZ Theory</b>                                                   | 638 |
| J.Y. Zhang, J.G. Jiang, Q. Lv and D.Y. Xu                                                                       |     |
| <b>DCM Oriented Operation and Maintenance Expense Model for High-Speed Train</b>                                | 644 |
| B.H. Lu and Y.K. Li                                                                                             |     |
| <b>Determination Method of Optimal Preventive Maintenance Measure of Based on Decision Matrix Principle</b>     | 650 |
| X. Qiu, Q. Yang and S.L. Xiao                                                                                   |     |
| <b>Diagnosis and Recognition of Pavement Structural Defects Based on Acoustic Emission Principle</b>            | 656 |
| G. Shen, Y.J. Hu, R.F. He and X. Qiu                                                                            |     |
| <b>Finite Element Simulation Application for Vibration Characteristic of Violin</b>                             | 662 |
| C.Z. Zhang, B.Y. Ye, X.Z. Hu, X.Z. Zhao and Y.F. Cao                                                            |     |
| <b>GA-Based Proactive-Reactive Scheduling Mechanism for a Flexible Job Shop Problem under Multi-Uncertainty</b> | 668 |
| J.L. Wang, J. Zhang and W. Qin                                                                                  |     |
| <b>Identification Control Based on the 2.4 GHz Active Technology</b>                                            | 676 |
| Y. Hong                                                                                                         |     |