### Table of Contents – Part I

# Recent Advances in Research and Application of Modern Mechanisms

Task-Oriented Design Method and Experimental Research ofSix-Component Force SensorJiantao Yao, Wenju Li, Hongyu Zhang, Yundou Xu,and Yongsheng Zhao	1
Mobility Analysis of Two Limited-DOF Parallel Mechanisms Using Geometric Algebra Xinxue Chai and Qinchuan Li	13
Design and Kinematic Analysis of a Novel Flight Simulator Mechanism Sheng Guo, Dian Li, Huan Chen, and Haibo Qu	23
Performance Indices for Parallel Robots Considering Motion/Force Transmissibility Fugui Xie, Xin-Jun Liu, and Jie Li	35
Instantaneous Motion of a 2-RCR Mechanism with Variable Mobility Xiang Liu, Jingshan Zhao, and Zhijing Feng	44
Rehabilitation Robotics	
Mechatronic Design of an Upper Limb Prosthesis with a Hand Lei He, Caihua Xiong, and Keke Zhang	56
Synergistic Characteristic of Human Hand during Grasping Tasks in Daily Life	67

 UKF-SLAM Based Gravity Gradient Aided Navigation
 77

 Meng Wu and Ying Weng
 77

 Fuzzy Entropy-Based Muscle Onset Detection Using Electromyography
 89

 Ming Lyu, Caihua Xiong, Qin Zhang, and Lei He
 89

Experimental Study on Cutter Deflection in Multi-axis NC Machining .. 99
 Xianyin Duan, Fangyu Peng, Rong Yan, Zerun Zhu, and Bin Li

#### **Underwater Robotics and Applications**

A Visual Measurement of Fish Locomotion Based on Deformable Models Chunlei Xia, Yan Li, and Jang-Myung Lee	110
Design and Pressure Experiments of a Deep-Sea Hydraulic Manipulator System Zhang Qifeng, Zhang Yunxiu, Huo Liangqing, Kong Fandong, Du Linsen, Cui Shengguo, and Zhao Yang	117
Optimal Sensors Deployment for Tracking Level Curve Based on Posterior Cramér-Rao Lower Bound in Scalar Field Wentao Zhao, Jiancheng Yu, Aiqun Zhang, and Yan Li	129
Path Planning Method of Underwater Glider Based on Energy Consumption Model in Current Environment Yaojian Zhou, Jiancheng Yu, and Xiaohui Wang	142
Visual Features Extraction and Types Classification of Seabed Sediments Yan Li, Chunlei Xia, Yan Huang, Liya Ge, and Yu Tian	153

# **Agricultural Robot**

Cymbal Piezoelectric Micro Displacement Actuator Characteristics Analysis	161
FEM Analysis and Parameter Optimization of a Linear Piezoelectric Motor Macro Driven	171
Finite Element Study on the Cylindrical Linear Piezoelectric Motor Micro Driven Zhang Tiemin, Cao Fei, Li Shenghua, Wen Sheng, and Liang Li	179
Friction Experiment Study on the Standing Wave Linear Piezoelectric Motor Macro Driven Li Liang, Tiemin Zhang, Penghuan Huang, and Debing Kong	187
Research on Intelligent Mobile Platform Base on Monocular Vision and Ultrasonic Sensor	197

A Novel Robot Leg Designed by Compliant Mechanism Huai Huang, Yangzhi Chen, and Yueling Lv	204
Master-Slave Gesture Learning System Based on Functional Electrical Stimulation	214
A Study of EMG-Based Neuromuscular Interface for Elbow Joint Ran Tao, Sheng Quan Xie, and James W.L. Pau	224
Towards Enhancing Motor Imagery Based Brain-Computer Interface Performance by Integrating Speed of Imagined Movement Tao Xie, Lin Yao, Xinjun Sheng, Dingguo Zhang, and Xiangyang Zhu	234
An Exoskeleton System for Hand Rehabilitation Based on Master-Slave Control	242
Anthropometric and Anthropomorphic Features Applied to a Mechanical Finger Alejandro Prudencio, Eduardo Morales, Mario A. García, and Alejandro Lozano	254
Design and Development of a Rotary Serial Elastic Actuator for Humanoid Arms	266
Human Manipulator Shared Online Control Using Electrooculography Jinhua Zhang, Baozeng Wang, Jun Hong, Ting Li, and Feng Guo	278
ET Arm: Highly Compliant Elephant-Trunk Continuum Manipulator Yunfang Yang and Wenzeng Zhang	288
Design of an Anthropomorphic Prosthetic Hand with EMG Control Nianfeng Wang, Kunyi Lao, and Xianmin Zhang	300
Hexapod Walking Robot CG Analytical Evaluation X. Yamile Sandoval-Castro, Eduardo Castillo-Castaneda, and Alejandro A. Lozano-Guzmán	309
The Design and Analysis of Pneumatic Rubber Actuator of Soft Robotic Fish Jinhua Zhang, Jiaqing Tang, Jun Hong, Tongqing Lu, and Hao Wang	320
Flexible Flying-Wing UAV Attitude Control Based on Back-Stepping, Adaptive and Terminal-Sliding Mode Yinan Feng, Xiaoping Zhu, Zhou Zhou, and Yanxiong Wang	328

Landing Control System Design for a Flying-Wing Aircraft Based on	340
ADRC Yanxiong Wang, Xiaoping Zhu, Zhou Zhou, and Zhuang Shao	540
Smartphone-Controlled Robot Snake for Urban Search and Rescue Yifan Luo, Jinguo Liu, Yang Gao, and Zhenli Lu	352
Service Robotics	
Design of a Continuum Wearable Robot for Shoulder Rehabilitation Kai Xu, You Wang, and Zhixiong Yang	364
Robust Control with Dynamic Compensation for Human-Wheelchair	0.70
System Víctor H. Andaluz, Paúl Canseco, José Varela, Jessica S. Ortiz, María G. Pérez, Flavio Roberti, and Ricardo Carelli	376
A Patient-Specific EMG-Driven Musculoskeletal Model for Improving the Effectiveness of Robotic Neurorehabilitation Ye Ma, Sheng Quan Xie, and Yanxin Zhang	390
Performance Analysis of Passenger Vehicle Featuring ER Damper with Different Tire Pressure	402
Development of Targeting Detection Module and Driving Platform at a Moving Target System Ki-Ho Yu, Seok-Jo Go, Min Kyu Park, Tae-Hoon Kim, and Min-Cheol Lee	410
A Nonlinear Control of 2-D UAVs Formation Keeping via Virtual	
Structures	420
Research of Cooperative Control Method for Mobile Robots Chang-Jun Woo, Jae-Hoon Jung, and Jang-Myung Lee	432
A Locomotion Driving of the Capsule Robot in Intestinal Tract Zhou Hongfu	438
Multi-agent Coordination for Resource Management of Netted	
Jamming Wang Xu, Jindan Chang, Xiaowei Shi, and Guangjie Wu	446
Simulation of Mobile Robot Navigation Using the Distributed Control Command Based Fuzzy Inference Mingoo Kim and Taeseok Jin	457

Robotics and Road Transportation: A Review José A. Romero, Alejandro A. Lozano-Guzmán, Eduardo Betanzo-Quezada, and Carlos S. López-Cajún	467
Exploration of Unknown Multiply Connected Environments Using Minimal Sensory Data Reem Nasir and Ashraf Elnagar	479
Navigation System Development of the Underwater Vehicles Using the GPS/INS Sensor Fusion Won-Suck Choi, Nhat-Minh Hoang, Jae-Hoon Jung, and Jang-Myung Lee	491
Component-Based System Integration Using Proper Augmented Marked Graphs	498
Author Index	511

# Table of Contents – Part II

#### **Parallel Robotics**

Kinematics Dexterity Analysis and Optimization of 4-UPS-UPU Parallel Robot Manipulator Guohua Cui, Haiqiang Zhang, Feng Xu, and Chuanrong Sun	1
Inverse Dynamics Analysis of a 6-PSS Parallel Manipulator Weiyuan Xu, Yangmin Li, Song Lu, and Xiao Xiao	12
Elastodynamics of the Rigid-Flexible 3-RRR Mechanism Using ANCF Method Xuchong Zhang and Xianmin Zhang	24
Kinematic Analysis and Control of a 3-DOF Parallel Mechanism Hongyang Zhang and Xianmin Zhang	36
Experimental Study on Joint Positioning Control of an Ultrasonic Linear Motor Driven Planar Parallel Platform Jiasi Mo, Zhicheng Qiu, Junyang Wei, and Xianmin Zhang	48
Stiffness Modeling and Optimization Analysis of a Novel 6-DOF Collaborative Parallel Manipulator Yao Liu, Bing Li, Peng Xu, and Hailin Huang	60
Experimental Characterization of Self-excited Vibration of a 3-RRR Parallel Robot	72
Design of Less-Input More-Output Parallel Mechanisms Huiping Shen, Xiaorong Zhu, Lifang Dai, and Jiaming Deng	81
Type Synthesis Approach for 2-DOF 1T1R Parallel Mechanisms Based         on POC         Ju Li, Hongbo Yin, Huiping Shen, Lifang Dai, Xiaomeng Ma,         and Jiaming Deng	89
Error Modeling and Simulation of a 2- DOF High-Speed Parallel Manipulator	100

#### **Robot Vision**

Fuzzy PD Compliance Control of 6-DOF Robot Using Disturbed Force	
Sense	111
Zhang Tie, Wang Bo, and Lin Junjian	

Research Scheduling Problem of Job-Shop Robotic Manufacturing Cell with Several Robots	119
Research on Robotic Trajectory Automatic Generation Method for Complex Surface Grinding and Polishing Shengqian Li, Xiaopeng Xie, and Litian Yin	124
The Control System Design of A SCARA Robot Nianfeng Wang, Jinghui Liu, Shuai Wei, Zhijie Xu, and Xianmin Zhang	136
Trajectory Planning with Bezier Curve in Cartesian Space for Industrial Gluing Robot Zhijie Xu, Shuai Wei, Nianfeng Wang, and Xianmin Zhang	146
CogRSim: A Robotic Simulator Software Yao Shi, Chang'an Yi, Yuguang Yan, Deqin Wang, Guixin Guo, Junsheng Chen, and Huaqing Min	155
A Study of Positioning Error Compensation Using Optical-Sensor and Three-Frame	167
An Ultrasonic Instrument for Osteoporosis Detecting Zhou Hongfu, Zhang Zheng, Lin Chengquan, Juliana Tam M.Y., Zhuang Zhenwei, and Yao Xinpeng	175
Avoiding of the Kinematic Singularities of Contemporary Industrial Robots Tadeusz Szkodny	183

#### Mechatronics

A Review of 3-D Reconstruction Based on Machine Vision Hong Jin, Fupei Wu, Chun Yang, Lian Chen, and Shengping Li	195
Research on Surface Mounted IC Devices Inspection Based on Lead's Features	204
A Fast Coplanarity Inspection System for Double-Sides IC Leads Using Single Viewpoint Qiusheng Zhong, Xianmin Zhang, and Zhong Chen	216
An Adaptive Enhancement Algorithm of Materials Bag Image of Industrial Scene	226

A Stereo Visual Interface for Manipulating the Grasping Operation of a Fruit-Harvesting Robot Baixin Liu, Liang Gong, Qianli Chen, Yuanshen Zhao, and Chengliang Liu	239
Effects of Camera's Movement Forms on Pollutant's Automatic Extraction Algorithm	245
Calibration of a Robot Vision System Coupled with Structured Light: Method and Experiments	256
A Contour Detection Approach for Mobile Robot Kun Ai, Zhiqiang Cao, Xilong Liu, Chao Zhou, and Yuequan Yang	265
Accuracy of Determining the Coordinates of Points Observed by Camera	273
Localization Using Vision-Based Robot Yeol-Min Yun, Ho-Yun Yu, and Jang-Myung Lee	285
Motion Estimation Algorithm for Blurred Image Using Gradient Filter Qinghua Lu, Wei Wei, and Weirong Kong	290
Design of a Stereo Handheld Camera Tool for Single Port Laparoscopy Kai Xu, Zhengchen Dai, Bo Feng, and Jiangran Zhao	299
A Robust and Precise Center Localization Method for the Strip Target on Microscopic Image Jindong Yu and Xianmin Zhang	311
The Application of Independent Component Analysis Method on the Mura Defect Inspection of LCD Process Xin Bi, Xiaoping Xu, and Jinhua Shen	321
Industrial Robotics	

Modeling of Temperature Control for an Intraperitoneal Hyperthermic	
Chemotherapy Machine	331
Teng Wang, Xinjun Sheng, Jianwei Liu, Qiumeng Yang,	
and Xiangyang Zhu	

A Diffraction Based Modified Exponential Model for Device-Free Localization with RSS Measurements Nanyong Jiang, Kaide Huang, Yao Guo, Guoli Wang, and Xuemei Guo	342
A Novel Mathematical Piezoelectric Hysteresis Model Based on Polynomial Jingiang Gan and Xianmin Zhang	354
Characterization of Presliding with Different Friction Models Yunzhi Zhang, Xianmin Zhang, and Junyang Wei	366
Fieldbus Network System Using Dynamic Precedence Queue (DPQ) Algorithm in CAN Network Hwi-Myung Ha, Wang ZhiTao, and Jang-Myung Lee	377
Research and Implement of 3D Interactive Surface Cutting Based on the Visualization Toolkit Guoxian Feng, Zhanpeng Huang, and Tao Chen	386
A Model Integration Architecture and Language in Computer Numerical Control System Development Xin Huang, Fang Li, Z.H. Wu, Q.Y. Chen, E.B. Liu, X.Y. Duan, Ping Li, and Z.W. Deng	392
Design and Implementation of High-Speed Real-Time Communication Architecture for PC-Based Motion Control System Jian Hu, Hui Wang, Chao Liu, Jianhua Wu, and Zhenhua Xiong	402
Hydraulic Actuator with Power Line Communication for Valve Remote Control System	414
Development of High Velocity Flying Touch Control Algorithm for Hot Rolling	424
A New Dynamic Modelling Algorithm for Pneumatic Muscle Actuators Jinghui Cao, Sheng Quan Xie, Mingming Zhang, and Raj Das	432
Multi-channel Transmission Mechanism Based on Embedded Motion Control System Hui Wang, Chao Liu, Jianhua Wu, Xinjun Sheng, and Zhenhua Xiong	441
A Method to Construct Low-Cost Superficial Tactile Array Sensors Thomas Cobb, Muhammad Sayed, and Lyuba Alboul	453

Enhanced Positioning Systems Using Optical Mouse Sensors Mingxiao He, Xuemei Guo, and Guoli Wang	463
A Novel Silicon Based Tactile Sensor on Elastic Steel Sheet for Prosthetic Hand Chunxin Gu, Weiting Liu, and Xin Fu	475
Development of a Compliant Magnetic 3-D Tactile Sensor with AMR Elements Ping Yu, Xiaoting Qi, Weiting Liu, and Xin Fu	484

# System Optimization and Analysis

Elastic Dynamic Analysis on the Scraping Paste Mechanism of the Printing Equipment for Silicon Solar Cells Jinglun Liang, Xianmin Zhang, Liangchun Cui, Jiapeng Han, and Yongcong Kuang	492
Covariant Decomposition of the Three-Dimensional Rotations Clementina D. Mladenova, Danail S. Brezov, and Ivailo M. Mladenov	504
Structure Performance Improvement of Parallel Mechanisms by Optimizing Topological Configurations Jiaming Deng, Huiping Shen, Ju Li, Xiaomeng Ma, and Qingmei Meng	512
Towards a Dynamic Based Agents Architecture for Cellular Networks Optimisation: Cell Breathing Dahi Zakaria Abd El Moiz and Mezioud Chaker	522
Modified Formula of Mobility for Mechanisms Wenjuan Lu, Lijie Zhang, Yitong Zhang, Yalei Ma, and Xiaoxu Cui	535

#### Mechanism Design

A Long Distance Polar Rover with Multifunctional Wind Energy Unit Jicheng Liu, Lingyun Hua, Jie Ma, Zili Xu, and Pange Jiang	546
DSE Stacker: Close-Packing Stacker with Double-Screw Elevating for Reagent Dispenser Dan Wang, Wenzeng Zhang, and Zhenguo Sun	555
Topological Design of Hinge-Free Compliant Mechanisms Using the Node Design Variables Method Jinqing Zhan, Kang Yang, and Zhichao Huang	567
Research on Lightweight Optimization Design for Gear Box Guoying Yang, Jianxin Zhang, Qiang Zhang, and Xiaopeng Wei	576

Design and Analysis of a Novel XY Micro-positioning Stage Used	586
Corrugated Flexure Beams	
Nianfeng Wang, Xiaohe Liang, and Xianmin Zhang	
Author Index	597