## CONTENTS

### NONLINEAR CONTROL

**DSCC2013-3722** .......................................................... V003T34A001  
Invariance Control of a Class of Cascade Nonlinear Systems With Input Unmodeled Dynamics  
_Caiyun Wu, Georgi M. Dimirovski, Jun Zhao, and Ruicheng Ma_

**DSCC2013-3741** .......................................................... V003T34A002  
Nonlinear Compensation for High Performance Feedback Systems With Actuator Imperfections  
_Cameron L. Mock, Zachary T. Hamilton, Dustin Carruthers, and John F. O'Brien_

**DSCC2013-3761** .......................................................... V003T34A003  
Proportional Nonlinear Systems: A Liable Class for Global Exponential State-Feedback Stabilization  
_Francesco Carravetta_

**DSCC2013-3807** .......................................................... V003T34A004  
UDE-Based Robust Control for a Class of Non-Affine Nonlinear Systems  
_Beibei Ren and Qing-Chang Zhong_

**DSCC2013-4039** .......................................................... V003T34A005  
Nonlinear Control of an Unmanned Amphibious Vehicle  
_Jose Alvarez, Ivan R. Bertaska, and Karl von Ellenrieder_

**DSCC2013-4047** .......................................................... V003T34A006  
Controller Design for Nonlinear Multi-Input/Multi-Output Systems Using the Contoured Robust Controller Bode Plot  
_J. D. Taylor and William Messner_

### NONLINEAR ESTIMATION AND CONTROL

**DSCC2013-3702** .......................................................... V003T35A001  
An Adaptive Control Method With Low-Resolution Encoder  
_Zhenyu Zhang and Nejat Olgac_

**DSCC2013-3783** .......................................................... V003T35A002  
Robust Disturbance Rejection for a Class of Nonlinear Systems Using Disturbance Observers  
_Ahmed H. El-Shaer and Abdulrahman H. Bajodah_

**DSCC2013-3884** .......................................................... V003T35A003  
Asymptotic Stability Method for PID Controller Tuning In a Backhoe Machine  
_Carlos Mastalli, Dimitar Ralev, Novel Certad, and Gerardo Fernandez-Lopez_

**DSCC2013-3966** .......................................................... V003T35A004  
Nonparametric Identification of Hammerstein Systems Using Orthogonal Basis Functions as Ersatz Nonlinearities  
_Khaled F. Aljanaideh and Dennis S. Bernstein_
Model-Predictive Control and Closed-Loop Stability Considerations for Nonlinear Plants Described by Local ARX-Type Models
Michael E. Cholette and Dragan Djurdjanovic

Robust Observer Design for Lipschitz Nonlinear Systems With Parametric Uncertainty
Yan Wang and David M. Bevly

OPTIMIZATION AND OPTIMAL CONTROL

Research on an Approximate Model Based Virtual Calibration Method With DoE and Optimization Algorithm for Transmission Control Unit
Guangqiang Wu, Lu Sun, Sheng Zhu, and Kuankuan Zhang

BMI Based Robust Optimal Control Synthesis via Sensitivity Minimization
Punit J. Tulpule and Atul G. Kelkar

DSCC2013-3845

Governing Parameter Changes in Nonlinear Parameter-Dependent Optimization Problems
Rohit Gupta and Ilya V. Kolmanovsky

A Gradient-Based Method for Team Evasion
Shih-Yuan Liu, Zhengyuan Zhou, Claire Tomlin, and Karl Hedrick

Optimal Compression of a Generalized Prandtl-Ishlinskii Operator in Hysteresis Modeling
Jun Zhang, Emmanuelle Merced, Nelson Sepúlveda, and Xiaobo Tan

Discrimination of Steady State and Transient State of Extremum Seeking Control via Sinusoidal Detection
Baojie Mu, Yaoyu Li, and John E. Seem

PIEZOELECTRIC ACTUATION AND NANOSCALE CONTROL

Flatness-Based Open Loop Command Tracking for Quasistatic Microscanners
Klaus Janschek, Richard Schroedter, and Thilo Sandner

Two Degree-of-Freedom Hysteresis Compensation for a Dynamic Mirror With Antagonistic Piezoelectric Stack Actuation
James A. Mynderse and George T. C. Chiu

Iterative-Control-Based High-Speed Direct Mask Fabrication via Ultrasonic-Vibration-Assisted Mechanical Plowing
Zhihua Wang and Qingze Zou
An Iterative Learning Controller for High Precision Calibration of an Inertial Measurement Unit Using a Piezoelectric Platform
Biju Edamana and Kenn Oldham

Design of a Piezoelectric Poly-Actuated Linear Motor
Shinichiro Tsukahara, Lluis Penalver-Aguila, James Torres, and H. Harry Asada

Static and Dynamic Modeling of a Multi-Axis Thin-Film Piezoelectric Micro-Actuator
Jongsoo Choi, Choong-Ho Rhee, Zhen Qiu, Thomas Wang, and Kenn Oldham

A Feed Forward Neural Network for Solving the Inverse Kinetics of Non-Constant Curvature Soft Manipulators Driven by Cables
Michele Giorelli, Federico Renda, Gabriele Ferri, and Cecilia Laschi

Evaluation and Design of Manipulators Based on a Dynamic Accuracy Index Considering Task-Directions
Yoshihiro Kai

Maneuver Based Design of Passive-Assist Devices: A Comparison of Parallel and Serial Systems
W. Robert Brown and A. Galip Ulsoy

Kinematic Synthesis of Minimally Actuated Multi-Loop Planar Linkages With Second Order Motion Constraints for Object Grasping
Gim Song Soh and Nina Robson

Design of Input Shaping Control for Planar Parallel Manipulators
Madusudanan Sathia Narayanan and Venkat Krovi

Optimal Control Algorithm for Multi-Input Binary-Segmented SMA Actuators Applied to a Multi-DOF Robot Manipulator
Mohammadreza Mollaei and Stephen Mascaro

Impedance Reduction Controller Design for Mechanical Systems
Hanseung Woo and Kyoungchul Kong
Fast Modeling and Identification of Robot Dynamics Using the Lasso
  Cong Wang, Xiaowen Yu, and Masayoshi Tomizuka

Automatic Sensor Frame Identification in Industrial Robots With Joint Elasticity
  Chung-Yen Lin, Wenjie Chen, and Masayoshi Tomizuka

Dynamics Modeling and Identification of a Dual-Blade Wafer Handling Robot
  Xiaowen Yu, Cong Wang, Yu Zhao, and Masayoshi Tomizuka

A Random Matrix Approach to Manipulator Jacobian
  Javad Sovizi, Aliakbar Alamdari, and Venkat N. Krovi

Discrete Deformation Models for Real-Time Computation of Compliant Mechanisms
  Jingjing Ji and Kok-Meng Lee

Vibration Measurement and Monitoring of a Rotating Disk Using Contactless Laser Excitation
  Itsuro Kajiwara and Naoki Hosoya

A New Rotary Position-Control System With Color Sensing
  Young-shin Kwon and Won-jong Kim

Visual Servoing for Robot Manipulators Considering Sensing and Dynamics Limitations
  Cong Wang, Chung-Yen Lin, and Masayoshi Tomizuka

A Human Motion Capture System Based on Inertial Sensing and a Complementary Filter
  Kan Kanjanapas, Yizhou Wang, Wenlong Zhang, Lauren Whittingham, and Masayoshi Tomizuka

Robust State Estimation With Redundant Proprioceptive Sensors
  David Rollinson, Howie Choset, and Stephen Tully

Spatial Feature Matching for Visual Odometry: A Parametric Study
  Garrett M. Clayton and Joshua R. Fabian
SYSTEM IDENTIFICATION AND ESTIMATION FOR AUTOMOTIVE APPLICATIONS

**DSCC2013-3775** ................................................................. V003T41A001
Robust Sideslip Angle Estimation for Lightweight Vehicles Using Smooth Variable Structure Filter
Xiaoyu Huang and Junmin Wang

**DSCC2013-3776** ................................................................. V003T41A002
Real-Time Battery Model Identification Using a Two Time-Scaled Approach
Yiran Hu and Yue-Yun Wang

**DSCC2013-3777** ................................................................. V003T41A003
Robust Sideslip Angle Estimation for Over-Actuated Electric Vehicles: A Linear Parameter Varying System Approach
Yan Chen and Junmin Wang

**DSCC2013-3831** ................................................................. V003T41A004
Vehicle Health Inferencing Using Feature-Based Neural-Symbolic Networks
Christopher M. Aasted, Sunwook Lim, and Rahmat A. Shoureshi

**DSCC2013-3984** ................................................................. V003T41A005
Online Adaptive Residual Mass Estimation in a Multicylinder Recompression HCCI Engine
Jacob Larimore, Shyam Jade, Erik Hellström, Anna G. Stefanopoulou, Julien Vanier, and Li Jiang

**DSCC2013-4005** ................................................................. V003T41A006
Cycle-by-Cycle Based-in-Cylinder Temperature Estimation for Diesel Engines
Song Chen and Fengjun Yan

SYSTEM IDENTIFICATION AND MODELING

**DSCC2013-3798** ................................................................. V003T42A001
Statistics Based Detection and Isolation of UEGO Sensor Faults
Hassene Jammoussi, Imad Makki, Dimitar Filev, and Matthew Franchek

**DSCC2013-3803** ................................................................. V003T42A002
An Ionic-Polymer-Metal-Composite Electrical Model With a Linear Time-Variant Method
Yi-chu Chang and Won-jong Kim

**DSCC2013-3808** ................................................................. V003T42A003
Nonlinear Models for Optimal Placement of a Magnetically-Actuated Cilium
Nathan Banka and Santosh Devasia

**DSCC2013-3953** ................................................................. V003T42A004
Battery Health Diagnostics Using Retrospective-Cost Subsystem Identification: Sensitivity to Noise and Initialization Errors
Xin Zhou, Tulga Ersal, Jeffrey L. Stein, and Dennis S. Bernstein

**DSCC2013-4007** ................................................................. V003T42A005
Structural Dynamic Imaging Through Interfaces Using Piezoelectric Actuation and Laser Vibrometry for Diagnosing the Mechanical Properties of Composite Materials
Christopher C. Watson, Jeffrey F. Rhoads, and Douglas E. Adams
<table>
<thead>
<tr>
<th>DSCC2013-4067</th>
<th>Model Predictive Sliding Mode Control: For Constraint Satisfaction and Robustness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yizhou Wang, Wenjie Chen, Masayoshi Tomizuka, and Badr N. Alsuwaidan</td>
</tr>
</tbody>
</table>

**VEHICLES AND HUMAN ROBOTICS**

<table>
<thead>
<tr>
<th>DSCC2013-3834</th>
<th>Bio-Inspired Robot Control for Human-Robot Bi-Manual Manipulation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stephen Warren and Panagiotis Artemiadis</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DSCC2013-3851</th>
<th>A System-Dynamics-Based Hazard Analysis of Inverted-Pendulum Human Transporters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Christopher Adams, William Singhose, and Dooroo Kim</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DSCC2013-3920</th>
<th>An Interactive Multimedia Framework for Education on Vehicle Electrification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Michael J. Rothenberger and Hosam K. Fathy</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DSCC2013-3933</th>
<th>Navigation of an Underwater Remotely Operated Vehicle Based on Extended Kalman Filter</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Blanca V. Martínez, Daniel A. Sierra, and Rodolfo Villamizar</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DSCC2013-4049</th>
<th>Modeling and Simulation of Human Walking With Wearable Powered Assisting Device</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Siniša Slavnić, Adrian Leu, Danijela Ristić-Durrant, and Axel Gräser</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DSCC2013-4056</th>
<th>Simulation of the Dynamic Behavior of Ships Based on Slender-Body Theory (SBT)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Oscar D. Tascon, Jaime D. Mora, and Roberto J. Algarín</td>
</tr>
</tbody>
</table>

**VEHICLE DYNAMICS AND CONTROL**

<table>
<thead>
<tr>
<th>DSCC2013-3829</th>
<th>Vehicle Roll Stabilization Enhancement Using a Variable Stiffness Architecture: Kinematic Control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Olugbenga M. Anubi and Carl D. Crane, III</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DSCC2013-3886</th>
<th>Cooperative Trajectory Planning for Automated Farming</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Charles Remeikas, Yunjun Xu, and Suhada Jayasuriya</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DSCC2013-3890</th>
<th>Network Control of Vehicle Lateral Dynamics With Control Allocation and Dynamic Message Priority Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Zhibin Shuai, Hui Zhang, Junmin Wang, Jianqiu Li, and Minggao Ouyang</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DSCC2013-3929</th>
<th>Adaptive Traction Control for Non-Rigid Tire-Wheel Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>John Adcox and Beshah Ayalew</td>
</tr>
</tbody>
</table>
The Role of Model Fidelity in Model Predictive Control Based Hazard Avoidance in Unmanned Ground Vehicles Using LIDAR Sensors

Jiechao Liu, Paramsothy Jayakumar, James L. Overholt, Jeffrey L. Stein, and Tulga Ersal

VEHICLE PATH PLANNING AND COLLISION AVOIDANCE

Guidance of a Robotic Off-Road Tractor-Trailer System Using Model Predictive Control

James T. Salmon, David M. Bevly, and John Y. Hung

Real-Time Energy-Reliable Path Planning for Unmanned Ground Vehicles Using Mission Prior Knowledge

Amir Sadrpour, Jionghua (Judy) Jin, and A. Galip Ulsoy

Simple Clothoid Paths for Autonomous Vehicle Lane Changes at the Limits of Handling

Joseph Funke and J. Christian Gerdes

Multi-Objective Collision Avoidance

Mohammad Ali, Andrew Gray, Yiqi Gao, J. Karl Hedrick, and Francesco Borrelli

Determination of Minimum State Preview Time to Prevent Vehicle Rollover

Paul G. Stankiewicz, Alex A. Brown, and Sean N. Brennan

Using a Path-Fitting Algorithm to Analyze the Racing Techniques of a Skilled Driver

Juan Pablo Samper Mejia, Paul A. Theodosis, and J. Christian Gerdes

VIBRATIONAL AND MECHANICAL SYSTEMS

Active Vibration Control of Resonant Systems via Multivariable Modified Positive Position Feedback

Ehsan Omidi and S. Nima Mahmoodi

Dynamic Response of a Dual-Hoist Bridge Crane

Ehsan Maleki, William Singhose, Jeffrey Hawke, and Joshua Vaughan

Dynamic Modeling and Updating of a Stacked Plate Dynamic System

Troy Lundstrom, Charlie Sidoti, and Nader Jalili

Modeling the Effects of Heat Transfer Processes on Material Strain and Tension in Roll-to-Roll Manufacturing

Youwei Lu and Prabhakar R. Pagilla
A Linearization-Based Approach to Vibrational Control of Second-Order Systems
I. P. M. Wickramasinghe and Jordan M. Berg

Relation Between End-Effector Impedance and Joint Friction of Statically-Balanced Mechanisms
Wenwu Xiu and Ou Ma

WIND ENERGY SYSTEMS AND CONTROL

Altitude and Crosswind Motion Control for Optimal Power-Point Tracking in Tethered Wind Energy Systems With Airborne Power Generation
Chris Vermillion

Optimal Control of a Wind Turbine for Tradeoff Analysis Between Energy Harvesting and Noise Emission
Mohamed L. Shaltout and Dongmei Chen

An Application of the Autogyro Theory to Airborne Wind Energy Extraction
Sigitas Rimkus and Tuhin Das

Active Control of Wind Turbine Rotor Torsional Vibration
Warren N. White, Zhichao Yu, Ruth Douglas Miller, and David Ochs

Maximizing Wind Farm Energy Capture via Nested-Loop Extremum Seeking Control
Zhongzhou Yang, Yaoyu Li, and John E. Seem

Nonlinear Controller Design With Bandwidth Consideration for a Novel Compressed Air Energy Storage System
Mohsen Saadat, Farzad A. Shirazi, and Perry Y. Li

Author Index...