

*Proceedings of the ASME*

**DYNAMIC SYSTEMS AND CONTROL CONFERENCE**  
**- 2019 -**

---

**VOLUME 1**

**ADVANCED DRIVER ASSISTANCE AND AUTONOMOUS TECHNOLOGIES**

**ADVANCES IN CONTROL DESIGN METHODS**

**ADVANCES IN ROBOTICS**

**AUTOMOTIVE SYSTEMS**

**DESIGN, MODELING, ANALYSIS, AND CONTROL OF ASSISTIVE AND**

**REHABILITATION DEVICES**

**DIAGNOSTICS AND DETECTION**

**DYNAMICS AND CONTROL OF HUMAN-ROBOT SYSTEMS**

**ENERGY OPTIMIZATION FOR INTELLIGENT VEHICLE SYSTEMS**

**ESTIMATION AND IDENTIFICATION**

**MANUFACTURING**

**presented at**

**ASME 2019 DYNAMIC SYSTEMS AND CONTROL CONFERENCE**

**OCTOBER 8-11 2019**

**PARK CITY, UTAH, USA**

**sponsored by**

**DYNAMIC SYSTEMS AND CONTROL DIVISION, ASME**

**THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS**

Two Park Avenue \* New York, NY. 10016

Printed from e-media with permission by:

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Statement from By-Laws: The Society shall not be responsible for statements or opinions  
Advanced in papers. . .or printed in its publications (7.1.3)

INFORMATION CONTAINED IN THIS WORK HAS BEEN OBTAINED BY ASME FROM SOURCES BELIEVED TO BE RELIABLE. HOWEVER, NEITHER ASME NOR ITS AUTHORS OR EDITORS GUARANTEE THE ACCURACY OR COMPLETENESS OF ANY INFORMATION PUBLISHED IN THIS WORK. NEITHER ASME NOR ITS AUTHORS AND EDITORS SHALL BE RESPONSIBLE FOR ANY ERRORS, OMISSIONS, OR DAMAGES ARISING OUT OF THE USE OF THIS INFORMATION. THE WORK IS PUBLISHED WITH THE UNDERSTANDING THAT ASME AND ITS AUTHORS AND EDITORS ARE SUPPLYING INFORMATION BUT ARE NOT ATTEMPTING TO RENDER ENGINEERING OR OTHER PROFESSIONAL SERVICES. IF SUCH ENGINEERING OR PROFESSIONAL SERVICES ARE REQUIRED, THE ASSISTANCE OF AN APPROPRIATE PROFESSIONAL SHOULD BE SOUGHT.

For authorization to photocopy material for internal or personal use under circumstances not falling within the fair use provisions of the Copyright Act, contact the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923, Tel: 978-750-8400

Requests for special permission or bulk reproduction should be addressed to [permissions@asme.org](mailto:permissions@asme.org).

**ISBN NO. 978-0-7918-5914-8**

**© 2019 ASME**

**All rights reserved.**

**Printed in U.S.A with permission by Curran Associates, Inc. (2020)**

**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  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# CONTENTS

## DSCC2019

### ADVANCED DRIVER ASSISTANCE AND AUTONOMOUS TECHNOLOGIES

**DSCC2019-9005**..... **V001T01A001**

Two Segments (Plus) Path Planning of Automatic Parking Assist System for 4WS Vehicles

*Yiwen Huang, Thiagarajan Chidambareswaran, Chuan Chang, Yan Chen*

**DSCC2019-9006**..... **V001T01A002**

Point-Clouds Fusion Based Obstacle Detection for Autonomous Ground Vehicles With Velodyne and Ibeo Lidar Sensors

*Mingcong Cao, Chuan Hu, Junmin Wang*

**DSCC2019-9065**..... **V001T01A003**

Ensured Collision Avoidance Over a Finite Time Horizon for Autonomous Vehicles in Presence of Uncertainty

*Seyedeh Mahsa Sotoudeh, Baisravan HomChaudhuri*

**DSCC2019-9096**..... **V001T01A004**

Resilient Control Under Cyber-Attacks in Connected ACC Vehicles

*Woongsun Jeon, Ali Zemouche, Rajesh Rajamani*

**DSCC2019-9135**..... **V001T01A005**

Experimental Results and Analysis of a Longitudinal Controlled Cooperative Adaptive Cruise Control (CACC) Truck Platoon

*Patrick Smith, Jacob Ward, John Pierce, David Bevly, Rob Daily*

**DSCC2019-9167**..... **V001T01A006**

Analyzing the Effects of Geometric Lane Constraints on RADAR-Based Sensing of Available Vehicle Headway Using Mapped Lane Geometry and Camera Registration of Lane Position

*Krishna Varadarajan, Robert Leary, Evan Pelletier, Mohamed Wahba, Sean Brennan*

### ADVANCES IN CONTROL DESIGN METHODS

**DSCC2019-8906**..... **V001T02A001**

Temperature Control of a Guard Heater Using Fuzzy Logic

*Shahin S. Nudehi, Luke Venstrom*

**DSCC2019-9009**..... **V001T02A002**

Sliding Mode Impedance and Stiffness Control of a Pneumatic Cylinder

*Jonathon E. Slightam, Eric J. Barth, Mark L. Nagurka*

**DSCC2019-9051**..... **V001T02A003**  
Adaptive Control of Nanowires Motion Using Electric Fields in Fluid Suspension  
*Juan Wu, Kaiyan Yu*

**DSCC2019-9126**..... **V001T02A004**  
Analytical Statistical Study of Linear Parallel Feedforward Compensators for  
Nonminimum-Phase Systems  
*Keyvan Noury, Bingen Yang*

**DSCC2019-9134**..... **V001T02A005**  
Adaptive Single Action Control Policies for Linearly Parameterized Systems  
*Osama Ennasr, Giorgos Mamakoukas, Maria Castano, Demetris Coleman, Todd Murphey,  
Xiaobo Tan*

**DSCC2019-9240**..... **V001T02A006**  
Class of Stabilizing Parallel Feedforward Compensators for Nonminimum-Phase  
Systems  
*Keyvan Noury, Bingen Yang*

## **ADVANCES IN ROBOTICS**

**DSCC2019-8912**..... **V001T03A001**  
A Variable-Structure Mass-Elastica Hopper  
*Sheryl Chau, Ranjan Mukherjee*

**DSCC2019-8921**..... **V001T03A002**  
Apex Height Control of a Two-DOF Ankle-Knee-Hip Robot Hopping on a Rigid  
Foundation  
*Amer Allafi, Ranjan Mukherjee*

**DSCC2019-8961**..... **V001T03A003**  
Calibration and Validation of Dynamic Model for Simulating Robotic Finger Kinematics  
and Contact Forces  
*James A. Tigue, Stephen A. Mascaró*

**DSCC2019-8962**..... **V001T03A004**  
Optimal Mini Segway Control Using Non-Minimum Phase Sample and Hold Input  
*Yingxu Wang, Guoming G. Zhu*

**DSCC2019-9016**..... **V001T03A005**  
Locomotion of an Origami Inspired Nonholonomic System  
*Vitaliy Fedonyuk, Priyanka Bhovad, Suyi Li, Phanindra Tallapragada*

**DSCC2019-9049**..... **V001T03A006**  
Dynamic Modeling and Control of Flexible Cables for Shape Forming  
*Naijing Lv, Jianhua Liu, Huanxiong Xia, Yunyi Jia*

**DSCC2019-9072**..... **V001T03A007**  
Ankle-Knee-Hip Robot Hopping on an Elastic Foundation and a Viscoelastic  
Foundation With Inertia  
*Amer Allafi, Ranjan Mukherjee*

**DSCC2019-9077**..... **V001T03A008**  
Effect of Manipulator's Joints Flexibility on the Positioning Precision of the End-  
Effector of the UVMS  
*Umer Hameed Shah, Mansour Karkoub, Hong-Du Wang, Deniz Kerimoglu*

**DSCC2019-9117**..... **V001T03A009**  
Global-Position Tracking Control of Multi-Domain Planar Bipedal Robotic Walking  
*Yuan Gao, Yan Gu*

**DSCC2019-9132**..... **V001T03A010**  
Contact Force and Position Tracking With a Planar Aerial Manipulator  
*Varun R. Mittal, Vivek Sangwan*

**DSCC2019-9207**..... **V001T03A011**  
Asymmetric Kinematic and Dynamic Models of Robotic Assisted Sit-to-Stand System  
for Stroke Rehabilitation  
*Jiaoying Jiang, Guangzhou Hu, Kok-Meng Lee*

**DSCC2019-9219**..... **V001T03A012**  
Lumped Parameter Modeling and Snap-Through Stability Analysis of Planar  
Hydraulically Amplified Dielectric Elastomer Actuators  
*Amir Hosein Zamanian, David Y. Son, Paul S. Krueger, Edmond Richer*

## **AUTOMOTIVE SYSTEMS**

**DSCC2019-8963**..... **V001T04A001**  
Emission Aware Eco-Driving on Country Roads  
*Junpeng Deng, Philipp Polterauer, Luigi del Re*

**DSCC2019-8994**..... **V001T04A002**  
An Experimental Study of Longitudinal Tire Relaxation Constants for Vehicle Traction  
Dynamics Modeling  
*Vladimir V. Vantsevich, Lyubomyr I. Demkiv, Sviatoslav R. Klos, Samuel R. Misko, Lee Moradi*

**DSCC2019-9121**..... **V001T04A003**  
An Improved Small-Scale Connected Autonomous Vehicle Platform  
*Xihui Wu, Azim Eskandarian*

**DSCC2019-9146**..... **V001T04A004**  
A Model Predictive Approach for the Coordination of Powertrain Control Systems  
*Stephanie Stockar, Cristian Rostiti, Marcello Canova, Michael Prucka*

**DSCC2019-9159**..... **V001T04A005**  
Experimental Validations on Vision-Based Path Tracking With Preview Four Wheel Steering Control  
*Yansong Peng, Fengchen Wang, Saikrishna Gurumoorthy, Yan Chen, Mutian Xin*

**DSCC2019-9206**..... **V001T04A006**  
Comparison of Estimation Techniques for the Crankshaft Dynamics of an Opposed Piston Engine  
*Joseph A. Drallmeier, Jason B. Siegel, Anna G. Stefanopoulou*

## **DESIGN, MODELING, ANALYSIS, AND CONTROL OF ASSISTIVE AND REHABILITATION DEVICES**

**DSCC2019-8985**..... **V001T05A001**  
End-Effector Stabilization of a Wearable Robotic Arm Using Time Series Modeling of Human Disturbances  
*Vighnesh Vatsal, Guy Hoffman*

**DSCC2019-9013**..... **V001T05A002**  
Combining Gait Trainers and Partial Weight Bearing Lifters: Passive Modulation of Lift Force via Cam Profile  
*Michael Yagiela, Scott Steinbrink, Davide Piovesan*

**DSCC2019-9026**..... **V001T05A003**  
Development of a Compact Velocity-Based Mechanical Safety Device for an Elbow Joint Assist Suit  
*Yoshihiro Kai, Keisuke Ikeda, Tsubasa Kaneda, Kenichi Sugawara, Masayoshi Tomizuka*

**DSCC2019-9041**..... **V001T05A004**  
Exploring the Usability of Retrofit Hardware to Reduce Compensatory Movements in Game Controller-Mediated Telerehabilitation  
*Roni Barak Ventura, Oded Nov, Maurizio Porfiri*

**DSCC2019-9042**..... **V001T05A005**  
Determination of Roles and Interaction Modes in a Haptic Shared Control Framework  
*Vahid Izadi, Arjun Yeravdekar, Amirhossein Ghasemi*

**DSCC2019-9078**..... **V001T05A006**  
Cadence Tracking for Switched FES-Cycling With Unknown Time-Varying Input Delay  
*Brendon C. Allen, Christian A. Cousin, Courtney A. Rouse, Warren E. Dixon*

**DSCC2019-9082**..... **V001T05A007**  
Design and Characterization of a Passive Instrumented Hand  
*Saad N. Yousaf, Victoria S. Joshi, John E. Britt, Chad G. Rose, Marcia K. O'Malley*

**DSCC2019-9114**..... **V001T05A008**  
Statistical Determination of Decision-Making Regions for Branching Paths: An Algorithm With a Wheelchair Assistance Application  
*Kelilah L. Wolkowicz, Robert D. Leary, Jason Z. Moore, Sean N. Brennan*

**DSCC2019-9120**..... **V001T05A009**  
Real-Time Path-Based Fusion of Spatial Databases With Temporal Control Inputs for Assistive Operation of Wheelchairs  
*Kelliah L. Wolkowicz, Robert D. Leary, Jason Z. Moore, Sean N. Brennan*

**DSCC2019-9189**..... **V001T05A010**  
Penalized Nonlinear Regression With Application to Head-Neck Position Tracking  
*Kyubaek Yoon, Jongeun Choi*

**DSCC2019-9191**..... **V001T05A011**  
Neural-Network Based Iterative Learning Control of a Hybrid Exoskeleton With an MPC Allocation Strategy  
*Vahidreza Molazadeh, Qiang Zhang, Xuefeng Bao, Nitin Sharma*

**DSCC2019-9211**..... **V001T05A012**  
Force and Stiffness Controller Design for a Pneumatic Haptic Glove for Virtual Palpation  
*Matt E. Galla, Ehab I. Al Khatib, Yildirim Hurmuzlu, Edmond Richer*

## **DIAGNOSTICS AND DETECTION**

**DSCC2019-8909**..... **V001T06A001**  
Optimal Sensor Configuration for Fatigue Life Prediction in Structural Applications  
*Mohamed Khalil, Ioannis Kouroudis, Roland Wuchner, Kai-Uwe Bletzinger*

**DSCC2019-8913**..... **V001T06A002**  
Adaptive Dynamics Learning for Small Fault Detection of Discrete-Time Nonlinear Uncertain Systems  
*Jingting Zhang, Chengzhi Yuan, Paolo Stegagno*

**DSCC2019-8942**..... **V001T06A003**  
Feature Learning Using Deep Neural Networks for Fault Diagnosis in Electromechanical Systems  
*Mehrdad Heydarzadeh, Alireza Mohammadi, Shahin Hedayati Kia, Mehrdad Nourani, Humberto Henao, Gerard-Andre Capolino*

**DSCC2019-9074**..... **V001T06A004**  
Generalization of Spectral Methods for High-Cycle Fatigue Analysis to Accommodate Non-Stationary Random Processes  
*Mohamed Khalil, Roland Wuchner, Kai-Uwe Bletzinger*

**DSCC2019-9188**..... **V001T06A005**  
Automotive Damper Defect Detection Using Novelty Detection Methods  
*Thomas Zehelein, Sebastian Schuck, Markus Lienkamp*

## **DYNAMICS AND CONTROL OF HUMAN-ROBOT SYSTEMS**

**DSCC2019-9066**..... **V001T07A001**  
A Strategy of Human Balancing Based on Lissajous Curves  
*Angel Cerda-Lugo, Alejandro Gonzalez, Antonio Cardenas, Davide Piovesan*

**DSCC2019-9115**..... **V001T07A002**  
Modeling, Analysis, and Control of Slip Running on Dynamic Platforms  
*Amir Iqbal, Zhu Mao, Yan Gu*

**DSCC2019-9150**..... **V001T07A003**  
User Intent Recognition for Transfemoral Amputees With Prosthetic Legs Using Evolutionary Algorithms  
*Hanieh Mohammadi, Gholamreza Khademi, Elizabeth C. Hardin, Dan Simon*

**DSCC2019-9177**..... **V001T07A004**  
Natural Language and Gesture Perception Based Robot Companion Teaching for Assisting Human Workers in Assembly Contexts  
*Rui Li, Weitian Wang, Yi Chen, Yunyi Jia*

**DSCC2019-9180**..... **V001T07A005**  
Convolutional Neural Networks for Environmentally Aware Locomotion Mode Recognition of Lower-Limb Amputees  
*Gholamreza Khademi, Dan Simon*

**DSCC2019-9243**..... **V001T07A006**  
Encrypted Motion Control of a Teleoperation System With Security-Enhanced Controller by Deception  
*Yingxin Qiu, Jun Ueda*

## **ENERGY OPTIMIZATION FOR INTELLIGENT VEHICLE SYSTEMS**

**DSCC2019-8969**..... **V001T08A001**  
Combined Energy and Comfort Optimization of Air Conditioning System in Connected and Automated Vehicles  
*Hao Wang, Mohammad Reza Amini, Ziyu Song, Jing Sun, Ilya Kolmanovsky*

**DSCC2019-9003**..... **V001T08A002**  
Energy Optimization of Lateral Motions for Autonomous Ground Vehicles With Four-Wheel Steering Control  
*Fengchen Wang, Peidong Xu, Ao Li, Yan Chen*

**DSCC2019-9046**..... **V001T08A003**  
Influence of Speed Forecasting on the Performance of Ecological Adaptive Cruise Control  
*Eunjeong Hyeon, Youngki Kim, Niket Prakash, Anna G. Stefanopoulou*

**DSCC2019-9056**..... **V001T08A004**  
Energy Optimal Routing of a Delivery Vehicle Fleet With Diverse Powertrains  
*Mukilan T. Arasu, Hamza Anwar, Qadeer Ahmed, Giorgio Rizzoni*

**DSCC2019-9075**..... **V001T08A005**  
Optimal Speed Control for a Connected and Autonomous Electric Vehicle Considering Battery Aging and Regenerative Braking Limits  
*Yunli Shao, Zongxuan Sun*



**DSCC2019-9151**..... **V001T08A006**  
Temperature Control to Reduce Capacity Mismatch in Parallel-Connected Lithium Ion Cells  
*Mayank Garg, Tanvir R. Tanim, Christopher D. Rahn, Hanna Bryngelsson, Niklas Legnedahl*

## **ESTIMATION AND IDENTIFICATION**

**DSCC2019-8920**..... **V001T09A001**  
Kinect-Based Human Gait Recognition Using a Novel Adaptive Dynamics Learning Approach  
*Xiaotian Chen, Paolo Stegagno, Xiaonan Dong, Chengzhi Yuan*

**DSCC2019-9024**..... **V001T09A002**  
Moving Sound Source Localization and Tracking Using a Self Rotating Bi-Microphone Array  
*Deepak Gala, Liang Sun*

**DSCC2019-9157**..... **V001T09A003**  
Allowing Type-3 Wind Turbines to Participate in Frequency Regulation Using a Genetic Algorithm for Parameter Tuning  
*Shat C. Pratoomratana, Marco P. Schoen*

**DSCC2019-9184**..... **V001T09A004**  
Temperature Dependent Hysteresis Modeling of a Piezotube Actuator Using Elman Neural Network  
*Mohammad Al Janaideh, Mohammad Al Saaideh, Micky Rakotondrabe*

**DSCC2019-9210**..... **V001T09A005**  
A Coupled Adaptive Measurement Delay Estimation and Iterative Learning Control Algorithm  
*Florian Browne, George T.-C. Chiu, Neera Jain*

**DSCC2019-9229**..... **V001T09A006**  
Real-Time Determination of the Cardiovascular Mechanical Determinants Using the Intra-Aortic Balloon Pump Mechanism  
*Ghazwan Alwan, Craig Emter, Aws Anaz, Noah Manning, Younes Alwan, Ali D. Salim, Emily Leary, Patrick Delafontaine, Azad Hassan*

## **MANUFACTURING**

**DSCC2019-8995**..... **V001T10A001**  
Machine-Learning Based Thermal-Geometric Predictive Modeling of Laser Powder Bed Fusion Additive Manufacturing  
*Yong Ren, Qian Wang, Pan Michaleris*

**DSCC2019-9111**..... **V001T10A002**  
A Control-Oriented Model for Melt-Pool Volume in Laser Powder Bed Fusion Additive Manufacturing  
*Qian Wang*

<b>DSCC2019-9143</b> .....	<b>V001T10A003</b>
Which Way Is the Best?: Evaluation and Optimization of Dual-Arm Robot Path Planning for Human-Robot Collaborative Tasks in Smart Manufacturing Contexts <i>Weitian Wang, Yi Chen, Yunyi Jia</i>	
<b>DSCC2019-9192</b> .....	<b>V001T10A004</b>
Spatial Iterative Learning Control for Multi-Material 3D-Structures <i>Zahra Afkhami, Christopher Pannier, Leontine Aarnoudse, David Hoelzle, Kira Barton</i>	
<b>DSCC2019-9200</b> .....	<b>V001T10A005</b>
Data-Based Learning for Control of Elastic Interactions Between Robot and Workpiece <i>Lance McCann, Chia-Ning Lee, Yoshua Gombo, Joseph Garbini, Santosh Devasia</i>	
<b>DSCC2019-9217</b> .....	<b>V001T10A006</b>
Model Predictive Height Control for Direct Energy Deposition <i>Michelle L. Gegel, Douglas A. Bristow, Robert G. Landers</i>	