

Proceedings of the ASME

DYNAMIC SYSTEMS AND CONTROL CONFERENCE
- 2019 -

VOLUME 2

MODELING AND CONTROL OF ENGINE AND AFTERTREATMENT SYSTEMS
MODELING AND CONTROL OF IC ENGINES AND AFTERTREATMENT SYSTEMS
MODELING AND VALIDATION
MOTION PLANNING AND TRACKING CONTROL
MULTI-AGENT AND NETWORKED SYSTEMS
RENEWABLE AND SMART ENERGY SYSTEMS
THERMAL ENERGY SYSTEMS
UNCERTAIN SYSTEMS AND ROBUSTNESS
UNMANNED GROUND AND AERIAL VEHICLES
VEHICLE DYNAMICS AND STABILITY
VIBRATIONS: MODELING, ANALYSIS, AND CONTROL

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.

ISBN NO. 978-0-7918-5915-5

© 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
Web: www.proceedings.com

CONTENTS

DSCC2019

MODELING AND CONTROL OF ENGINE AND AFTERTREATMENT SYSTEMS

DSCC2019-9038..... V002T11A001

IMC-Based Calibration of the Boost Pressure Controller in an Electrically Assisted Turbocharged Gasoline Engine

Baitao Xiao, Tyler Kelly, Timothy Stolzenfeld, Chenliu Lu, Dave Bell, Mrdjan Jankovic, Julia Buckland, John Rollinger

DSCC2019-9092..... V002T11A002

Online Nonlinear System Identification With Parameter Constraints: Application to Automotive Engine Systems

Kaian Chen, Zhaojian Li, Yan Wang, Jing Wang, Kai Wu, Dimitar P. Filev

DSCC2019-9110..... V002T11A003

Diesel Engine Characterization and Performance Scaling via Brake Specific Fuel Consumption Map Dimensional Analysis

Evan Pelletier, Sean Brennan

DSCC2019-9226..... V002T11A004

Modeling the Gas Exchange Processes of a Modern Diesel Engine With an Integrated Physics-Based and Data-Driven Approach

Jorge Pulpeiro Gonzalez, King Ankobea-Ansah, Elena Escuder Milian, Carrie M. Hall

DSCC2019-9231..... V002T11A005

A Torque Balance Method for Multi-Cylinder Gasoline Engines With Non-Uniform Cylinder-to-Cylinder Combustion Strategies

Qinghua Lin, Pinggen Chen

MODELING AND CONTROL OF IC ENGINES AND AFTERTREATMENT SYSTEMS

DSCC2019-8964..... V002T12A001

Optimal Transient Real-Time Engine-Generator Control in the Series-Hybrid Vehicle

Jonathan Lock, Rickard Arvidsson, Tomas McKelvey

DSCC2019-8984..... V002T12A002

Engine Calibration Optimization Based on its Surrogate Models

Anuj Pal, Yan Wang, Ling Zhu, Guoming G. Zhu

DSCC2019-9039..... V002T12A003

A Numerical Study of an Electrically Assisted Boosting System for Turbocharged Diesel Engines

Yifan Men, Jason B. Martz, Eric Curtis, Guoming G. Zhu

DSCC2019-9073..... **V002T12A004**
Control-Oriented Model-Based Burn Duration and Ignition Timing Prediction With Recursive-Least-Square Adaptation for Closed-Loop Combustion Phasing Control of a Spark Ignition Engine
Xin Wang, Amir Khameneian, Paul Dice, Bo Chen, Mahdi Shahbakhti, Jeffrey D. Naber, Chad Archer, Qiuping Qu, Chris Glugla, Garlan Huberts

DSCC2019-9147..... **V002T12A005**
A Real-Time Pressure Wave Model for Predicting Engine Knock
Ruixue C. Li, Guoming G. Zhu

DSCC2019-9247..... **V002T12A006**
Control-Oriented Physics-Based NO_x Emission Model for a Diesel Engine With Exhaust Gas Recirculation
Saravanan Durairasan, Rasoul Salehi, Anna Stefanopoulou, Siddharth Mahesh, Marc Allain

MODELING AND VALIDATION

DSCC2019-8929..... **V002T13A001**
Kinetic to Potential Energy Transformation Using an Elasticity
Sheryl Chau, Ranjan Mukherjee

DSCC2019-9084..... **V002T13A002**
Multi-Physics Dynamic Modeling and Transient Simulation of a Multi-Stage Heat Recovery Steam Generator (HRSG)
Jonathan McConnell, Tuhin Das, Andres Caesar, James Hoy, Prithvi Veeravalli

DSCC2019-9187..... **V002T13A003**
Torsional Oscillations of a Shape-Morphing Plate in Viscous Fluids
Syed N. Ahsan, Matteo Aureli

DSCC2019-9195..... **V002T13A004**
Model-Based Analysis of a Photovoltaic Array Powering a Flywheel Energy Storage System
Mohamed Mohamed, Reza Tafreshi, Zurwa Khan

DSCC2019-9222..... **V002T13A005**
An Agent-Based Model of Lost Person Dynamics for Enabling Wilderness Search and Rescue
Amanda Hashimoto, Nicole Abaid

DSCC2019-9242..... **V002T13A006**
Modeling Height Profile for Drop-on-Demand Print of UV Curable Ink
Yumeng Wu, George Chiu

MOTION PLANNING AND TRACKING CONTROL

DSCC2019-8926..... **V002T14A001**
Data-Driven ILC for Trajectory Tracking in Nonlinear Dynamic Systems
Yu-Hsiu Lee, Tsu-Chin Tsao

DSCC2019-8951..... **V002T14A002**
Experimental Autonomous Deep Learning-Based 3D Path Planning for a 7-DOF
Robot Manipulator
Alex Bertino, Mostafa Bagheri, Miroslav Krstic, Peiman Naseradinmousavi

DSCC2019-9015..... **V002T14A003**
Magnetically Actuated Artificial Microswimmers As Mobile Microparticle Manipulators
Jake Buzhardt, Phanindra Tallapragada

DSCC2019-9141..... **V002T14A004**
Towards Cooperative Transportation of Multiple Mecanum-Wheeled Automated
Guided Vehicles
Jih-Sien Peng, Yen-Chen Liu

DSCC2019-9160..... **V002T14A005**
Distributionally Robust Stochastic Model Predictive Control for Collision Avoidance
Baisravan HomChaudhuri

DSCC2019-9181..... **V002T14A006**
Dynamic Control of Soft Robots Using Reinforcement Learning
Ben Pawlowski, Charles W. Anderson, Jianguo Zhao

MULTI-AGENT AND NETWORKED SYSTEMS

DSCC2019-8979..... **V002T15A001**
Thermodynamics-Inspired Modeling of Macroscopic Swarm States
Hossein Haeri, Kshitij Jerath, Jacob Leachman

DSCC2019-9044..... **V002T15A002**
Energy-Balanced Leader-Switching Policy for Formation Rotation Control of Multi-
Agent Systems Inspired by Bird Flocks
Corey Dotson, Geronimo Macias, Kooktae Lee

DSCC2019-9054..... **V002T15A003**
Contagion Processes Over Temporal Networks With Time-Varying Backbones
Matthieu Nadini, Alessandro Rizzo, Maurizio Porfiri

DSCC2019-9138..... **V002T15A004**
Observability of Multi-Agent Network Sensing Systems
Ioannis Raptis, Clark Taylor

DSCC2019-9190..... **V002T15A005**
Comparing Collective Foraging With Interactions Inspired by Pheromones and Sonar
Aidan J. Bradley, Masoud Jahromi Shirazi, Nicole Abaid

DSCC2019-9218..... **V002T15A006**
Multi-Mobile Sensing With Temporal-Spatial Coupling via Compressed Sensing
Tianwei Li, Qingze Zou

RENEWABLE AND SMART ENERGY SYSTEMS

DSCC2019-9004..... **V002T22A001**
Optimal Maintenance of Electric Vehicle Battery System Through Overnight Home Charging
Sidharth Jangra, Chien Hsin Chung, Qingzhi Lai, Xinfan Lin

DSCC2019-9068..... **V002T22A002**
Empirical Regret Bounds for Control in Spatiotemporally Varying Environments: A Case Study in Airborne Wind Energy
Ben Haydon, Jack Cole, Laurel Dunn, Patrick Keyantuo, Tina Chow, Scott Moura, Chris Vermillion

DSCC2019-9071..... **V002T22A003**
Fused Model Predictive Control Techniques for Strategic Platooning Amongst Heterogeneous Pairs of Heavy-Duty Trucks
Christian Earnhardt, Ben Groelke, John Borek, Chris Vermillion

DSCC2019-9103..... **V002T22A004**
Understanding the Role of Microgrid Topology for Decentralized Model-Based Control
Matthew K. Chu Cheong, Dongmei Chen, Pengwei Du

DSCC2019-9156..... **V002T22A005**
Auto-Tuning Control of PEM Water Electrolyzer
Alicia Keow, Zheng Chen

DSCC2019-9168..... **V002T22A006**
Flight Dynamics and Control of a Farm of Tethered Energy Systems in a Turbulent Field
Ayaz Siddiqui, Praveen Ramaprabhu, Joe Deese, Chris Vermillion

THERMAL ENERGY SYSTEMS

DSCC2019-9089..... **V002T23A001**
A Hybrid Electro-Thermal Energy Storage System for High Ramp Rate Power Applications
Cary E. Laird, Andrew G. Alleyne

DSCC2019-9101..... **V002T23A002**
Design and Verification of a Small-Scale District Heating Network Experiment
Melissa Krieger, Dylan Steckclair, Stephen Peluso, Stephanie Stockar

DSCC2019-9106..... **V002T23A003**
Model Predictive Control of Micro-CSP Integrated Into a Building HVAC System for Load Following Demand Response Programs
Mohamed Toub, Mahdi Shahbakhti, Rush D. Robinett III, Ghassane Aniba

DSCC2019-9212..... **V002T23A004**
Dynamic Design Optimization for Thermal Management: A Case Study on Shell and
Tube Heat Exchangers
Austin L. Nash, Neera Jain

DSCC2019-9223..... **V002T23A005**
Modeling of Thermal Dynamics of a Connected Hybrid Electric Vehicle for Integrated
HVAC and Powertrain Optimal Operation
Nehal Doshi, Drew Hanover, Sadra Hemmati, Christopher Morgan, Mahdi Shahbakhti

DSCC2019-9236..... **V002T23A006**
Switched Linear Model of a Stratified Hot Water Tank for Control of Micro-CHP
Systems
Trevor Bird, Catherine Weaver, Neera Jain

UNCERTAIN SYSTEMS AND ROBUSTNESS

DSCC2019-8949..... **V002T24A001**
Solution of the Benchmark Control Problem by Scenario Optimization
Roberto Rocchetta, Luis G. Crespo, Sean P. Kenny

DSCC2019-8950..... **V002T24A002**
Reference Governors Based on Online Learning of Maximal Output Admissible Set
Manuel Lanchares, Ilya Kolmanovsky, Anouck Girard, Denise Rizzo

DSCC2019-9007..... **V002T24A003**
Identification of Temperature Dynamics Using Subspace and Machine Learning
Techniques
Aleksandar Haber, Francesco Pecora, Mobin Uddin Chowdhury, Melvin Summerville

DSCC2019-9047..... **V002T24A004**
A Stabilizing Control Algorithm for Asynchronous Parallel Quadratic Programming via
Dual Decomposition
Kooktae Lee

DSCC2019-9198..... **V002T24A005**
Bidirectional LSTM Recurrent Neural Network Plus Hidden Markov Model for
Wearable Sensor Based Dynamic State Estimation
Ritika Sibal, Ding Zhang, Julie Rocho-Levine, K. Alex Shorter, Kira Barton

DSCC2019-9221..... **V002T24A006**
Modeling Peripheral Artery Behavior Beneath a Non-Invasive Wearable Sensor
Subject to Varying Outside Pressure
Lu Wang, Sardar Ansari, Yingjie Cai, Kevin R. Ward, Kayvan Najarian, Kenn R. Oldham

UNMANNED GROUND AND AERIAL VEHICLES

DSCC2019-8954..... **V002T25A001**
Trajectory Tracking of 3D Autonomous Vehicles Using Backstepping Control
Karl Ludwig Fetzer, Sergey G. Nersesov, Hashem Ashrafiuon

DSCC2019-8990..... **V002T25A002**
Multi-Objective Optimal Design of a PID Sliding Mode Controller With Three Different Reaching Laws
Xiaotian Xu, Yousef Sardahi, Almuatazbellah Boker

DSCC2019-8992..... **V002T25A003**
Agricultural Field Coverage Using Cooperating Unmanned Ground Vehicles
Saba Faryadi, Mohammadreza Davoodi, Javad Mohammadpour Velni

DSCC2019-9097..... **V002T25A004**
Behavior Identification and Prediction for a Probabilistic Risk Framework
Jasprit S. Gill, Pierluigi Pisu, Venkat N. Krovi, Matthias J. Schmid

DSCC2019-9176..... **V002T25A005**
Autonomous Real-Time Monitoring of Crops in Controlled Environment Agriculture
Saba Faryadi, Mohammadreza Davoodi, Javad Mohammadpour Velni

DSCC2019-9203..... **V002T25A006**
The Effect of Wing-Motor Connection Mechanism on the Payload Capacity of Flapping Flight Hovering Robots
Victoria Pellerito, Hamid Vejdani

VEHICLE DYNAMICS AND STABILITY

DSCC2019-8997..... **V002T26A001**
Enhanced Tire Blowout Modeling Using Vertical Load Redistribution and Self-Alignment Torque
Ao Li, Yan Chen, Xinyu Du, Wen-Chiao Lin

DSCC2019-9021..... **V002T26A002**
Structured Robust Linear Parameter-Varying Vehicle Sideslip Angle Estimation
Jingqiang Zha, Junmin Wang, Min Li, Xin Zhang, Xiao Yu

DSCC2019-9055..... **V002T26A003**
Influence of Tire Inflation Pressure on Vehicle Dynamics and Handling Performance
Jianyang Wu, Zhenpo Wang, Junmin Wang

DSCC2019-9166..... **V002T26A004**
A Supervisory Lateral Slip Prevention Controller for Autonomous Vehicles
Nikunj Kumbhani, Saeid Bashash

DSCC2019-9239..... **V002T26A005**
Modeling and Control of Wheel Motor Based Articulated Vehicle System
Heeseong Kim, Taehyun Shim, Byungjun Sung

VIBRATIONS: MODELING, ANALYSIS, AND CONTROL

DSCC2019-8976	V002T27A001
Control-Oriented Modeling and Repetitive Control in In-Layer and Cross-Layer Thermal Interactions in Selective Laser Sintering <i>Dan Wang, Tianyu Jiang, Xu Chen</i>	
DSCC2019-9000	V002T27A002
Self-Resonant Energy Harvester With a Passively Tuned Sliding Mass <i>Hongjip Kim, Arthur Smith, Oumar Barry, Lei Zuo</i>	
DSCC2019-9017	V002T27A003
Performance Study of a Bat Searching Algorithm From System Dynamics Perspective <i>Haopeng Zhang, Nathan Schutte</i>	
DSCC2019-9018	V002T27A004
Dynamics of a Vibration Driven Bristlebot <i>Chandravamsi Gandra, Phanindra Tallapragada</i>	
DSCC2019-9059	V002T27A005
Voltage Response of Parametric Resonance of MEMS Circular Plates Under Hard Excitations <i>Julio S. Beatriz, Dumitru I. Caruntu</i>	
DSCC2019-9091	V002T27A006
Multiple-Scale Analysis of a Novel Piezoelectric Energy Harvester With a Tunable Potential Function <i>Feng Qian, Nicole Abaid, Lei Zuo</i>	
DSCC2019-9094	V002T27A007
On the Modeling and Optimization of Anti-Vibration Gloves for Hand-Arm Vibration Control <i>Sunit K. Gupta, Oreoluwa Alabi, Paul-Camille Kakou, Oumar Barry</i>	
DSCC2019-9118	V002T27A008
On the Dynamics and Control of a Full Wrist Exoskeleton for Tremor Alleviation <i>Jiamin Wang, Oumar Barry, Andrew J. Kurdila, Sujith Vijayan</i>	
DSCC2019-9129	V002T27A009
Configuration Optimization for End-Point Stabilization of Redundant Manipulators With Base Flexibility <i>Michael LiBretto, Yong K. Cho, Yong Han Ahn, Chang Soo Han, Jun Ueda</i>	
DSCC2019-9171	V002T27A010
Comparison of Frequency Response of Parametric Resonance of DWCNT and SWCNT Under Electrostatic Actuation <i>Dumitru I. Caruntu, Ezequiel Juarez</i>	

DSCC2019-9172..... **V002T27A011**
Amplitude-Frequency Response of Superharmonic Resonance of Third Order of
Electrostatically Actuated MEMS Cantilever Resonators
Dumitru I. Caruntu, Christopher Reyes