

3rd Modeling, Estimation and Control Conference (MECC 2023)

IFAC PapersOnline Volume 56, Issue 3

Lake Tahoe, USA
2-5 October 2023

Editors:

Marcello Canova

ISBN: 978-1-7138-8666-2

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.

To the extent permissible under applicable laws, no responsibility is assumed by the Owner, the Publisher or the Licensee for any injury and/or damage to persons or property as a result of any actual or alleged libelous statements, infringement of intellectual property or privacy rights, or products liability, whether resulting from negligence or otherwise, or from any use or operation of any ideas, instructions, procedures, products or methods contained in the material therein.

The publication of an advertisement in the POD Edition does not constitute on the part of the Owner, the Publisher or the Licensee a guarantee or endorsement of the quality or value of the advertised products or services described therein or of any of the representations or the claims made by the advertisers with respect to such products or services.

Copyright© (2023) by the authors
Open access publication under the CC-BY-NC-ND License
<https://creativecommons.org/licenses/by-nc-nd/4.0/>
All rights reserved.

Printed with permission by Curran Associates, Inc. (2025)

For permission requests, please contact the publisher, Elsevier Limited
at the address below.

Elsevier Limited
The Boulevard, Langford Lane
Kidlington
Oxford OX5 1GB UK

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

TABLE OF CONTENTS

Repetitive Process Control Interpolation for Varied Thin-Wall Path Lengths in DED Processes	1
<i>Elias B. Snider, Douglas A. Bristow</i>	
Development of Linear Battery Model for Path Planning with Mixed Integer Linear Programming: Simulated and Experimental Validation	7
<i>Drew D. Scott, Isaac E. Weintraub, Satyanarayana G. Manyam, David W. Casbeer, Manish Kumar, Michael J. Rothenberger</i>	
A Switching Composition of Horizontal and Vertical Controllers for a UAV to Reach a 3D Waypoint	13
<i>Dejan Milutinovic, David W. Casbeer, Steven Rasmussen</i>	
Challenges in Integrating Low-Level Path Following and High-Level Path Planning Over Polytopic Maps	19
<i>Jonah J. Ghunt, Jacob A. Siefert, Herschel C. Pangborn, Sean B. Brennan</i>	
Optimal Generator Policy for Hybrid Fuel UAV Under Airspace Noise Restrictions	25
<i>Drew D. Scott, Isaac E. Weintraub, Satyanarayana G. Manyam, David W. Casbeer, Manish Kumar</i>	
Experimental Validation on Aerial Vehicles of Real-Time Motion Planning with Continuous-Time Q-Learning	31
<i>Christian Llanes, Joshua Netter, Kyriakos G. Vamvoudakis, Samuel Coogan</i>	
Subspace Structured Neural Network for Rapid Trajectory Optimization	37
<i>Luis Tituaña, Yunjun Xu</i>	
Prediction of Aircraft Estimated Time of Arrival using a Supervised Learning Approach.....	43
<i>James Z. Wells, Tejas G. Puranik, Krishna M. Kalyanam, Manish Kumar</i>	
Modelling and Parameter Estimation of Cartridge Probes for Atomic Force Microscopy	49
<i>Sergey Belikov</i>	
Hybrid Unscented Kalman Filter: Application to the Simplest Walker	55
<i>James Bittler, Pranav A. Bhounsule</i>	
Wind Field Estimation using Multiple Quadcopters.....	61
<i>Hao Chen, He Bai, Clark N. Taylor</i>	
Koopman-Based Modeling of an Open Cathode Proton Exchange Membrane Fuel Cell Stack	67
<i>Da Huo, Qian Peng, Carrie M. Hall</i>	
Active Suspension Parameters Identification: An Algebraic Approach and Its Application to Suspension Travel Control	73
<i>Zejiang Wang, Anye Zhou, Adian Cook, Yunli Shao, Junmin Wang</i>	
Closed-Loop Control of SI $\longleftrightarrow$ RCCI Mode Transitions in a Multi-Mode Combustion Engine	79
<i>Sadaf Batool, Jeffrey D. Naber, Mahdi Shahbakhti</i>	
Reinforcement Learning Enabled Safety-Critical Tracking of Automated Vehicles with Uncertainties via Integrated Control-Dependent, Time-Varying Barrier Function, and Control Lyapunov Function	85
<i>Jingxiong Meng, Junfeng Zhao, Yan Chen</i>	

Integration of Optimal Engine and Driveline Controllers to Minimize Driveline Clunk and Shuffle.....	91
<i>Prithvi Reddy, Xin Wang, Mahdi Shahbakhti, Jeff Naber, Maruthi Ravichandran, Jeff Doering</i>	
Dynamic Mode Decomposition for Control Systems with Input Delays	97
<i>Christopher C. Zawacki, Eyad H. Abed</i>	
Tuning of Subspace Predictive Controls	103
<i>V. Breschi, T. Bou Hamdan, G. Mercère, S. Formentin</i>	
GNSS-Free Online Calibration of Inertial Measurement Units in Road Vehicles	109
<i>Rodrigo Senofieni, Matteo Corno, Silvia C. Strada, Sergio M. Savaresi, Stefano Fredella</i>	
Data-Driven Feedforward Compensation Tuning in Torque Vectoring Control.....	115
<i>Rodrigo Senofieni, Matteo Corno, Sergio M. Savaresi</i>	
Characterizing Key Process Strategies for Conductive Submicron Electrohydrodynamic Jet Printing	121
<i>Kaifan Yue, Angelo Hawa, Ali Bahrami, Kira Barton</i>	
Robust Estimation of State of Charge in Lithium Iron Phosphate Cells Enabled by Online Parameter Estimation and Deep Neural Networks	127
<i>Junzhe Shi, Dylan Kato, Shida Jiang, Chitra Dangwal, Scott Moura</i>	
On-Line Prediction of Resistant Force During Soil-Tool Interaction	133
<i>Sencheng Yu, Xingyong Song, Zongxuan Sun</i>	
A Study on Human-Like Deceleration Considering Static Objectives for One-Pedal Driving of Electric Vehicles	139
<i>Kyoung H. Kwak, Yu He, Youngki Kim, Shihong Fan, Heeseong Kim, Justin Holmer, Yue M. Chen, Brian Link</i>	
Improved Energy Predictions for High-Confidence Trajectory Planning of Automated Off-Road Vehicles	145
<i>Nathan Goulet, Beshah Ayalew</i>	
Multi-Stage Estimation Algorithm for Vehicle Trajectory Tracking	151
<i>Hamidreza Alai, Rajesh Rajamani</i>	
A Non-Dimensional Input Excitation Optimization Approach for Battery Health Parameter Estimation.....	157
<i>Rui Huang, Jackson Fogelquist, Simon Kuang, Xinfan Lin</i>	
Knee Stiffness in Assistive Device Control at Quiet Stance: A Preliminary Study	163
<i>Gayatri Sreenivasan, Chunchu Zhu, Jingang Yi</i>	
Cerebral Blood Flow Monitoring with Piezoelectric Film, Photoplethysmogram and an LSTM Neural Network	169
<i>Zixiao Zhang, Mohamad H. Tiba, Nicholas Greer, Kenn R. Oldham</i>	
An Energy Efficient Jumping Drone - A Simple Projectile Motion Approach.....	175
<i>Shraddha Barawkar, Manish Kumar</i>	
Combined Stiffness and Damping Handling-Oriented Control of a Multichamber Suspension	181
<i>Chiara Martellosio, Gabriele Marini, Giulio Panzani, Matteo Corno, Sergio M. Savaresi</i>	
Mobile Topology Learning of a Linear Dynamic Network	187
<i>Fan Wu, Qingze Zou</i>	

Modeling the Impact of Animal Size on the Effectiveness of Peritoneal Oxygenation.....	193
<i>Grace M. Sarkar, Anna E. Shaw, Hosam K. Fathy</i>	
On the Stabilization of Forking and Cyclic Trajectories for Nonlinear Systems.....	199
<i>Nicolas Kessler, Lorenzo Fagiano</i>	
Platform Oscillation Reduction of a Floating Offshore Wind Turbine.....	205
<i>Yue Niu, Ryoza Nagamune</i>	
Robust Adaptive Control for Large-Scale Inverter-Based Resources with Partial and Complete Loss of Inverters	211
<i>Sina Ameli, Ayobami Olajube, Olugbenga M. Anubi</i>	
A Capture Strategy for Multi-Pursuer Coordination Against a Fast Evader in 3D Reach-Avoid Games.....	217
<i>Andrew C. Frommer, Matthew Abate, Phillip M. Rivera-Ortiz, Yancy Diaz-Mercado</i>	
Adaptive Control to Suppress Torque Ripple in Electric Vehicles	223
<i>Hyung-Jin Yoon, Antonio F. Castaño, Petros Voulgaris</i>	
Vibration Reduction of Semisubmersible Floating Wind Turbine using Optimized Tuned Mass and Tuned Inerter Dampers.....	229
<i>Duncan L. Lambert, Lei Zuo</i>	
An Uncertainty-Aware Health Monitoring Model for Wind Turbine Drivetrains Based on Bayesian Neural Network	235
<i>Abdelrahman Amin, Amin Bibo, Meghashyam Panyam, Phanindra Tallapragada</i>	
Synchronization of a Pair of Nonholonomic Oscillators	241
<i>Ali Mohseni, Phanindra Tallapragada</i>	
Reinforcement Learning for Shared Driving.....	247
<i>Sangjin Ko, Reza Langari</i>	
Flocking Control of Multi-Agent Automated Vehicles for Curved Driving: A Polyline Leader Approach	253
<i>Gang Wang, Yan Chen</i>	
Efficient Uncertainty Mitigation in Automated Vehicles: Combining MPC with Model Reference Adaptive Control.....	259
<i>Mugdha B. Thakur, Matthias Schmid</i>	
An Automatic Tuning MPC with Application to Ecological Cruise Control.....	265
<i>Mohammad Abtahi, Mahdis Rabbani, Shima Nazari</i>	
Connected Eco-Driving for Urban Corridors	271
<i>Xinpeng Wang, Han Zheng, Kukhyun Ahn, Xiaowu Zhang, Shreshta R. Deshpande, Ciro Soto, Huei Peng</i>	
Towards Sim2Real Transfer of Autonomy Algorithms using AutoDRIVE Ecosystem.....	277
<i>Chinmay Samak, Tanmay Samak, Venkat Krovi</i>	
Estimation of Respiratory Displacements using a Nonlinear Observer.....	283
<i>M. Ba, Paolo Pianosi, R. Rajamani</i>	
Design of Parallel Exoskeleton System for Wrist Tremor Suppression.....	289
<i>Sudarsana J. Janakaraj, Oumar Barry</i>	

Directional Force Feedback for a 3 DOF Pneumatic Haptic Finger	295
<i>Edmond Richer, Matt Galla, Yildirim Hurmuzlu</i>	
Safe Model-Based Multivariable Control of Peritoneal Perfusion	301
<i>Yejin Moon, Behzad Kadkhodaeiyladerani, Joshua Leibowitz, Parham Rezaei, Eman M. Abdelazim, Morcos Awad, Stephen Stachnik, Shelby Stewart, Joseph S. Friedberg, Jin-Oh Hahn, Hosam K. Fathy</i>	
Time-Scale Separation Analysis for Surgical Needle Control in Electromagnetic Robotic Systems	307
<i>Suraj Raval, Lamar Mair, Will Pryor, Onder Erin, Trevor Schwehr, Janya Budaraju, Axel Krieger, Yancy Diaz-Mercado</i>	
Scenario-Based Model Predictive Control of Water Reservoir Systems	313
<i>Raffaele G. Cestari, Andrea Castelletti, Simone Formentin</i>	
Multi-Player Linear-Quadratic Exponential Stochastic Differential Games on Directed Graphs	319
<i>Guilu Li, Jianan Wang, Kewei Xia</i>	
Model-Based and Koopman-Based Predictive Control: A Braking Control Systems Comparison.....	325
<i>Andrea Sassella, Valentina Breschi, Milan Korda, Simone Formentin</i>	
Nonlinear Model Predictive Control for Efficient Control of Variable Speed Variable Displacement Pumps.....	331
<i>Leonardo Cecchin, Jonathan Frey, Stefan Gering, Maximilian Manderla, Adrian Trachte, Moritz Diehl</i>	
Model Predictive Control for Tremor Suppressing Exoskeleton	337
<i>Subham Samal, Oumar Barry</i>	
A Nonlinear Fractional-Order Dynamical Framework for State of Charge Estimation of LiFePO ₄ Batteries in Electric Vehicles	343
<i>Manashita Borah, Scott Moura, Dylan Kato, Jaewoong Lee</i>	
Li-S Battery Outlier Detection and Voltage Prediction using Machine Learning.....	349
<i>Zahra Nozarijoubari, Hosam K. Fathy</i>	
Machine Learning-Based Electric Vehicle Battery State of Charge Prediction and Driving Range Estimation for Rural Applications	355
<i>Magdy A. Eissa, Pinggen Chen</i>	
Personalized Ground Vehicle Lane-Keeping Assist System Design: An Adaptive Sliding Mode Control Formulation with $L^{1+\alpha}$ Reachability	361
<i>Xingyu Zhou, Heran Shen, Zejiang Wang, Hyunjin Ahn, Yung-Chi Kung, Junmin Wang</i>	
Using Information Theory to Detect Model Structure with Application in Vehicular Traffic Systems	367
<i>Daniel Lane, Subhradeep Roy</i>	
Probabilistic RRT Connect with Intermediate Goal Selection for Online Planning of Autonomous Vehicles	373
<i>Darshit Patel, Azim Eskandarian</i>	
Damage Detection of a Pressure Vessel with Smart Sensing and Deep Learning	379
<i>Yang Zhang, Qianyu Zhou, Kai Zhou, Jiong Tang</i>	
Optimal Control Barrier Functions for RL Based Safe Powertrain Control	385
<i>Habtamu Hailemichael, Beshah Ayalew, Andrej Ivanco</i>	

Effects of Spring-Like Magnetic Energy from Embedded Permanent Magnets on Elastic Actuation	391
<i>Wenjing Li, Kok-Meng Lee</i>	
Neural Network Based Tire-Road Friction Estimation using Experimental Data	397
<i>Nicolas Lampe, Karl-Philipp Kortmann, Clemens Westerkamp</i>	
Kinematic Modeling of a Twisted-String Actuated Soft Robotic Finger as Part of an Anthropomorphic Gripper	403
<i>Steven Swanbeck, Revanth Konda, Jun Zhang</i>	
Free Vibration Modeling of Power Line Conductors	409
<i>Ranhee Yoon, Erdi Gulbahce, Oumar Barry</i>	
Modelling and Validation of a Remotely Operated Towed Vehicle and Computational Cost Analysis of Umbilical Cable	415
<i>Mika Fabricius, Daniel Ø. Tarp, Rasmus W. Kristensen, Jan M. Andersen, Jesper Liniger, Simon Pedersen</i>	
Modeling Canopy Temperature in Closed Greenhouses using Coupled Elliptic Models	421
<i>R. Tawegoum</i>	
Combined Film and Pulse Heating of Lithium Ion Batteries to Improve Performance in Low Ambient Temperature	427
<i>Habtamu Hailemichael, Beshah Ayalew</i>	
Physics-Informed Optimal Experiment Design of Calendar Aging Tests and Sensitivity Analysis for SEI Parameters Estimation in Lithium-Ion Batteries	433
<i>Hamidreza Movahedi, Sravan Pannala, Jason B. Siegel, Anna G. Stefanopoulou</i>	
Improving Li-S Battery SOC Estimation using an SOC-Dependent Resistance Model.....	439
<i>Chu Xu, Timothy Cleary, Hosam K. Fathy</i>	
Single Particle Model with Electrolyte for Simulating Diffusion-Limited Dynamics During an External Short in Li-Ion Batteries	445
<i>Vivian Tran, Jason B. Siegel, Anna G. Stefanopoulou</i>	
Laboratory Setup for Solid-State Battery Pressure Characterization and Control.....	451
<i>Timothy P. Cleary, Daiwei Wang, Donghai Wang, Hosam K. Fathy, Christopher D. Rahn</i>	
Empirical Modeling of Degradation in Lithium-Ion Batteries and Validation in Complex Scenarios	457
<i>Apoorva Roy, Hamidreza Movahedi, Jason B. Siegel, Anna G. Stefanopoulou</i>	
Dynamic Instabilities and Pattern Formation in Diffusive Epidemic Spread	463
<i>Aman K. Singh, Grace Miller, Manish Kumar, Subramanian Ramakrishnan</i>	
PageRank vs. ANP: A Comparative Analysis for Prioritizing Maintenance Activities in Industrial Water Distribution Systems	469
<i>Giulia Marcon, Silvia Carpitella, Antonella Certa</i>	
AutoVRL: A High Fidelity Autonomous Ground Vehicle Simulator for Sim-to-Real Deep Reinforcement Learning	475
<i>Shathushan Sivashangaran, Apoorva Khairnar, Azim Eskandarian</i>	
An Optimization Based Planner for Autonomous Navigation in Vineyards.....	481
<i>Sara Furioli, Simone Specchia, Matteo Corno, Sergio Savaresi</i>	

NMPC of Unmanned Aerial Manipulators Considering Obstacle Avoidance and Manipulability	487
<i>José Varela-Aldás, Luis F. Recalde, Bryan S. Guevara, Juan M. Toibero, Daniel Gandolfo</i>	
Design of a Lightweight Autonomous Robotic Phenotyping System for Turfgrass	493
<i>Tianyuan Zheng, Feng Han, Jingang Yi</i>	
Second-Order Differential Dynamic Programming for Whole-Body MPC of Legged Robots	499
<i>John N. Nganga, He Li, Patrick M. Wensing</i>	
Dynamic Path Planning for Multiple Robots Transporting Objects in a Deformable Sheet.....	505
<i>Kyle Hunte, Craig J. Ramlal, Jingang Yi</i>	
3-DOF Orientation Motion Control of a Weight-Compensated Spherical Motor with Embedded Magnetic Field Sensing	511
<i>Min Li, Kok-Meng Lee, Eric Hanson, Wenjing Li</i>	
Design, Modeling, and Control of a Millimeter-Range Flexure-Based Positioner for Dual-Stage 3D-Printing	517
<i>Ross Baer, Andre L. Lewis, Elizabeth M. Williams, William S. Nagel</i>	
Integrating Reconfigurable Foot Design, Multi-Modal Contact Sensing, and Terrain Classification for Bipedal Locomotion	523
<i>Ted Tyler, Vaibhav Malhotra, Adam Montague, Zhigen Zhao, Frank L. Hammond, Ye Zhao</i>	
Clustering Techniques for Stable Linear Dynamical Systems with Applications to Hard Disk Drives.....	529
<i>Nikhil P. S. Prakash, Joohwan Seo, Jongeun Choi, Roberto Horowitz</i>	
Stabilization of the Wind Turbine Floating Platform using Mooring Actuation.....	535
<i>Tajnuba Hasan, Doyal Sarker, Tri Ngo, Tuhin Das</i>	
Adaptive Speed Controller with Intelligent Startup Logic for Remote Control of Mainline Train Locomotives	541
<i>Sanketh Bhat, Saurabh Dhamne, Prem Pachaikani, Sahil Modi, Jayesh Barve, Derek Woo</i>	
A Novel Framework for Trajectory Planning and Safe Navigation of Satellite Swarms.....	547
<i>Yasaman Pedari, Himadri Basu, Hamid R. Ossareh</i>	
Distributed Network Embedding: A Distributed Control Approach for Undirected Networks	553
<i>Yoo-Bin Bae, Yeong-Ung Kim</i>	
Causality-Free Modeling of a Floating Wind Turbine Semisubmersible Platform with Validation Results	559
<i>Doyal Sarker, Tajnuba Hasan, Tri Ngo, Tuhin Das</i>	
A Supplemental Lighting Control Approach in Controlled Environment Agriculture to Reduce Peak Power Consumption	565
<i>Sahand Mosharafian, Shirin Afzali, Marc Van Iersel, Velni J. Mohammadpour</i>	
Trust-Based Performance Optimization for Human-Swarm Collaboration.....	571
<i>R. Oliver Zanone, Javad M. Velni</i>	
Identification of Contact Avoidance Zones of Robotic Devices in Human-Robot Collaborative Workspaces	577
<i>Marvin H. Cheng, Ci-Jyun Liang, E. A. McKenzie, Elena G. Dominguez</i>	

A Data-Driven Approach to Motion Planning and Optimal Control of Medical Nanorobots with Dynamic Window Approach	583
<i>Prahlad Pandav, Juan Ren</i>	
Quadcopters Control using Online Dynamic Mode Decomposition	589
<i>Bryan S. Guevara, Luis F. Recalde, José Varela-Aldás, Daniel C. Gandolfo, Juan M. Toibero</i>	
Integration of an Adaptively Reconfigurable Compliant Anatomical Palmar Mechanism with Multi- DOF Robotic Finger Grasping	595
<i>Ivy Chang, Kok-Meng Lee</i>	
Energy Efficient Foot-Shape Design for Bipedal Walkers on Granular Terrain	601
<i>Xunjie Chen, Jingang Yi, Hao Wang</i>	
SE(3) Koopman-MPC: Data-Driven Learning and Control of Quadrotor UAVs	607
<i>Sriram S. K. S. Narayanan, Duvan Tellez-Castro, Sarang Sutavani, Umesh Vaidya</i>	
Off-Road Navigation of Legged Robots using Linear Transfer Operators	613
<i>Joseph Moyalán, Andrew Zheng, Sriram S. K. S. Narayanan, Umesh Vaidya</i>	
Analytical Construction of Koopman EDMD Candidate Functions for Optimal Control of Ackermann-Steered Vehicles	619
<i>Ajinkya Joglekar, Chinmay Samak, Tanmay Samak, Krishna C. Kosaraju, Jonathon Smereka, Mark Brudnak, David Gorsich, Venkat Krovi, Umesh Vaidya</i>	
Adaptive Koopman-Based Models for Holistic Controller and Observer Design	625
<i>Annika Junker, Keno Pape, Julia Timmermann, Ansgar Trächtler</i>	
Control-Oriented Combustion Modeling for Compression-Ignition Engines Operating with Low Cetane Fuels	631
<i>Omar Ahmed, Robert Middleton, Anna Stefanopoulou, Kenneth Kim, Chol-Bum Kweon</i>	
A Concurrent Switching Model for Traffic Congestion Control	637
<i>Hossein Rastgoftar, Xun Liu, Jean-Baptiste Jeannin</i>	

Author Index