

Proceedings of the ASME

**INTERNATIONAL DESIGN ENGINEERING TECHNICAL
CONFERENCES & COMPUTERS AND INFORMATION IN
ENGINEERING CONFERENCE
- 2019 -**

VOLUME 9

**15TH IEEE/ASME INTERNATIONAL CONFERENCE ON MECHATRONIC
AND EMBEDDED SYSTEMS AND APPLICATIONS**

presented at
ASME 2019 INTERNATIONAL DESIGN ENGINEERING TECHNICAL CONFERENCES &
COMPUTERS AND INFORMATION IN ENGINEERING CONFERENCE

AUGUST 18-21, 2019

ANAHEIM, CALIFORNIA, USA

sponsored by
DESIGN ENGINEERING DIVISION, ASME
COMUTERS AND INFORMATION IN ENGINEERING DIVISION, AMSE

**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. 978-0-7918-5929-2

**© 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

15TH IEEE/ASME INTERNATIONAL CONFERENCE ON MECHATRONIC AND EMBEDDED SYSTEMS AND APPLICATIONS

ARTIFICIAL INTELLIGENCE AND EMERGING TECHNOLOGIES FOR MECHATRONICS AND EMBEDDED SYSTEMS

DETC2019-97046..... V009T12A001

Embedded RIOTS: Model Predictive Control Towards Edge

Jairo Viola, Sina Dehghan, YangQuan Chen

DETC2019-97668..... V009T12A002

Contactless Li-Ion Battery Voltage Detection by Using Walabot and Machine Learning

Yanan Wang, Haoyu Niu, Tiebiao Zhao, Xiaozhong Liao, Lei Dong, Yangquan Chen

DETC2019-97902..... V009T12A003

Augmented Microscopy for DNA Damage Quantification: A Machine Learning Tool for Environmental, Medical and Health Sciences

Michele Bernardini, Alessandro Ferri, Lucia Migliorelli, Sara Moccia, Luca Romeo, Sonia Silvestri, Luca Tiano, Adriano Mancini

BIO-INSPIRED ROBOTICS AND SOFT ROBOTICS

DETC2019-97227..... V009T12A004

Dynamical Modelling and Control of Snake-Like Motion in Vertical Plane for Locomotion in Unstructured Environments

Mohammadali Javaheri Koopaei, Christopher Pretty, Koen Classens, XiaoQi Chen

DETC2019-97901..... V009T12A005

Analysis of a Multibody Elastodynamic Model for Closed-Loop Kinematic Mechanisms

Luca Carbonari, Stefano Brillarelli, Matteo-Claudio Palpacelli, Massimo Callegari

DETC2019-97976..... V009T12A006

Computer Vision-Based Object Recognition and Automatic Pneumatic Soft Gripping

Ebrahim Shahabi, Wei-Hao Lu, Po Ting Lin, Chin-Hsing Kuo

DISTURBANCE REJECTION CONTROL

DETC2019-97831..... V009T12A007

On External Disturbance Rejection of Linear ADRC

Huiyu Jin, Yang Chen, Weiyao Lan

DETC2019-98352..... V009T12A008

Frequency Response Analysis of Macro-Micro Stages With Active Disturbance Reject Controller

Danping Zeng, Ruirui Huang, Zhijun Yang, Wenchao Xue

EMBEDDED SYSTEMS INFRASTRUCTURE AND THEORY

DETC2019-97526..... V009T12A009

A Cloud-Based Healthcare Infrastructure for Neonatal Intensive-Care Units

Lucia Migliorelli, Annalisa Cenci, Michele Bernardini, Luca Romeo, Sara Moccia, Primo Zingaretti

DETC2019-97950..... V009T12A010

Checking Application Level Properties Using Assertion Synthesis

Matthias Wenzl, Peter Roessler, Andreas Puhm

EMBEDDED VISION AND AMBIENT INTELLIGENCE

DETC2019-97328..... V009T12A011

Analysis of Octree Coding for 3D Point Cloud Frame

Pei-Heng Li, Juo-Wei Lin, Yi-Lun Huang, Ting-Lan Lin

FRACTIONAL DERIVATIVES AND THEIR APPLICATIONS

DETC2019-97209..... V009T12A012

Formalization of Fractional Flow Component in Higher-Order Logic Theorem Proving

Chunna Zhao, Murong Jiang, Yaqun Huang

DETC2019-97351..... V009T12A013

Some Fundamental Properties on the Sampling Free Nabla Laplace Transform

Yiheng Wei, Yuquan Chen, Yong Wang, YangQuan Chen

DETC2019-97489..... V009T12A014

Model Predictive Control of General Fractional Order Systems Using a General

Purpose Optimal Control Problem Solver: RIOTS

Sina Dehghan, Tiebiao Zhao, YangQuan Chen, Taymaz Homayouni

DETC2019-97624..... V009T12A015

On the Unified Design of Accelerated Gradient Descent

Yuquan Chen, Yiheng Wei, Yong Wang, YangQuan Chen

DETC2019-97652..... V009T12A016

Fractional-Order Extreme Learning Machine With Mittag-Leffler Distribution

Haoyu Niu, Yuquan Chen, YangQuan Chen

DETC2019-97662..... V009T12A017

Actuator Rate Limit Effects on Proportional-Integral Controller for First-Order Plus

Time-Delay Systems

Zhenlong Wu, Jie Yuan, Donghai Li, Yali Xue, YangQuan Chen

DETC2019-97674..... V009T12A018

Chattering-Free Finite-Time Stability of a Class of Fractional-Order Nonlinear Systems

Bin Wang, Yangquan Chen, Ying Yang

DETC2019-97709..... V009T12A019

Improving Cuckoo Search Algorithm With Mittag-Leffler Distribution
Jiamin Wei, YangQuan Chen, Yongguang Yu, Yuquan Chen

DETC2019-98178..... V009T12A020

Periodic-Doubling Bifurcation of a Circuit With a Fractional-Order Memristor
Yajuan Yu, Yangquan Chen

DETC2019-98254..... V009T12A021

Online Identification of Uncertain Fractional-Order Nonlinear Systems Using a Reinforced Differential Evolution Optimizer
Jiamin Wei, Yongguang Yu, YangQuan Chen

DETC2019-98258..... V009T12A022

Renormalization Group Method for Singular Perturbed Systems Driven by Fractional Brownian Motion
Lihong Guo, Shaoyun Shi, YangQuan Chen

DETC2019-98329..... V009T12A023

Improvement of Admissibility of Linear Singular Fractional Order Systems
XueFeng Zhang, Yingbo Zhang

DETC2019-98342..... V009T12A024

Satisfactory Optimization Design for Fractional Order PID Controller
Tianyu Liu, Yuanjun Jia, Weidong Jin, Yong Wang

JOINT SYMPOSIUM: SMART CYBER-PHYSICAL SYSTEMS

DETC2019-98147..... V009T12A025

Study of Industry 4.0 and its Impact on Lean Transformation in Aerospace Manufacturing
Sagil James, Alejandro Cervantes

MECHATRONICS AND EMBEDDED SYSTEMS FOR AGRICULTURE 4.0

DETC2019-97011..... V009T12A026

Deep Learning Automatic Inspections of Mushroom Substrate Packaging for PP-Bag Cultivations
Rong-Yuan Jou, Tseng-Wei Li

DETC2019-98457..... V009T12A027

Overview of Remote Sensing Efforts at University of Maryland Eastern Shore
Abhijit Nagchaudhuri, Travis Ford, Christopher Hartman

MECHATRONICS AND EMBEDDED SYSTEMS APPLICATIONS

DETC2019-97382..... V009T12A028

Modeling, Simulation and Assessment of a Hybrid Electric Ferry: Case Study for Mid-Size Ferry
Yanbiao Feng, Li Chen, Zuomin Dong

DETC2019-97479..... V009T12A029
Metaheuristic Tuning and Practical Implementation of a PID Controller Employing
Genetic Algorithms
Luis Angel, Jairo Viola, Mauro Vega

MECHATRONICS AND EMBEDDED SYSTEMS EDUCATION

DETC2019-97664..... V009T12A030
Low-Cost Real-Time Vision Platform for Spatial Temperature Control Research
Education Developments
Jairo Viola, Alberto Radici, Sina Dehghan, YangQuan Chen

DETC2019-98470..... V009T12A031
Extending Educational Robot Sensing Capabilities Through Equipping an External
Microcontroller
Binsen Qian, Harry H. Cheng

MECHATRONICS AND EMBEDDED TECHNOLOGIES IN INTELLIGENT TRANSPORTATION SYSTEMS

DETC2019-97600..... V009T12A032
Research on an Intelligent Diagnostic Equipment Suitable for Rail Traffic Braking
System
Changzheng Fang, Jing Yang, Quan Liu, Furen Feng, Jianyong Zuo

DETC2019-97703..... V009T12A033
Model-Based Combustion Duration and Ignition Timing Prediction for Combustion
Phasing Control of a Spark-Ignition Engine Using In-Cylinder Pressure Sensors
*Xin Wang, Amir Khameneian, Paul Dice, Bo Chen, Mahdi Shahbakhti, Jeffrey D. Naber, Chad
Archer, Qiuping Qu, Chris Glugla, Garlan Huberts*

DETC2019-97712..... V009T12A034
MPC-Based Control of Autonomous Vehicles With Localized Path Planning for
Obstacle Avoidance Under Uncertainties
Sai Rajeev Devaragudi, Bo Chen

DETC2019-97779..... V009T12A035
A Cloud Computing Architecture to Map Trawling Activities Using Positioning Data
*A. Galdelli, A. Mancini, A. N. Tassetti, C. Ferra Vega, E. Armelloni, G. Scarella, G. Fabi, P.
Zingaretti*

MECHATRONICS AND INDUSTRY 4.0

DETC2019-97768..... V009T12A036
Heuristic Approach for Warehouse Resources and Production Planning Optimization:
An Industry Case Study
*Roberto Rosetti, Mirco Sturari, Emanuele Frontoni, Jelena Loncarski, Anselmo Cicchitti,
Enrico Iavazzo, Diego Gualtieri*

DETC2019-97917..... **V009T12A037**
An Event Based Machine Learning Framework for Predictive Maintenance in Industry
4.0

Matteo Calabrese, Martin Cimmino, Martina Manfrin, Francesca Fiume, Dimos Kapetis, Maura Mengoni, Silvia Ceccacci, Emanuele Frontoni, Marina Paolanti, Alberto Carrotta, Giuseppe Toscano

DETC2019-97958..... **V009T12A038**
On-Line Programming of Robot Skills
Tapio Heikkila, Janne Saukkoriipi, Jari M. Ahola, Tuomas Seppala

MICRO-/NANO-MANIPULATION TECHNOLOGIES AND APPLICATIONS

DETC2019-97313..... **V009T12A039**
Tracking Performance Improvement of Repetitive Controller for Nano-Manipulating
Systems With Time Delays
Pengbo Liu, Peng Yan

DETC2019-97522..... **V009T12A040**
Development of a Compact and Cost Effective MSL System Based on a Compliant
Nanomanipulator
Zheng Liu, Zhen Zhang, Yingchun Guan

ROBOTICS AND MOBILE MACHINES

DETC2019-97418..... **V009T12A041**
Affine ICP for Fine Localization of Smart-AGVs in Smart Factories
Abdurrahman Yilmaz, Hakan Temeltas

DETC2019-97916..... **V009T12A042**
Mechanical Design and Prototype of a Reconfigurable Actuated Universal Joint
M. C. Palpacelli, L. Carbonari, G. Palmieri, M. Callegari

DETC2019-97974..... **V009T12A043**
Indoor Testbed for Vector Field Multirobot Adaptive Navigation: Feasibility Study
Danop Rajabhandharaks, Robert T. McDonald, Michael A. Neumann, Christopher A. Kitts

DETC2019-98048..... **V009T12A044**
Dual-Arm Manipulators Kinematic Control Under Multiple Constraints via Virtual Joints
Approach
Daniele Proietti Pagnotta, Alessandro Freddi, Sauro Longhi, Andrea Monteriu

SENSORS AND ACTUATORS

DETC2019-97116..... **V009T12A045**
Design of Multi-DOF Spherical Piezoelectric Motor Using Electrode Configuration
Based Actuating Units
Chi-Ying Lin, Yu-Ting Sung, Yu-Hsi Huang

DETC2019-98156..... **V009T12A046**

Energy Optimal Control of Dielectric Elastomer Actuators via Adaptive Dynamic Programming

Paolo Roberto Massenio, David Naso, Gianluca Rizzello

DETC2019-98297..... **V009T12A047**

Development of an Assist-As-Need Controller for an Upper-Limb Exoskeleton With Voluntary Torque Estimate

Logan T. Chatfield, Benjamin C. Fortune, Lachlan R. McKenzie, Christopher G. Pretty

DETC2019-98298..... **V009T12A048**

Electrode-Skin Impedance Component Estimation in the Time-Domain

Benjamin C. Fortune, Lachlan R. McKenzie, Logan T. Chatfield, Christopher G. Pretty

UNMANNED VEHICLE TECHNOLOGIES AND APPLICATIONS

DETC2019-97288..... **V009T12A049**

Neighborhood Optimization Method for Shaping Bode Plot With Larger Phase Margin

Bo Shang, Chengdong Wu, YangQuan Chen

DETC2019-97497..... **V009T12A050**

Smart Agricultural In-Field Service Robot: From Toy to Tool

Peng Wang, Junwei Tian, Haoyu Niu, YangQuan Chen

DETC2019-97665..... **V009T12A051**

A Modular Approach to Level Curve Tracking With Two Nonholonomic Mobile Robots

Sarthak Chatterjee, Wencen Wu

DETC2019-97666..... **V009T12A052**

Multi-Resolution Energy Strategy for Battery Management System of Unmanned

Ground Vehicles in Agriculture

Yanan Wang, Junwei Tian, Haoyu Niu, Peng Wang, Xiaozhong Liao, Yangquan Chen

DETC2019-97895..... **V009T12A053**

Fire Detection Using Both Infrared and Visual Images With Application to Unmanned

Aerial Vehicle Forest Fire Surveillance

Chi Yuan, Zhixiang Liu, Anim Hossain, Youmin Zhang

DETC2019-97939..... **V009T12A054**

Pilot-Induced-Oscillations Issue in Driverless Car Age

Jie Yuan, Zhenlong Wu, Shumin Fei, YangQuan Chen

DETC2019-98259..... **V009T12A055**

Smart and Autonomous Farm Field Scouting Service Robot As an Edge Device Under \$1000: Challenges and Opportunities

Junwei Tian, Haoyu Niu, Peng Wang, YangQuan Chen