2018 19th International **Conference on Research and Education in Mechatronics** (REM 2018)

Delft, Netherlands 7-8 June 2018



IEEE Catalog Number: CFP1845X-POD ISBN:

978-1-5386-5414-9

Copyright \odot 2018 by the Institute of Electrical and Electronics Engineers, Inc. All Rights Reserved

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

*** This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.

 IEEE Catalog Number:
 CFP1845X-POD

 ISBN (Print-On-Demand):
 978-1-5386-5414-9

 ISBN (Online):
 978-1-5386-5413-2

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

E-mail: curran@proceedings.com Web: www.proceedings.com



Table of contents

Committees	İΧ
Sessions	χi
Program	xiii
Papers:	
Session 1a: Signal Processing and Control	
Comparison of different Methods for Encoder Speed Signal Filtering exemplified by	1
an inverted Pendulum (14424) Analysis of the error generated by the voltage output accelerometer using the optimal	7
structure of an artificial neural network (14371)	,
Neural Network based Activity Tracker (14421)	12
\mathcal{H}_{∞} Controller Design for a Robotic Research and Educational Mining Loader (14423)	18
Session 1b: Mechatronic Systems Design	
Explore Design Spaces using a generic framework (14394)	24
Usage of agile practices in Mechatronics System Design — Potentials, Challenges	30
and Actual Surveys (11800)	
A Hierarchical Meta-Model for the Design of Cyber-Physical Production Systems	36
(14319)	
Structuring Student Projects along Concept Inventories (14420)	42
Session 2a: Mechatronics Special Topics	
Fluid Flow Pinched by Near-Wall Bingham Plastic Zones: Simulation Study (14392)	48
Control of Linear Hydraulic Actuator using the full Hydraulic Bridge (14411)	52
Custom hip implant design optimization (10532)	58
Session 2b: Trends in Teaching Mechatronics 1	
Measuring Quality Performance of Mechatronics Engineering Programs (14374)	64
Implementing of a project-based and skill assessment pedagogy in a mechatronics	69
course (12630) Seamless Integration of Machine Learning Contents in Mechatronics Curricula	75
(14375)	75
Session 3a: Robotics and Applications	
Statically Stable Gait Synthesis Algorithm For 4-legged Walking Robot Based On The	81
Ground Reaction Forces Determination (14476)	0.
Development of a PTP Movement of a Industrial Robot via MATLAB by deriving its	87
Kinematics and Integration in an Offline Programming Tool (14390)	
System Identification for Bixler3 Unmanned Aerial Vehicle (11639)	93
Navigation and Vision System of a Mobile Robot (14417)	99
Session 4a: Mobile Robotics and Vehicles	
Lightweight Vehicle as multipurpose Platform for Education and Research (14434)	105
Self-driving car ISEAUTO for research and education (14389)	111
Session 4b: Trends in Teaching Mechatronics 2	
Practical methodologies for the development of the students' multidisciplinary engi-	117
neering skills — A win-win cooperation for both universities and companies (14463)	

Recognition of prior learning and academic success — Expert knowledge of a German	121
University of Applied Sciences (11875)	
MEXLE — A new Multimodal System for Experiments and Learning in Mechatronics	124
(14419)	
Session 5a: Computer Vision	
Object Tracking for 'Car Platooning' Using a Single Area-Scan Camera (14414)	130
Detection of Semantic Grasping-Parameter using Part-Affordance Recognition	136
(14379)	
Affordable Modular Mobile Manipulator for Domestic Applications (14398)	141
Session 5b: Educational lab-setup development	
Educational setup for Power Electronics and IoT (14388)	147
Brushed universal motor controller for DC-grids (14391)	153
Automation of a Creep-testing Machine for Research Activities (14322)	159
Author index	165