

# **4th International Conference on System-Integrated Intelligence: Intelligent, Flexible and Connected Systems in Products and Production 2018**

Procedia Manufacturing Volume 24

Hannover, Germany  
19 – 20 June 2018

## **Editors:**

**Berend Denkena  
Klaus-Dieter Thoben  
Ansgar Trachtler**

ISBN: 978-1-5108-6572-3

**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.**

Copyright© by Elsevier B.V.  
All rights reserved.

Printed by Curran Associates, Inc. (2018)

For permission requests, please contact Elsevier B.V.  
at the address below.

Elsevier B.V.  
Radarweg 29  
Amsterdam 1043 NX  
The Netherlands

Phone: +31 20 485 3911  
Fax: +31 20 485 2457

<http://www.elsevierpublishingsolutions.com/contact.asp>

**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)

# TABLE OF CONTENTS

<b>EDITORIAL</b> .....	1
<i>Berend Denkena, Klaus-Dieter Thoben, Ansgar Trächtler</i>	
<b>A CASE STUDY FOR A UNIFIED DESIGNATION OF DEVELOPMENT INFORMATION IN A PDM SYSTEM FOR TECHNICAL INHERITANCE</b> .....	2
<i>Wieben Scheidel, Iryna Mozgova, Roland Lachmayer</i>	
<b>A MULTI-PHYSICS SIMULATION APPROACH FOR ENERGY AND COST ANALYSIS DURING THE DECELERATION OF HIGH-SPEED TRAINS</b> .....	8
<i>David Meinel, Tallal Javied, Sebastian Rast, Christian Zipp, Jörg Franke</i>	
<b>A REINFORCEMENT LEARNING STRATEGY FOR THE SWING-UP OF THE DOUBLE PENDULUM ON A CART</b> .....	15
<i>Michael Hesse, Julia Timmermann, Eyke Hüllermeier, Ansgar Trächtler</i>	
<b>A UNIFIED SYSTEM MODELLING AND PROGRAMMING LANGUAGE BASED ON JAVASCRIPT AND A SEMANTIC TYPE SYSTEM</b> .....	21
<i>Stefan Bosse</i>	
<b>APPLICATION SCENARIOS OF ARTIFICIAL INTELLIGENCE IN ELECTRIC DRIVES PRODUCTION</b> .....	40
<i>A. Mayr, M. Weigelt, M. Masuch, M. Meiners, F. Huttel, J. Franke</i>	
<b>ENERGY CONSUMPTION ANALYSIS OF MODULES FOR CPS RETROFITTING</b> .....	48
<i>M. Rehe, B. Denkena, C. Wagener</i>	
<b>CHALLENGES AND OPPORTUNITIES OF RFID SENSORTAGS INTEGRATION BY FIBRE-REINFORCED PLASTIC COMPONENTS PRODUCTION</b> .....	54
<i>Michael Brink, Frank Berkemeyer, Jan-Hendrik Ohlendorf, Gerrit Dumstorff, K. Thoben, Walter Lang</i>	
<b>CLUSTER IDENTIFICATION OF SENSOR DATA FOR PREDICTIVE MAINTENANCE IN A SELECTIVE LASER MELTING MACHINE TOOL</b> .....	60
<i>Eckart Uhlmann, Rodrigo Pastl Pontes, Claudio Geisert, Eckhard Hohwieler</i>	
<b>COMPARISON OF EEG DATA CLASSIFICATION BETWEEN CONVENTIONAL VISUAL CUE-MARKER AND EMG-BASED MARKER ON BRAIN ACTIVITY</b> .....	66
<i>Khairunnisa Johar, Noor Ayuni Che Zakaria, Muhammad Azmi Ayub, Cheng Yee Low, Fazah Akthar Hanapiah</i>	
<b>CONCEPT AND DESIGN OF A SPHERICAL JOINT MECHANISM FOR SERVICE ROBOTS</b> .....	74
<i>Tim Froehlich, Ulrich Reiser, Felix Meßmer, Alexander Verl</i>	
<b>CONCEPT FOR THE IMPLEMENTATION OF A SCALING STRATEGY INTO THE PARADIGM OF TECHNICAL INHERITANCE</b> .....	80
<i>Philipp Wolniak, Iryna Mozgova, Roland Lachmayer</i>	
<b>CONFIGURATION BASED PROCESS AND KNOWLEDGE MANAGEMENT BY STRUCTURING THE SOFTWARE LANDSCAPE OF GLOBAL OPERATING INDUSTRIAL ENTERPRISES WITH MICROSERVICES</b> .....	86
<i>Eike Schöffler, Hannes Leibinger, Axel Stamm, Matthias Brossog, Jörg Franke</i>	
<b>CURING TRANSPONDER – INTEGRATING RFID TRANSPONDER INTO GLASS FIBER-REINFORCED COMPOSITES TO MONITOR THE CURING OF THE COMPONENT</b> .....	94
<i>Marius Veigt, Elisabeth Hardi, Michael Koerdit, Axel S. Herrmann, Michael Freitag</i>	
<b>COMMUNICATION CONCEPT OF DECONSIM: A DECENTRALIZED CONTROL SIMULATOR FOR PRODUCTION SYSTEMS</b> .....	100
<i>R. Davide D'Amico, Georg Egger, Andrea Giusti, Erwin Rauch, M. Riedl, Dominik T. Matt</i>	
<b>DEVELOPING THE REQUIREMENTS OF A PLM/ALM INTEGRATION: AN INDUSTRIAL CASE STUDY</b> .....	107
<i>Andreas Deuter, Andreas Otte, Marcel Ebert, Frank Possel-Dölken</i>	
<b>DEVELOPMENT OF A HANDLING SYSTEM WITH INTEGRATED SENSORS FOR TEXTILE PREFORMS USING ADDITIVE MANUFACTURING</b> .....	114
<i>Michael Brink, Jan-Hendrik Ohlendorf, Klaus-Dieter Thoben</i>	
<b>ENABLING DATA ANALYTICS IN LARGE SCALE MANUFACTURING</b> .....	120
<i>Achim Kampker, Heiner Heimes, Ulrich Bühner, Christoph Lienemann, Stefan Krottl</i>	
<b>ENHANCING EXPERT KNOWLEDGE BASED CAUSE-EFFECT NETWORKS USING CONTINUOUS PRODUCTION DATA</b> .....	128
<i>Daniel Rippel, Michael Lütjen, Michael Freitag</i>	
<b>EVALUATION OF AN ENERGY SELF-SUFFICIENT SENSOR FOR MONITORING MARINE GEARBOXES</b> .....	135
<i>T. Schneider, T. Kruse, B. Kuester, M. Stonis, L. Overmeyer</i>	

<b>FEATURE MODEL FOR THE SPECIFICATION OF INDUSTRIAL INDOOR LOCATION-BASED SERVICES</b> .....	141
<i>Tommy Falkowski, Christoph Jürgenhake, Harald Anacker, Roman Dumitrescu</i>	
<b>FRAMEWORK FOR THE AGILE DEVELOPMENT OF INNOVATIVE PRODUCT-SERVICE-SYSTEMS FOR EXISTING PHYSICAL REHABILITATION SYSTEMS</b> .....	147
<i>Laban Asmar, Martin Rabe, Cheng Yee Low, Jingye Yee, A. Kuhn, Roman Dumitrescu</i>	
<b>GENERATING CORRECT, COMPACT, AND EFFICIENT PLC CODE FROM SCENARIO-BASED ASSUME-GUARANTEESPECIFICATIONS</b> .....	153
<i>Daniel Gritzner, Joel Greenyer</i>	
<b>HYBRID SPINDLE – AN APPROACH FOR A MILLING MACHINE TOOL SPINDLE WITH EXTENDED WORKING RANGE FOR HSC AND HPC</b> .....	159
<i>B. Denkena, B. Bergmann, M. Mücke, J. Königsberg, B. Ponick</i>	
<b>IMPROVING CLUSTER-BASED METHODS FOR USAGE ANTICIPATION BY THE APPLICATION OF DATA TRANSFORMATIONS</b> .....	166
<i>Andres Auquilla, Yannick De Bock, Joost R. Duflou</i>	
<b>INFLUENCE OF STRAIN ON MINIATURIZED FLEXIBLE SENSOR FOR ON-LINE MONITORING OF CFRP PRODUCTION</b> .....	173
<i>Martina Hübner, Daniel Gräbner, Aynur Özdemir, Walter Lang</i>	
<b>INTEGRATING SENSORS IN CASTINGS MADE OF ALUMINUM – NEW APPROACHES FOR DIRECT SENSOR INTEGRATION IN GRAVITY DIE CASTING</b> .....	179
<i>Rico Tiedemann, Martin Fischer, Matthias Busse, Walter Lang</i>	
<b>INTELLIGENT CONTROL OF AN ASSEMBLY STATION BY INTEGRATION OF A DIGITAL TWIN FOR EMPLOYEES INTO THE DECENTRALIZED CONTROL SYSTEM</b> .....	185
<i>Iris Graessler, Alexander Poehler</i>	
<b>INTELLIGENT WORKPIECE CARRIER FOR DISTRIBUTED DATA COLLECTION AND CONTROL IN MANUFACTURING ENVIRONMENTS</b> .....	190
<i>Walter Gasparetto, Georg Egger, Andrea Giusti, Erwin Rauch, M. Riedl, Dominik T. Matt</i>	
<b>INVESTIGATION ON THE INFLUENCE OF MATERIAL INTERFACES AND IMPEDANCE CHANGES ON THE PROPAGATION OF GUIDED WAVES IN LAMINATED STEEL LAYERS</b> .....	196
<i>Liv Rittmeier, Tobias Losch, Michael Sinapius, Rolf Lammering</i>	
<b>LOW POWER SENSOR NODE WITH PHOTOVOLTAIC POWER SUPPLY FOR RADIO-BASED PROCESS MONITORING</b> .....	203
<i>Christoph Von Der Ahe, Bernard Lüers, Ludger Overmeyer, Bernd Geck, Tobias Fürtjes</i>	
<b>MOBILE AUTOMATED DIAGNOSTICS OF STRESS STATE AND RESIDUAL LIFE PREDICTION FOR A COMPONENT UNDER INTENSIVE RANDOM DYNAMIC LOADS</b> .....	210
<i>Iryna Mozgova, Ihor Yanchevskiy, Mykola Gerasyenko, Roland Lachmayer</i>	
<b>MODEL-BASED SYSTEMS ENGINEERING FOR MACHINE TOOLS AND PRODUCTION SYSTEMS (MODEL-BASED PRODUCTION ENGINEERING)</b> .....	216
<i>Karl Kübler, Stefan Scheifele, Christian Scheifele, Oliver Riedel</i>	
<b>OPTIMIZATION MODEL TO EXTEND EXISTING PRODUCTION PLANNING AND CONTROL SYSTEMS FOR THE USE OF ADDITIVE MANUFACTURING TECHNOLOGIES IN THE INDUSTRIAL PRODUCTION</b> .....	222
<i>Wjatscheslav Baumung, Vladislav V. Fomin</i>	
<b>PROCESS-PARALLEL CENTER DEVIATION MEASUREMENT OF A BTA DEEP-HOLE DRILLING TOOL</b> .....	229
<i>Berend Denkena, Benjamin Bergmann, Sebastian Kaiser, Markus Mücke, Dieter Bolle</i>	
<b>RAPID-CONTROL-PROTOTYPING AS PART OF MODEL-BASED DEVELOPMENT OF HEAT PUMP DRYERS</b> .....	235
<i>Jens Holtkötter, Jan Michael, Christian Henke, Ansgar Trächtler, M. Bockholt, A. Mohlenkamp, Michael Katter</i>	
<b>SCENARIO-BASED MANUFACTURING DATA ANALYTICS WITH THE EXAMPLE OF ORDER TRACING THROUGH BLE-BEACONS</b> .....	243
<i>Sebastian Groggert, Hannes Elser, Quoc Hao Ngo, Robert H. Schmitt</i>	
<b>SELF-DESCRIBING CONNECTED COMPONENTS FOR LIVE INFORMATION ACCESS WITHIN PRODUCTION SYSTEMS</b> .....	250
<i>David Barton, Philipp Gönnheimer, Chuanqi Qu, Jürgen Fleischer</i>	
<b>SIMULTANEOUS MEASUREMENT OF STRAIN AND TEMPERATURE WITH TWO RESISTIVE STRAIN GAUGES MADE FROM DIFFERENT MATERIALS</b> .....	258
<i>Daniel Gräbner, Gerrit Dumstorff, Walter Lang</i>	
<b>SMART HUMAN-ROBOT-COLLABORATION IN MECHANICAL JOINING PROCESSES</b> .....	264
<i>Jens Meißner, M. Sc. Frederik Schmatz, Florian Beuß, Jan Sender, W Flugge, Eugen Gorr</i>	
<b>SPECIFICATION TECHNIQUE FOR VIRTUAL TESTBEDS IN SPACE ROBOTICS</b> .....	271
<i>Ruslan Bernijazov, Michael Hillebrand, Christian Bremer, Lydia Kaiser, Roman Dumitrescu</i>	

<b>SYSTEMATIC DEVELOPMENT OF SMART FACTORY USING CONSENS</b> .....	278
<i>Ubaidullah Mohammad, Cheng Yee Low, Ramhuzaini Abd Rahman, Laban Asmar, M. Rabe, R. Dmitrescu, Noor Ayuni Che Zakaria</i>	
<b>TESTING LORA FOR FOOD APPLICATIONS - EXAMPLE APPLICATION FOR AIRFLOW MEASUREMENTS INSIDE COOLED WAREHOUSES WITH APPLES</b> .....	284
<i>R. Jedermann, M. Borysov, N. Hartgenbusch, S. Jaeger, M. Sellwig, W. Lang</i>	
<b>THERMAL ANALYSIS OF PERFORATED PIN-FINS HEAT SINK UNDER FORCED CONVECTION CONDITION</b> .....	290
<i>Alhassan Salami Tijani, Nursyameera Binti Jaffri</i>	
<b>TOOLS 4.0 – INTELLIGENCE STARTS ON THE CUTTING EDGE</b> .....	299
<i>W. Maier, H.-C. Möhring, K. Werkle</i>	
<b>USE OF RFID TAGS FOR MONITORING RESIN FLOW AND INVESTIGATION OF THEIR INFLUENCE ON THE MECHANICAL PROPERTIES OF THE COMPOSITE</b> .....	305
<i>E. Hardi, M. Veigt, M. Koerdt, A. S. Herrmann, M. Freitag</i>	
<b>USING TRANSITIVE RELATIONS FOR AUTOMATIC CREATION OF CONSISTENT TRACEABILITY IN MODEL-BASED SYSTEMS ENGINEERING</b> .....	311
<i>Atakan Sünnetcioglu, Rainer Stark</i>	
<b>WIRELESS ONLINE IMPACT SOURCE LOCALIZATION ON A COMPOSITE</b> .....	319
<i>Sarah Aguasvivas Manzano, Dana Hughes, Nikolaus Correll</i>	
<b>Author Index</b>	