

TABLE OF CONTENTS

1. PREFACE	V
Foreword	XIII
Members of the Organizing Committee	XV
Members of the International Paper Review Panel	XVI
Invited paper	XVII
Competitive engineering in the age of industry 4.0 and beyond <i>Iris Graessler (DE)</i>	XIX
2 ENGINEERING OF SYSTEMS	1
Implementation of cyber-physical systems	3
A virtual reality based cyber physical framework for micro devices assembly <i>Joe Cecil (US), Sadiq Albuhamood (US), Parmesh Ramanathan (US)</i>	3
Towards validation of smart cyber-physical systems <i>Jože Tavčar (SI), Jože Duhovnik (SI), Imre Horváth (NL)</i>	17
Trustworthiness in designing cyber-physical systems <i>Yan Wang (US)</i>	27
Components and interactions: Paving the way to model agent-based cyber-physical social systems <i>Stefano Borgo (IT), Emilio M. Sanfilippo (IT)</i>	41
Advancing smart factories with synced factory twins approach: Representation and scenarios for synchronized digital and real factories <i>Alain Pfouga (DE), Josip Stjepandić (DE), Timo Wekerle (DE)</i>	49
Application of complex systems	61
The design of IOT based smart simulation environments for orthopedic surgical training <i>Joe Cecil (US), Avinash Gupta (US), Miguel Pirela-Cruz (US), Parmesh Ramanathan (US)</i>	61
Observation of intention, action and conduct by cyber-physical systems in home care context <i>Imre Horváth (NL)</i>	75
Manufacturing process selection integrated in the design process <i>Pedro Hernández-Castellano (ES), María Dolores Martínez-Rivero (ES), María Dolores Marrero-Alemán (ES), Luis Suárez-García (ES)</i>	93
Constructing personalized messages for informing cyber-physical systems based on dynamic context information processing	
	VII

<i>Yongzhe Li (NL), Imre Horváth (NL), Zoltán Rusák (NL)</i>	105
Agent-enabled systems	121
Revisiting the society of mind: Convolutional neural networks via multi-agent systems <i>Michéle Cullinan (SA), Duncan Anthony Coulter (SA)</i>	121
Holonic agents for design and manufacturing integration in virtual digital cells <i>Alain-Jérôme Fougères (FR), Egon Ostrosi (FR)</i>	133
CESIMAS: A continual evaluative self-aware immune-inspired multi agent critical information infrastructure protection system model <i>Jan Hendrik van Niekerk (SA), Elizabeth Marie Ehlers (SA)</i>	145
A project monitoring methodology for distributed product generation engineering <i>Benjamin Walter (DE), Katharina Dühr (DE), Nikola Bursac (DE), Albert Albers (DE)</i>	159
Holonic superposition intelligence of multi-agent systems <i>Gerard Gouws (SA), Elizabeth Marie Ehlers SA</i>	171
Smart systems engineering	183
Adaptive supply chain systems - Conceptual framework using Internet of Things (IOT) <i>Parthasarathi Ramakrishnan (CA), Yongsheng Ma (CA)</i>	183
Smart Systems Engineering (SMARTSE) – Uniformed approach for exchange of functional and behavior models for simulation using Functional Modelling Interface (FMI) <i>Timo Wekerle (DE), Josip Stjepandić (DE), Alain Pfouga (DE), Claas Blume (DE)</i>	197
Next generation digital twin <i>Stefan Boschert (DE), Christoph Heinrich (DE), Roland Rosen (DE)</i>	209
The evolution of computer assisted product design and manufacturing tools to smart systems for the factories of the future <i>Giampaolo Campana (IT), Barbara Cimatti (IT), Mattia Mele (IT)</i>	219
Protecting distributed computer systems through an artificial immune system <i>Merrick Kenna Bengis (SA), Elizabeth Marie Ehlers (SA)</i>	229
Architecture, construction and urban-design	237
NEOMORPH VR: A multi-user virtual reality conceptual design platform for architecture and urbanism using procedural game technologies <i>Claudiu Bârsan-Pipu (NL)</i>	237
A survey of different design rules-based techniques for facility layout problems <i>Mariem Besbes (FR), Roberta Costa Affonso (FR), Marc Zolghadri (FR), Faouzi Masmoudi (TN), Mohamed Haddar (TN)</i>	251
Diagrid façade design for public pool building using differential evolution <i>Nezahat Puren Unlu (TR), Berk Ekici (TR), Ioannis Chatzikonstantinou (TR), I. Sevil Sariyildiz (NL), M. Fatih Tasgetiren (TR), Cemre Cubukcuoglu (NL)</i>	265

Implementing a prototype of a web-based refrigeration engineering education system using blended enablers <i>Garrett Keenaghan (IR), Imre Horváth (NL)</i>	275
Eye movements while cycling in GTA V <i>Pavlo Bazilinskyy (NL), Niels Heisterkamp (NL), Philine Luik (NL), Stijn Klevering (NL), Assia Haddou (NL), Michiel Zult (NL), George Dialynas (NL), Dimitra Dodou (NL), Joost de Winter (NL)</i>	287
Socially responsible engineering	295
Eye tracking study on successful micro-strategies by design engineers for the synthesis-driven analysis of technical systems <i>Sven Matthiesen (DE), Thomas Nelius (DE)</i>	295
Product design for elderly: The need for a new design methodology <i>Lau Langeveld (NL)</i>	305
Towards green e-commerce systems: Opportunities for fresh food delivery <i>Els Du Bois (BE), Cedric Wery (BE), Paul Bailleul (BE)</i>	319
Early detection of Alzheimer's disease using white matter and grey matter alterations in the wavelet domain <i>Shiwangi Mishra (IN), Pritee Khanna (IN)</i>	329
The connected society calls for macro-engineering <i>Shuichi Fukuda (JP)</i>	339
3 SUPPORT FOR ENGINEERING	345
Assembly, disassembly and generations	347
Registration of shapes for mechanical assembly <i>Hariharan Krishnamurthy (IN), Dibakar Sen (IN)</i>	347
A CAD model relationship matrix generation and influence coefficient determination <i>Ameni Eltaief (FR), Borhen Louhichi (FR), Sébastien Remy (FR), Guillaume Ducellier (FR), Benoit Eynard (FR)</i>	361
Towards the integration of disassembly technological relationships for sustainable product enhancement <i>Elise Gruhier (FR), Robin Kromer (FR), Nicolas Perry (FR)</i>	373
Decision heuristics in PGE – Product generation engineering <i>Nikola Bursac (DE), Narucha Tanaiutchawoot (DE), Simon Rapp (DE), Albert Albers (DE), Jan Breitschuh (DE), Claudia Eckert (DE)</i>	385
Pitch 2.0 – Concept of early evaluation of product profiles in product generation engineering <i>Thilo Richter (DE), Jonas Heimicke (DE), Nicolas Reiß (DE), Jan Breitschuh (DE), Albert Albers (DE), Marius Gutzeit (DE), Benjamin Walter (DE), Nikola Bursac (DE)</i>	395
Data driven design	405
BOLEPI: A machine learning framework for forecasting project outcomes <i>Thabo Daniel Mphuthi (SA), Duncan Anthony Coulter (SA)</i>	405
An auditory dataset of passing vehicles recorded with a smartphone	

<i>Pavlo Bazilinskyy (NL), Arne van der Aa (NL), Michael Schoustra (NL), John Spruit (NL), Laurens Staats (NL), Klaas Jan van der Vlist (NL), Joost de Winter (NL)</i>	417
What do designers miss regarding the outputs of data analytics tools in the context of possible product improvements? <i>Fatima-Zahra Abou Eddahab (NL), Imre Horváth (NL)</i>	423
Design with industry 4.0 - Priorization of sensor data for a smart data driven product development process <i>Tobias Stürmlinger (DE), Bartosz Gladysz (DE), Markus Strauch (DE), Albert Albers (DE)</i>	439
Design intervention for productivity improvement in glass bangles manufacturing unit <i>Kiran Kumari Mahato (IN), Pratul Chandra Kalita (IN), Amarendra Kumar Das (IN)</i>	451
Methods, methodologies and tools	459
Emergent methods, methodologies, tools and technologies for design and engineering processes <i>Robert E. Wendrich (NL)</i>	459
Evaluation of a method supporting the integration of packaging development into product development using an assessment framework for methodologies under development <i>Damien Motte (SE), Robert Björnemo (SE), Gunilla Jönson (SE)</i>	471
Food packaging design: Case of study about perception of shapes and reliefs thermoformed? <i>Lucía Rodríguez-Parada (ES), Pedro F. Mayuet Ares (ES), Rafael Bienvenido Bárcena (ES)</i>	487
A generic function decomposition framework inspired by biology <i>Yuemin Hou (CN)</i>	495
Towards human-induced failure assessment during early design <i>Salman Ahmed (US), H. Onan Demirel (US), Irem Y. Tumer (US), Robert B. Stone (US)</i>	507
Additive manufacturing technologies	521
Discrete element method to study the powder-bed layer characteristics in additive manufacturing <i>Robin Kromer (FR), Emilie Le Guen (FR), Corinne Arvieux (FR), Eric Lacoste (FR), Jean Marc Agullo (FR), Gaëlle Vanard (FR), Simon Perusin (FR)</i>	521
An optimization framework for additive manufacturing given topology optimization results <i>Anton Wiberg (SE), Johan Persson (SE), Johan Ölvander (SE)</i>	533
Interactive training material about additive manufacturing technologies <i>Pedro M. Hernández-Castellano (ES), Alejandro Gutierrez-Barcenilla (ES), María Dolores Martínez-Rivero (ES), María Dolores Marrero-Alemán (ES), Luis Suárez-García (ES), Rubén Paz-Hernández (ES), Antonio Nizardo Benítez-Vega (ES)</i>	543
Simulation of early-ejected injection-moulded plastic parts with integrated FEA	

<i>Junyu Fu (CA), Yongsheng Ma (CA)</i>	555
Development of thickness prediction strategy in incremental forming for improvement in part evaluation <i>Satwik Priyadarshi (IN), Saurabh Verma (IN), Puneet Tandon (IN)</i>	567
Triply periodic helical structure of minimal surfaces produced by additive approach and its mechanical properties <i>Katarina Monkova (SK), Peter Monka (SK), Ivana Zetkova (SK)</i>	577
Modeling, design and analysis	585
An image-based method to classify power lines in LIDAR point clouds <i>Sebastián Ortega (ES), Agustín Trujillo (ES), José Miguel Santana (ES), José Pablo Suárez (ES)</i>	585
G-codes and free-form motions <i>Ben Cross (UK), Robert J. Cripps (UK), Jason Matthews (UK), Glen Mullineux (UK)</i>	593
Automated retrieval of arbitrary complex similar CAD-parts based on dimensionless invariants <i>Dennis Kaiser (DE), Stephan Rudolph (DE)</i>	603
Tennis string-bed response measurement <i>Rod Valentine (UK)</i>	615
Development and implementation of behavioural modules for platform-based mechatronic design <i>Zuhal Erden (TR)</i>	625
Geometry and image processing	635
Mesh segmentation driven by bijective parameterization <i>Daniel Mejia (CO), Oscar Ruiz-Salguero (CO), Carlos Cadavid (CO), Jairo R. Sánchez (CO), Jorge Posada (CO), Diego A. Acosta (CO)</i>	635
Predicting haptic perception of textile texture and analysis between smooth rough preferences through images <i>K.V. Rakhin (IN), Prasad S. Onkar (IN)</i>	647
Non-manifold modelling of lattice materials using kinematically constrained FEA <i>Diego Montoya-Zapata (CO), Oscar Ruiz-Salguero (CO), Juan Lalinde-Pulido (CO), Juan Pareja-Corcho (CO), Jorge Posada (CO)</i>	657
Types of free-form motion <i>Ben Cross (UK), Robert J. Cripps (UK), Glen Mullineux (UK)</i>	671
3D retrieval in huge CAD databases: New shape-based similarity calculation approach <i>Ahmed Fradi (FR), Borhen Louhichi (FR), Mohamed Ali Mahjoub (FR), Benoit Eynard (FR)</i>	681
4 LIST OF CONTRIBUTING AUTHORS	693