

2020 IEEE 15th International Conference of System of Systems Engineering (SoSE 2020)

**Budapest, Hungary
2 – 4 June 2020**



**IEEE Catalog Number: CFP20SOS-POD
ISBN: 978-1-7281-8051-9**

**Copyright © 2020 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:	CFP20SOS-POD
ISBN (Print-On-Demand):	978-1-7281-8051-9
ISBN (Online):	978-1-7281-8050-2

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

CURRAN ASSOCIATES INC.
proceedings
.com

Table of Contents

Committees.....	3
Research on Operational Tasks Analysis Method Based on Complex Network Theory..... Lushun Ding, Zhen Jia, Yufang Zhou	11
A System of Systems Approach to Optimize a Realtime Risk Situational Awareness System Yu Li, Cihan Dagli	17
SoS Meta-Architecture Selection for Infrastructure Inspection System Using Aerial Drones..... Muhammad Monjurul Karim, Cihan H. Dagli	23
A system-of-systems meta-architecting approach for seru production system design Samuel Vanfossan, Cihan H. Dagli, Benjamin Kwasa	29
Reinforcement Learning for Multi-robot Field Coverage Based on Local Observation Matthew Zhu, Dennis Simon, Nachiketa Rajpurohit, Sagar Jayantkumar Kalathia, and Wencen Wu	35
Investment Decision-Making for Transport Infrastructure Projects: Optimizing vs. Satisficing Tiep Nguyen, Leonie Hallo, Indra Gunawan, Phu Tran	41
Requirements Decomposition using a Graphical method J Craig Wrigley	47
Systems Engineers are Borg! But do they have their means and tools? Ulrich Lenk, Hans Lenk	53
MBSE along the Value Chain – An Approach for the Compensation of additional Effort Fabian Wilking, Benjamin Schleich, Sandro Wartzack	61
A time constrained System of Systems discovery process and canvas. A case study in agriculture technology focusing on an automated Asparagus Harvester. Nick Pickering, Mike Duke, Shen Hin Lim	67
Research on Assessment of Technical Importance Based on Weapon Technology System-of-Systems Network Model..... Qiancheng Jin, Jichao Li, Jiang Jiang, Kewei Yang	75
Identifying Security Issues with MBSE while Rebuilding Legacy Software Systems..... Donatas Mazeika, Rimantas Butleris	83
Systems-of-Systems Engineering Online Education: An Experience Report..... Jakob Axelsson	87
Architectural Strategy to Enhance the Availability Quality Attribute in System-of-Systems Architectures: a Case Study Alexandre Delécolle, Rodrigo Silva Lima, Valdemar Vicente Graciano Neto, Jérémy Buisson	93
A Multi-domain Approach Toward Adaptations of Socio-technical Systems: The Dutch Railway Case-Part 1 Mohsen Jafari Songhori, Leo A.M. van Dongen, Mohammad Rajabalinejad	99
Satisfaction analysis of public services using Evidential Network model..... Jiang Jiang, Yaqian You, Jianbin Sun, Xuan Li	105
Needs and Architectural Strategies Related to Geospatial Information in Systems-of-Systems..... Jakob Axelsson	111
MBSE Product Line Engineering - Variability Overview lost? Martin Kortwinkel	117
MLCP: A Framework Integrating with Machine Learning and Optimization for Planning and Scheduling in Manufacturing and Services Jian Zheng, Yuichi Kobayashi, Yoshiyasu Takahashi, Takashi Yanagida, Tatsuhiro Sato, Daiji Hitaka	123

Distributed Consensus Algorithm for Multi-Missile Networks with Switching-Topologies and Dynamically-Changed Delay (Dcams)	129
Ahmed Abdelmawgoud, Paul Hershey	
System of Systems Engineering: Meta-Modelling Perspective	135
Charaf Eddine Dridi, Zakaria Benzadri, Faiza Belala	
Flexible Solution of the Inverse Kinematic Task for Cooperating Robots of Different Structures.....	145
Hemza Redjimi, József K. Tar	
Artificial Intelligence based Asset Management	151
Juliette Mattioli, Paolo Perico, Pierre-Olivier Robic	
Towards Standards-based Execution of System of Systems Models	157
Aurelijus Morkevicius, Jovita Bankauskaite, Nerijus Jankevicius	
Advanced Monkey Testing for connected autonomous systems	163
Michael Hillebrand, Matthias Greinert, Roman Dumitrescu, Otthein Herzog	
Smart Cities and MBSE: Comparison of Concepts	169
Ulrich Lenk	
Grid of Hybrid AC/DC Microgrids: A New Paradigm for Smart City of Tomorrow.....	175
Mehrdad Kazerani, Kambiz Tehrani	
Multi-layer Modeling for Capability Generation of UAV Swarm System	181
Jun Shao, Minghao Li, Kewei Yang	
Research on Capability Architecture Construction Methodology to System of Systems.....	187
Zhang Jing, Zhang Yu, He Yan, Xu Fei	
Characterization of a High Voltage and High Frequency pulse generator configuration for Atom Probe	193
Loic Rousseau, Antoine Normand, Kambiz Tehrani, Francois Vurpillot	
Towards a Tool-Based Approach for Dynamically Generating Co-Simulation Scenarios based on complex Smart Grid System Architectures.....	199
Christoph Binder, Michael Fischinger, Christian Neureiter, Goran Lastro, Katharina Polanec, Jounes-Alexander Gross	
EDUFYSoS: A Factory of Educational System of Systems Case Studies	205
Antonia Bertolino, Guglielmo De Angelis, Francesca Lonetti, Vânia de Oliveira Neves, Miguel Angel Olivero	
Performance Evaluation of an Inverter-Based Microgrid Under Cyberattacks	211
Ardavan Mohammadhassani, Armin Teymouri, Ali Mehrizi-Sani, Kambiz Tehrani	
Governance & Autonomy: Towards a Governance-based Analysis of Autonomy in Cyber-Physical Systems-of-Systems.....	217
Mohamad Gharib, Paolo Lollini, Andrea Ceccarelli, Andrea Bondavalli	
A Multi-domain Approach Toward Adaptations of Socio-technical Systems: The Dutch Railway Case-Part 2	223
Mohsen Jafari Songhori, Leo A.M. van Dongen, Mohammad Rajabalinejad	
The System (of Interest) Definitions phase: Key features and challenges in the Dutch Railway system.....	229
Merishna Ramtahalsing, Mohsen Jafari, Jan Braaksma, Mohammad Rajabalinejad, Leo van Dongen	
Optimal Enterprise: Engineering and Control.....	235
Mikhail Belov, Dmitry Novikov	
Digitalization in Next Generation C2: Research Agenda from Model-Based Engineering Perspective	243
Jérémy Buisson, Jean Levrai Mbeck M., Nicolas Belloir	
Course of Action Generation Using Graph Model for Conflict Resolution	249
Yuming Huang, Bingfeng Ge, Bin Zhao, and Kewei Yang	
Transformation of the UML Deployment Model into a Distributed Ledger Network Configuration	255
Tomasz Górski, Jakub Bednarski	
A Study on Hammering Test using Deep Learning.....	261
Tsubasa Fukumura, Hayato Aratame, Atsushi Ito, Masafumi Koike, Katsuhiko Hibino, Yoshihisa Kawamura	

Experiences from Teaching Master level Course in Research Methods in Systems of Systems Engineering	265
Satyanarayana Kokkula, Gerrit Muller, Kristin Falk, Elisabet Syverud	
Improved Antenna Gain and Efficiency Using Novel EBG Layer	271
Yahiea Alnaiemy, Lajos Nagy	
On two-machine Flow Shop Scheduling Problem with disjoint setups	277
Andrzej Gnatowski, Jarosław Rudy, Radosław Idzikowski	
Comparison of algorithms for dimensionality reduction and their application to index generation functions	283
Grzegorz Borowik, Tadeusz Łuba, Ryszard Klempous	
Extracting Microservices' Candidates from Monolithic Applications: Interface Analysis and Evaluation Metrics Approach	289
Omar Al-Debagy, Péter Martinek	
Gait Classification using LSTM Networks for Tagging System	295
Konrad Kluwak, Teodor Nizynski	
A Roadmap for Sustainability for a Community in The Netherlands	301
Gerrit Muller	
Using Photoplethysmography for Simple Hand Gesture Recognition	307
Karthik Subramanian, Celal Savur, Ferat Sahin	
Towards Security of Cyber-Physical Systems using Quantum Computing Algorithms	313
Deepak Tosh, Oscar Galindo, Vladik Kreinovich, Olga Kosheleva	
Scheduling System for Multi-party Arrangement Work by Utiling Mathematical Optimization and Machine Learning Techniques	321
Yoshiyasu Takahashi, Yumiko Ishido, Yuko Kato, Yuichi Kobayashi	
Analysis of sword fencing training evaluation possibilities using Motion Capture techniques	325
Anita Grontman, Łukasz Horyza, Krzysztof Koczan, Małgorzata Marzec, Maciej Smiertka, Maciej Trybała	
High-speed train scheduling and rescheduling models	331
María del Cacho Estil-Ies, Chiara Bersani, Roberto Sacile	
Correlation Analysis for Complex Equipment Systems Based on Multi-objective Association Rule Mining	337
Maidi Liu, Zhiwei Yang, Jiang Jiang, Kewei Yang	
Development of an integrated validation environment for System of Systems in the context of V2X using the XiL-Approach	343
Moritz Wäschle, Yi Jiang, Matthias Behrendt, Albert Albers	
Model Based Computed Torque Control for an Experimental Test Bed	349
Árpád Varga, György Eigner, József K. Tar	
Challenges for System of Systems in the Agriculture Application Domain	355
Benjamin Weinert, Mathias Uslar	
Situation Awareness and Decision Making for Constituent Systems	361
Pontus Svenson, Jakob Axelsson	
Special design aspects of a biomechanical program	367
György Fekete, András Molnár	
Evaluation of Data Storage Patterns in Microservices Architecture	373
Munonye K, Martinek P	
On the way to strict glycemc control for hemodialysis patients	381
József Klespitz, Levente Kovács	
Advanced Control of Heat Exchangers in Series	385
Anna Vasičkaninová, Monika Bakošová, Alajos Mészáros	
Extending the Concept of Domain Specific Systems Engineering to System-of-Systems	391
Christian Neureiter, Christoph Binder, Boris Brankovic, Goran Lastro	

Neural Network Controllers in Chemical Technologies	397
Karol Kiš, Martin Klaučo, Alajos Mészáros	
An Improved SoSE Model – The “V+” Model	403
Hongjun Zhang, Baiqiao Huang, Hongbin Ju	
Optimal scheduling of low-dose metronomic chemotherapy: an in-silico analysis	411
Bálint Péceli, Dániel András Drexler, Levente Kovács	
Sensitivity and identifiability analysis of a third-order tumor growth model	417
Máté Siket, György Eigner, Levente Kovács	
Design of A Multistage Marx Generator topology based on SiC-MOSFET Device for Atomic Probe Tomography Applications	423
Kambiz Tehrani, Yunbi Liu, Loïc Rousseau, Antoine Normand, François Vurpillot	
Interval-Valued q-Rung Orthopair Fuzzy Weighted Geometric Aggregation Operator and its Application to Multiple Criteria Decision-Making	429
Hongxu Li, Yang Yang, Yingchao Zhang	
The use of block maxima method of extreme value statistics to characterise blood glucose curves.....	433
Mátyás Szigeti, Tamás Ferenci, Levente Kovács	
Operational Context-Based Design Method of Autonomous Vehicles Logical Architectures	439
Youssef Damak, Yann Leroy, Guillaume Trehard, Marija Jankovic	
Modeling the emergence of COVID-19: a systems approach.....	445
Bijun Wang, Song Xu, Mo Mansouri	
Gait Generation for Damaged Hexapods using a Genetic Algorithm.....	451
Justin Kon, Ferat Sahin	
A System of Systems Management Framework for Digital Transformation in eGovernment	457
Samantha Papavasiliou, Alex Gorod, Carmen Reaiche	
Real-Time Distributed Ensemble Learning for Fault Detection of an Unmanned Ground Vehicle	463
Conor Wallace, Sean Ackels, Patrick Benavidez, and Mo Jamshidi	
Comparison of Cloud Architectures for Mobile Sensor Optimization Problem Implementation	469
Sean Ackels, Patrick Benavidez, and Mo Jamshidi	
Down Sampling using Simulated Annealing	475
Sean Ackels, Patrick Benavidez, Mo Jamshidi	
Elderly Health Promotion using Multiple Ballrobots based on Evolutionary Robot	481
Wei Quan, Zhang haibin, Naoyuki Kubota	
Autonomous Applied Robotics: Ultrasound-based Robot-assisted Needle Insertion System Concept and Development	487
Bence Takács, Tamás Haidegger	
Digitizing the Maintenance Documentation; a System of Systems in Oil and Gas Industry.....	493
Kristin Falk, Abass Kwaku Kamara, Eivind Paule Bråthen, Kirsten Helle, Per Thomas Moe, Satyanarayana Kokkula	
A Complexity A nalysis A pproach for Model based System Engineering	501
Zhenchao Hu, Jinzhi Lu, Jinwei Chen, Xiaochen Zheng, Dimitrios Kyritsis, Huisheng Zhang	
Design Of High Voltage Pulse Generator with Back Tto Back Multilevel Boost Buck Converters Using Sic-Mosfet Switches	507
K. Tehrani, M.weber, I.rasoanarivo	
Model predictive control of a vehicle platoon.....	513
Simone Graffione, Chiara Bersani, Roberto Sacile, Enrico Zero	
Real time object detection for aerial search and rescue missions for missing persons	519
Zsolt Domozi, Daniel Stojcsics, Abdallah Benhamida, Miklos Kozlovsky, Andras Molnar	
Random Forest-based predictive modelling on Hungarian Myocardial Infarction Registry	525
Péter Piros, Rita Fleiner, Levente Kovács	

Brain Tumor Segmentation from Multi-Spectral MRI Data Using Cascaded Ensemble Learning.....	531
Tímea Fülöp, Ágnes Györfi, Szabolcs Csa holczi, Levente Kovács, László Szilágyi	
Traffic Signs Recognition in a mobile-based application using TensorFlow and Transfer Learning technics	537
Abdallah Benhamida, Annamária R. Várkonyi-Kóczy, Miklos Kozlovszky	
Two-Tier analyzed content filtering based Data Management Architecture in Industry 4.0	543
Ravi Sharma, Balázs Villányi	
Graph Based Root Cause Analysis in Cloud Data Center	549
Divyaansh Dandona, Mevlut Demir, John J. Prevost	
Fuzzy Architecture Description for Handling Uncertainty in IoT Systems-of-Systems.....	555
Flavio Oquendo	
Enabling an IoT System of Systems through Auto Sound Synthesis in Silent Video with DNN	563
Sanchita Ghose, John J. Prevost	
Improving Applications of Systems of Systems using Ultra Fast Instance Segmentation	569
Michael DeMoor, John J. Prevost	
SIMVA-SoS: Simulation-based Verification and Analysis for System-of-Systems.....	575
Sumin Park, Yong-jun Shin, Sangwon Hyun, Doo-Hwan Bae	
Utilizing the spectral properties of weighted data flow graphs for designing railway signaling systems.....	581
Tibor Gergely Markovits, György Rácz	
Towards a governance dashboard for smart cities initiatives: a system of systems approach	587
Ben Payne, Lee Oon Ling, Alex Gorod	
The present and future of the precision agriculture	593
Gábor Gyarmati, Tamás Mizik	
One-Shot Re-identification using Image Projections in Deep Triplet Convolutional Network	597
Gábor Kertész, Imre Felde	
Model System for the Representation of Smart System of Systems in Engineering	603
László Horváth	
Authors' Index	609