

## EG-ICE 2020 Programme

27<sup>th</sup> International Workshop on Intelligent Computing in Engineering

### Wednesday, July 1<sup>st</sup>

Session 1.1	<b>Best Paper 2019</b> <i>Chair: Timo Hartmann</i>	page
10:00–10:20	<b>#93 – Felix Eickeler and André Borrmann</b> <i>Retracing Positions of Terrestrial Laser Scanners to Reinststate Legacy Point Clouds</i>	1–11

Session 1.2	<b>Monitoring and Control Algorithms in Engineering</b> <i>Chair: Timo Hartmann</i>	
10:20–10:30	<b>#29 – Yewei Ouyang, Chi Kwong Wong, and Xiaowei Luo</b> <i>Assessing Students' Hazard Identification Ability in Virtual Reality using Eye Tracking Devices</i>	12–21
10:30–10:40	<b>#24 – Jinjing Ke, Xiaowei Luo, and Hainan Chen</b> <i>Investigating Information Overload and Cognitive Correlation of Crane Operators</i>	22–32
10:40–11:00	<i>Discussions and Questions</i>	

Session 1.3	<b>Life-cycle design support</b> <i>Chair: Christian Koch</i>	
11:00–11:10	<b>#36 – Jimmy Abualdenien and André Borrmann</b> <i>Formal analysis and validation of Levels of Geometry (LOG) in building information models</i>	33–42
11:10–11:20	<b>#39 – Goran Sibenik, Iva Kovacic, and Valentinas Petrinis</b> <i>From physical to analytical models: automated geometry interpretations</i>	43–51
11:20–11:30	<b>#77 – Nan Zhu, Fangzheng Lin, Raimar Scherer, and Philipp Dohmen</b> <i>Underground Engineering Orientated Data Mapping from Construction Information Models to Structural Analysis</i>	52–61
11:30–11:50	<i>Discussions and Questions</i>	

<b>Session 1.4</b>	<b>Life-cycle design support</b> <i>Chair: HaiJiang Li</i>	
<b>11:50–12:00</b>	<b>#82 – Manav Mahan Singh and Philipp Geyer</b> <i>Examining and Improving Accuracy in a Deep Learning-based Pipeline for the Prediction of Building Energy Demand</i>	62–72
<b>12:00–12:10</b>	<b>#11 – Khaleel Odeh and Pieter de Wilde</b> <i>BIM to BEM: an investigation of practical interoperability challenges when working with Revit and DesignBuilder</i>	73–82
<b>12:10–12:20</b>	<b>#81 – Jerson Alexis Pinzon Amoroch and Timo Hartmann</b> <i>Reno-Inst: An Ontology for Installation of Components in Building Renovation Projects</i>	82–92
<b>12:20–12:40</b>	<i>Discussions and Questions</i>	

<b>12:40–14:00</b>	<i>Break</i>	
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<b>14:00–15:00</b>	<i>Keynote – Sabine Kruschwitz</i>	
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<b>Session 2.1</b>	<b>Advanced Computing in Engineering</b> <i>Chair: Philipp Geyer</i>	
<b>15:00–15:10</b>	<b>#46 – Junqi Zhao, and Esther Obonyo</b> <i>Applying Deep Incremental Learning-based Posture Recognition Model for Injury Prevention in Construction</i>	93–105
<b>15:10–15:20</b>	<b>#26 – Juhyeong Ryu, Tasha McFarland, Carl Haas, and Eihab Abdel-Rahman</b> <i>Automatic Clustering of Proper Working Posture</i>	106–114
<b>15:20–15:30</b>	<b>#2 – S. Bükrü, M. Wolf, B. Böhm, M. König, J. Teizer</b> <i>Augmented Virtuality in Construction Safety Education and Training</i>	115–124
<b>15:30–15:50</b>	<i>Discussions and Questions</i>	

<b>Session 2.2</b>	<b>Advanced Computing in Engineering</b> <i>Chair: André Borrmann</i>	
<b>15:50–16:00</b>	<b>#85 – Jingdao Chen and Yong K. Cho</b> <i>Unsupervised Crack Segmentation from Disaster Site Point Clouds using Point Feature Clustering</i>	125–133
<b>16:00–16:10</b>	<b>#5 – Yalong Pi, Nipun Nath, and Amir Behzadan</b> <i>Disaster Impact Information Retrieval Using Deep Learning Object Detection in Crowdsourced Drone Footage</i>	134–143
<b>16:10–16:20</b>	<b>#3 – Mathias Artus and Christian Koch</b> <i>Modeling Geometry and Semantics of Physical Damages using IFC</i>	144–153
<b>16:20–16:40</b>	<i>Discussions and Questions</i>	

<b>Session 2.3</b>	<b><i>Advanced Computing in Engineering</i></b> <i>Chair: Iva Kovacic</i>	
<b>16:40–16:50</b>	<b>#62 – Md Nazmus Sakib, Theodora Chaspari, Changbum R. Ahn and Amir Behzadan</b> <i>An Experimental Study of Wearable Technology and Immersive Virtual Reality for Drone Operator Training</i>	154–163
<b>16:50–17:00</b>	<b>#74 – Zhengbo Zou, Suzana Duran Bernardes, Abdullah Kurcu, Semiha Ergan, Kaan Ozbay</b> <i>An Integrated Approach to Capture Construction Workers’ Response towards Safety Alarms using Wearable Sensors and Virtual Reality</i>	164–174
<b>17:00–17:10</b>	<b>#37 – Sanaz Saeidi and Yimin Zhu</b> <i>Exploring Thermally-Driven Occupant Behavioral Intention in Immersive Virtual Environment</i>	175–184
<b>17:10–17:30</b>	<i>Discussions and Questions</i>	
<b>17:30–18:30</b>	<i>Virtual Bar and Discussion Rooms</i>	
<b>18:30–19:30</b>	<i>EG-ICE board meeting (closed doors)</i>	

## Thursday, July 2<sup>nd</sup>

<b>Session 3.1</b>	<b><i>BIM and Engineering Ontologies</i></b> <i>Chair: Georg Suter</i>	
<b>10:00–10:10</b>	<b>#86 – Hui-Hsin Cheng and Shang-Hsien Hsieh</b> <i>A Design Evaluation Framework for Building Lifts Based on BIM and Pedestrian Simulation</i>	185–193
<b>10:10–10:20</b>	<b>#87 – Tarek Zaki, Abdelrahman Magdy and Khaled Nassar</b> <i>BIM-Based Bill of Quantities Generator following POMI and NRM2 Methods of Measurement</i>	194–203
<b>10:20–10:30</b>	<b>#22 – Sophia Pibal and Iva Kovačić</b> <i>Digital Design Workflow for an Algorithm Aided BIM Approach in Research Led Teaching</i>	204–214
<b>10:30–10:50</b>	<i>Discussions and Questions</i>	

<b>Session 3.2</b>	<b><i>Advanced Computing in Engineering</i></b> <i>Chair: Bernd Domer</i>	
<b>10:50–11:00</b>	<b>#42 – Beidi Li, John Fitzgerald and Carl Schultz</b> <i>Modelling Co-presence in the Built Environment - a Spatio-temporal Approach to Human Perception and Movement</i>	215–225
<b>11:00–11:10</b>	<b>#92 – Slah Drira, Sai G.S. Pai and Ian Smith</b> <i>Model-based multiple-occupant tracking through floor vibrations</i>	226–236
<b>11:10–11:20</b>	<b>#25 – Barbara Strug, Grażyna Ślusarczyk and Jakub Jas</b> <i>Parameterized IFC-based Graph Generation for User-oriented Path Search</i>	237–242
<b>11:20–11:40</b>	<i>Discussions and Questions</i>	

<b>Session 3.3</b>	<b><i>Life-Cycle Design Support</i></b> <i>Chair: Pieter de Wilde</i>	
<b>11:40–11:50</b>	<b>#65 – Manuel Jungmann, Christoph Bindal-Gutsche and Timo Hartmann</b> <i>Developing a multi-criteria method to evaluate deep renovation options for buildings considering ecological, economic and socio-cultural factors over its lifecycle</i>	243–253
<b>11:50–12:00</b>	<b>#38 – Maarten Albert van Eldik, João Santos, Faridaddin Vahdatikhaki, Maarten Visser, Andre Dorée</b> <i>BIM-based life cycle assessment framework for infrastructure design</i>	254–263
<b>12:00–12:10</b>	<b>#23 – Monica Pena Acosta, Faridaddin Vahdatikhaki, João Santos, Andries G. Dorée</b> <i>A conceptual framework for more efficient simulation of the interplay between road pavements and the Urban Heat Island phenomenon</i>	264–274
<b>12:10–12:30</b>	<i>Discussions and Questions</i>	

<b>12:30–14:00</b>	<i>Break</i>	
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14:00–15:00	<i>International discussions – sessions 1, 2, 3</i>	
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<b>Session 4.1</b>	<b><i>Advanced Computing in Engineering</i></b> <i>Chair: Ivan Mutis</i>	
15:00–15:10	<b>#47 – Ning Wang and Raja R. A. Issa</b> <i>Natural Language Generation from Building Information Models for Intelligent NLP-based Information Extraction</i>	275–284
15:10–15:20	<b>#75 – Ruichuan Zhang and Nora El-Gohary</b> <i>A Deep-Learning Method for Evaluating Semantically-Rich Building Code Annotations</i>	285–293
15:20–15:30	<b>#33 – Dion Moullet and Thomas Krijnen</b> <i>Compliance checking on building models with the Gherkin language and Continuous Integration</i>	294–303
15:30–15:50	<i>Discussions and Questions</i>	

<b>Session 4.2</b>	<b><i>BIM and Engineering Ontologies</i></b> <i>Chair: Pieter Pauwels</i>	
15:50–16:00	<b>#28 – Christopher Rausch, Benjamin Sanchez, Chloe Edwards, and Carl Haas</b> <i>A computational model for product cycling of modular buildings</i>	304–313
16:00–16:10	<b>#84 – Tan Tan, Grant Mills, Eleni Papadonikolaki, Weisheng Lu and Ke Chen</b> <i>BIM-enabled Design for Manufacture and Assembly</i>	314–323
16:10–16:20	<b>#6 – Patricia Peralta Abadia, Sebastian Heine, Horst-Michael Ludwig and Kay Smarsly</b> <i>A BIM-based approach towards additive manufacturing of concrete structures</i>	324–332
16:20–16:40	<i>Discussions and Questions</i>	

<b>Session 4.3</b>	<b><i>Advanced Computing in Engineering</i></b> <i>Chair: Ian Smith</i>	
16:40–16:50	<b>#48 – Thomas Czerniawski, Jong Won Ma, and Fernanda Leite</b> <i>Metadata-based photo filtering for facility management</i>	333–341
16:50–17:00	<b>#56 – Ying Shi, Zhe Sun, Wen Xiong, and Pingbo Tang</b> <i>Automated Detection of Information Anomalies in Bridge Inspection Reports for Bridge Deterioration Prognosis</i>	342–351
17:00–17:10	<b>#80 – Linh Truong-Hong and Roderik Lindenbergh</b> <i>Inspecting structural components of a construction project using laser scanning</i>	352–362
17:10–17:30	<i>Discussions and Questions</i>	

17:30–18:30	<i>Virtual Bar and Discussion Room</i>	
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## Friday, July 3<sup>rd</sup>

Session 5.1	<b><i>Life-Cycle Design Support</i></b> <i>Chair: Heng Li</i>	
10:00–10:10	#35 – <b><i>Carl Schultz, Beidi Li, and Jochen Teizer</i></b> <i>Towards a Unifying Domain Model of Construction Safety: SafeConDM</i>	363–372
10:10–10:20	#4 – <b><i>Tengxiang Su and Haijiang Li</i></b> <i>Data exchange analysis for property valuation on sustainability perspective</i>	373–382
10:20–10:30	#91 – <b><i>Irem Dikmen and Timo Hartmann</i></b> <i>Seeing the Risk Picture: Visualization of Project Risk Information</i>	383–392
10:30–10:50	<i>Discussions and Questions</i>	

Session 5.2	<b><i>BIM and Engineering Ontologies</i></b> <i>Chair: Wolfgang Huhnt</i>	
10:50–11:00	#60 – <b><i>Tim-Jonathan Huyeng, Christian-Dominik Thiele, Anna Wagner, Meiling Shi, André Hoffmann, Wendelin Sprenger, Uwe Rüppel</i></b> <i>An approach to process geometric and semantic information as open graph-based description using a microservice architecture on the example of structural data</i>	393–402
11:00–11:10	#64 – <b><i>Madhumitha Senthilvel, Jakob Beetz</i></b> <i>A Visual Programming Approach for Validating Linked Building Data</i>	403–411
11:10–11:20	#7 – <b><i>Heinrich Söbke, Patricia Peralta Abadia, Dominik Heigener and Kay Smarsly</i></b> <i>BIM-based sizing of reactors in processing facilities</i>	412–421
11:20–11:40	<i>Discussions and Questions</i>	

Session 5.3	<b><i>Advanced Computing in Engineering</i></b> <i>Chair: Jakob Beetz</i>	
11:40–11:50	#41 – <b><i>Ana Sánchez-Rodríguez, Sebastian Esser, Jimmy Abualdenien, André Borrmann and Belén Riveiro</i></b> <i>From point cloud to IFC: A masonry arch bridge case study</i>	422–431
11:50–12:00	#15 – <b><i>Enrico Romanschek, Christian Clemen and Wolfgang Huhnt</i></b> <i>From Terrestrial Laser Scans to a Surface Model of a Building; Proof of Concept in 2D</i>	432–442
12:00–12:10	#17 – <b><i>Ashley Caselli, Vincenzo Daponte, Gilles Falquet and Claudine Métral</i></b> <i>A Rule Language Model for Subsurface Data Refinement</i>	443–452
12:10–12:30	<i>Discussions and Questions</i>	

12:30–14:00	<i>Break</i>	
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14:00–15:00	EG–ICE assembly (open session)	
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<b>Session 6.1</b>	<b>Advanced Computing in Engineering</b> <i>Chair: Carl Haas</i>	
15:00–15:10	<b>#53 – Makram Bou Hatoum and Hala Nassereddine</b> <i>Developing a Framework for the Implementation of Robotics in Construction Enterprises</i>	453–462
15:10–15:20	<b>#66 – Leyuan Ma and Timo Hartmann</b> <i>A Review of Wall-Climbing Robots: Technical Analysis and Potential for Indoor Building Inspection</i>	463–471
15:20–15:30	<b>#12 – Aiyu Zhu, Pieter Pauwels, and Bauke de Vries</b> <i>Robot Construction Simulation using Deep Reinforcement Learning</i>	472–480
15:30–15:50	<i>Discussions and Questions</i>	

<b>Session 6.2</b>	<b>Monitoring and control algorithms in engineering</b> <i>Chair: Fernanda Leite</i>	
15:50–16:00	<b>#43 – Yuan Zheng, Seppo Törmä and Olli Seppänen</b> <i>An object-based conceptual model of the construction process for ICT-based situational awareness</i>	481–490
16:00–16:10	<b>#61 – David F. Bucher and Daniel M. Hall</b> <i>Common Data Environment within the AEC Ecosystem: moving collaborative platforms beyond the open versus closed dichotomy</i>	490–500
16:10–16:20	<b>#55 – Mahmoud El Jazzar, Melanie Piskernik, Hala Nassereddine</b> <i>Digital Twin in Construction: An Empirical Analysis</i>	500–510
16:20–16:40	<i>Discussions and Questions</i>	

17:30–18:30	<i>Virtual Bar and Discussions Room</i>	
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## Saturday, July 4<sup>th</sup>

13:00–14:00	<i>International discussions – sessions 4,5,6</i>	
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14:00–15:00	<i>Best paper award and closing</i>	
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