# ISARC 2020 Online

**This is the final schedule of the program as of October 23, 2020. All times are in Japanese Standard Time (JST). Personalized ZOOM access links have been sent to all registered participants on October 23, 2020. Please check you spam folder, if needed. Those still registering on or after October 23, 2020 will receive their access links by the end of Octocber 26, 2020 (JST).**

Please note, some countries observe a time change the weekend before the ISARC 2020 Online will take place. To figure out your presentation time, add to the hours given in the schedule or use the link for your city.

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|---|---|
| Sydney | +2 hours |
| Tokyo | 0 hours |
| Beijing | -1 hours |
| New Delhi | -3 hours 30 minutes |
| Berlin | -8 hours |
| London | -9 hours |
| NYC | -13 hours |
| Los Angeles | -16 hours |
| Your city | |

## Tuesday, October 27, 2020

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|---|---|
| 08:00 | **ISARC Opening Ceremony**<br><br>**Tucker-Hasegawa 2020 Keynote - Smart Safety Assurance for Temporary Structures**<br>Prof. Hyoungkwan Kim |

| Track 1 | | | Track 2 | | | Track 3 | | |
|---|---|---|---|---|---|---|---|---|
| **Session 01** | Paper ID | **Automation and robotics**<br>Session Chair: Genya Ishigami | **Session 02** | Paper ID | **Mixed themes**<br>Session Chair: Hiroshi Furuya | **Session 03** | Paper ID | **Mixed themes**<br>Session Chair: Anoop Sattineni |
| 09:00 | 78 | **Application of robots to the construction of complex structures using standardized timbers**<br>Leng Yi, Shi Xinyu and Fukuda Hiroatsu | 09:00 | 79 | **Rationalization of free-form surface construction method using wooden formwork**<br>Sei Hayashi and Tomoyuki Gondo | 09:00 | 379 | **Scenario Based Construction Safety Training Platform Using Virtual Reality**<br>Ankit Gupta and Koshy Varghese |
| | 97 | **An assistive interface of a teleoperation system of an excavator by overlapping the predicted position of the arm**<br>Yuzuki Okawa, Masaru Ito, Ryota Sekizuka, Seiji Saiki, Yoichiro Yamazaki and Yuichi Kurita | | 156 | **A systematic review of technical specification of 3D concrete printer**<br>Jihoon Chung, Ghang Lee and Jung-Hoon Kim | | 38 | **Field application of Tunnel Half Section Inspection System**<br>Nobukazu Kamimura, Satoru Nakamura, Daisuke Inoue and Takao Ueno |
| | 111 | **Design and Construction of Shell-shaped Bench using a 3D Printer for Construction**<br>Hajime Sakagami, Haruna Okawa, Masaya Nakamura, Takuya Anabuki, Yoshikazu Ishizeki and Tomoya Kaneko | | 120 | **Visualization of the progress management of earthwork volume at construction jobsite**<br>Hajime Honda, Akifumi Minami, Yoshihiko Takahashi, Seishi Tajima, Takashi Ohtsuki and Yushi Shiiba | | 175 | **Report on the Measurement of the Form of SHOTCRETE GRID BEAM-FREE FRAME Using Point Cloud Data**<br>Kojima Takayuki and Yori Nomoto |
| | 95 | **Proposal for automation system diagram and automation levels for earthmoving machine**<br>Takeshi Hashimoto, Mitsuru Yamada, Genki Yamauchi, Yasushi Nitta and Shinichi Yuta | | | | | 223 | **Block Chain based Remicon Quality Managementr**<br>Seungwon Cho, Doyeop Lee and Chansik Park |
| | | **Q&A for all papers in this session** | | | **Q&A for all papers in this session** | | | **Q&A for all papers in this session** |

# Tuesday, October 27, 2020

## Track 1

### Session 04 — Mixed themes

Session Chair: Xuesong Shen

| | Paper ID | |
|---|---|---|
| 10:00 | 127 | **Constructible Design for Off-site Prefabricated Structures in Brownfield Environments: Review of Mixed Reality Applications**<br>Ankit Shringi, Mehrdad Arashpour and Arnaud Prouzeau |
| | 5 | **Real-time early warning of clogging risk in slurry shield tunneling: a self-updating machine learning approach**<br>Qiang Wang, Xiongyao Xie and Yu Huang |
| | 17 | **A Predictive Model for Scaffolding Man-hours Estimation in Heavy Industrial Construction Projects**<br>Wenjing Chu, Zhen Lei, Sanghyeok Han, Ulrich Hermann and Di Hu |
| | 118 | **Development of Cloud Computing System for Concrete Structure Inspection by Deep Learning Based Infrared Thermography Method**<br>Shogo Hayashi, Koichi Kawanishi, Isao Ujike and Pang-Jo Chun |
| | | **Q&A for all papers in this session** |

## Track 2

### Session 05 — Building information modeling (BIM)

Session Chair: Hung-Ming Chen

| | Paper ID | |
|---|---|---|
| 10:00 | 14 | **Five-dimensional Simulation of Bridge Engineering Based on BIM and VR**<br>Kun-Chi Wang, Sheng-Han Tung, Wei-Chih Chen and Zi-Chi Zhao |
| | 41 | **A Construction Progress On-site Monitoring and Presentation System Based on The Integration of Augmented Reality and BIM**<br>Sheng-Kai Wang and Hung-Ming Chen |
| | 65 | **System Development of an Augmented Reality On-site BIM Viewer Based on the Integration of SLAM and BLE Indoor Positioning**<br>Yu-Cheng Liu, Jhih-Rong Chen and Hung-Ming Chen |
| | 66 | **An Information Quality Assessment Framework for Developing Building Information Models**<br>Liji Chen and K.W. Yeoh |
| | | **Q&A for all papers in this session** |

## Track 3

### Session 06 — Inspection and monitoring

Session Chair: Mitsuhiro Kamezaki

| | Paper ID | |
|---|---|---|
| 10:00 | 80 | **Challenges in working with the UAV image data of the construction sites**<br>Saurabh Gupta and Syam Nair |
| | 103 | **Research and development on inspection technologz for afetz verification of small scale bridges using 3D model**<br>Kazuhiko Seki, Koichi Iwasa, Satoshi Kubota, Yoshinori Tsukada, Yoshihiro Yasumuro and Ryuichi Imai |
| | 114 | **Weakly Supervised Defect Detection using Acoustic Data based on Positive and Negative Constraints**<br>Jun Younes Louhi Kasahara, Atsushi Yamashita and Hajime Asama |
| | 113 | **Virtual Prototyping Based Path Planning of Unmanned Aerial Systems for Building Exterior Inspection**<br>Zhenjie Zheng, Mi Pan and Wei Pan |
| | | **Q&A for all papers in this session** |

### Session 07 — Artificial intelligence and machine learning

Session Chair: Xuesong Shen

| | Paper ID | |
|---|---|---|
| 11:00 | 132 | **Optimal Travel Routes of On-road Vehicles Considering Sustainability**<br>Nassim Mehrvarz, Zhilin Ye, Khalegh Barati and Xuesong Shen |
| | 195 | **MLIT's initiatives for promotion the efficient construction and inspection by using new technologies such as AI and robots in Japan.**<br>Kenichi Watanabe |
| | 228 | **Accuracy and Generality of Trained Models for Lift Planning Using Deep Reinforcement Learning-Optimization of the Crane Hook Movement Between**<br>Aoi Tarutani and Kosei Ishida |
| | 190 | **A study on an autonomous crawler carrier system with AI based transportation control**<br>Hironobu Hatamoto, Kazuya Fujimoto, Tsubasa Asuma, Yoshito Takeshita, Tetsuo Amagai, Atsushi Furukawa and Shigeo Kitahara |
| | | **Q&A for all papers in this session** |

### Session 08 — Building information modeling (BIM)

Session Chair: Fumihiro Inoue

| | Paper ID | |
|---|---|---|
| 11:00 | 229 | **A framework for camera planning in construction site using 4D BIM and VPL**<br>Si Tran, Numan Khan, Doyeop Lee, Chansik Park and Ahmed Khairadeen Ali |
| | 154 | **Automating crane lift path through integration of BIM and path finding algorithm**<br>Songbo Hu and Yihai Fang |
| | 181 | **A Web-Based Approach to Dynamically Assessing Space Conflicts by Integrating BIM and Graph Database**<br>Wei-Ting Chien and Shang-Hsien Hsieh |
| | | **Q&A for all papers in this session** |

### Session 09 — Inspection and monitoring

Session Chair: Hiroshi Furuya

| | Paper ID | |
|---|---|---|
| 11:00 | 115 | **Road Maintenance Management System Using 3D Data by Terrestrial Laser Scanner and UAV**<br>Satoshi Kubota, Kotaro Nishi, Ryosuke Hata, Chiyuan Ho and Yoshihiro Yasumuro |
| | 178 | **Development and verification of inspection method for concrete surface utilizing digital camera**<br>Shungo Matsui, Yoshimasa Nakata, Hidenori Shitashimizu, Ryota Nakatsuji, Takeshi Ueda and Naoki Maehara |
| | 187 | **Automated On-Site Quality Inspection and Reporting Technology for Off-Site Construction(OSC)-based Precast Concrete**<br>Seojoon Lee, Soonwook Kwon, Minkyeong Jeong, Syedmobeen Hasan and Alexander Kim |
| | 200 | **Research on a method to consider inspection and processing for atypical wood members using 3D laser scanning**<br>Shunsuke Someya, Yasushi Ikeda, Kensuke Hotta, Seigo Tanaka, Mizuki Hayashi, Mitsuhiro Jokaku and Taito Takahashi |
| | | **Q&A for all papers in this session** |

# Tuesday, October 27, 2020

| Track 1 | | | Track 2 | | | Track 3 | | |
|---|---|---|---|---|---|---|---|---|
| **Session 10** | **Artificial intelligence and machine learning** | | **Session 11** | **Building information modeling (BIM)** | | **Session 12** | **Inspection and monitoring** | |
| | Paper ID | Session Chair: Yasutoshi Nomura | | Paper ID | Session Chair: Hyoungkwan Kim | | Paper ID | Session Chair: Soungho Chae |
| 12:00 | 343 | **Robotics autonomous surveillance algorithms for assessing construction automation and completion progress**<br>Firas Habbal, Ahmed Alali, Mariam Alrayssi, Abdualla Alnuaimi, Dhoha Alhmoudi and Dr. Fawaz Habbal | 12:00 | 375 | **Status of 4D BIM Implementation in Indian Construction**<br>V. Paul C. Charlesraj and T. Dinesh | 12:00 | 342 | **Cracks detection using artificial intelligence with deep learning to enhance inspection efficiency and analyze the critical defects**<br>Firas Habbal, Fawaz Habbal, Mohammed Al Shamsi, Thuraya Aldarmaki, Saleh Alshaibah and Abdualla Alnuaimi |
| | 374 | **Action Recognition of Excavator using Simulated Training Data in Excavator Loading Trucks**<br>Jinhyeok Sim, Jun Younes Louhi Kasahara, Shota Chikushi, Hiroshi Yamakawa, Yusuke Tamura, Keiji Nagatani, Takumi Chiba, Shingo | | 401 | **Optimization of a Sustainable HVAC System Design Layout in BIM Environment**<br>Pouya Baradaran-Noveiri, Sang Hyeok Han and Mohammed Zaheeruddin | | 226 | **Stereo Vision based hazardous area detection for construction worker's safety**<br>Doyeop Lee, Numan Khan and Chansik Park |
| | 300 | **Automatic Detection of Air Bubbles with Deep Learning**<br>Takuma Nakabayashi, Koji Wada and Yoshikazu Utsumi | | 406 | **Synthetic Data Generation for Indoor Scene Understanding Using BIM**<br>Yeji Hong, Somin Park and Hyoungkwan Kim | | 231 | **Optical Character Recognition and Blockchain-based inspection data recording system for portable firefighting equipment**<br>Numan Khan, Doyeop Lee, Ahmed Khairadeen Ali and Chansik Park |
| | 339 | **Digital Twin Technology Utilizing Robots and Deep Learning**<br>Fuminori Yamasaki | | | | | 319 | **Generative Damage Learning for Concrete Aging Detection using Auto-flight Images**<br>Takato Yasuno, Akira Ishii, Junichiro Fujii, Masazumi Amakata and Yuta Takahashi |
| | | **Q&A for all papers in this session** | | | **Q&A for all papers in this session** | | | **Q&A for all papers in this session** |

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|---|---|
| 13:00 | **Break** |

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| 14:00 | **Keynote 2 - International Space Exploration and Japanese Lunar Activities**<br>Naoki Sato<br><br>**2021 ISARC Announcement** |

# Tuesday, October 27, 2020

## Track 1

| Session 13 | Paper ID | Artificial intelligence and machine learning<br>Session Chair: Benny Raphael |
|---|---|---|
| 15:00 | 408 | **Utilizing AI and machine learning for forecasting planning risks in construction**<br>Fawaz Habbal, Firas Habbal, Abdualla Alnuaimi, Anwar Alshimmari, Nawal Alhanaee and Ammar Safi |
| | 409 | **Automated detection for road marking quality, using visual based machine learning**<br>Firas Habbal, Fawaz Habbal, Abdualla Alnuaimi, Shafia Alkheyaili and Ammar Safi |
| | 148 | **Improving Construction Project Schedule before Execution with Machine Learning Methods**<br>John Fitzsimmons, Ying Hong and Ioannis Brilakis |
| | 377 | **Improvement of 3D modeling efficiency and accuracy of earthwork site by noise processing using deep learning and structure from motion**<br>Nobuyoshi Yabuki, Yukako Sakamoto and Tomohiro Fukuda |
| | | **Q&A for all papers in this session** |

## Track 2

| Session 14 | Paper ID | Construction management<br>Session Chair: Miho Makatayama |
|---|---|---|
| 15:00 | 240 | **Decision Support System for Site Layout Planning**<br>Abhishek Raj Singh, Ankan Karmakar and Venkata Santosh Kumar Delhi |
| | 367 | **Overall utilization of Information and Communication Technologies in excavation work and management at Yoneshiro-gawa River, a first-class river**<br>Tatsuro Masu, Akihiro Ishii, Fumihiro Tamori, Hanako Hatakeyama, Yutaka Suzuki, Satoshi Shirato and Yurie Abe |
| | 369 | **Stakeholder Perspectives on the Adoption of Drones in Construction Projects**<br>V. Paul C. Charlesraj and N. Rakshith |
| | 180 | **Constructability: The Prime Target in Value Engineering for Design Optimization**<br>Arun Sekhar and Uma Maheswari |
| | | **Q&A for all papers in this session** |

## Track 3

| Session 15 | Paper ID | Inspection and monitoring<br>Session Chair: Bharadwaj Mantha |
|---|---|---|
| 15:00 | 348 | **Development of Field View Monitor 2 -An assisting function for safety check around a hydraulic excavator using real-time image recognition with**<br>Susumu Aizawa, Yoshihisa Kiyota and Shunsuke Otsuki |
| | 366 | **Smart Tunnel Inspection and Assessment using Mobile Inspection Vehicle, Non-Contact Radar and AI**<br>Toru Yasuda, Hideki Yamamoto, Mami Enomoto and Yasushi Nitta |
| | 368 | **Development of ROV for visual inspection of concrete pier superstructure**<br>Toshinari Tanaka, Shuji Nogami, Ema Kato and Tsukasa Kita |
| | 378 | **Examination of efficiency of bridge periodic inspection using 3D data (point cloud data and images)**<br>Tatsuru Ninomiya, Mitsuharu Shimokawa, Tatsuya Hattori, Yasushi Nitta and Mami Enomoto |
| | | **Q&A for all papers in this session** |

| Session 16 | Paper ID | Mixed themes<br>Session Chair: Benny Raphael |
|---|---|---|
| 16:00 | 179 | **An integrated sensor network method for safety management of construction workers**<br>Tingsong Chen, Nobuyoshi Yabuki and Tomohiro Fukuda |
| | 19 | **Simulation-based Reinforcement Learning Approach towards Construction Machine Automation.**<br>Keita Matsumoto, Atsushi Yamaguchi, Takahiro Oka, Masahiro Yasumoto, Satoru Hara, Michitaka Iida and Marek Teichmann |
| | 42 | **A Robust Framework for Identifying Automated Construction Operations**<br>Aparna Harichandran, Benny Raphael and Abhijit Mukherjee |
| | 29 | **Development of A Mobile Robot pulling an Omni-directional Cart for a Construction Site**<br>Yusuke Takahashi, Yoshiro Hada and Satoru Nakamura |
| | | **Q&A for all papers in this session** |

| Session 17 | Paper ID | Mixed themes<br>Session Chair: Ammar Safi |
|---|---|---|
| 16:00 | 224 | **Blockchain based framework for verifying the adequacy of scaffolding installation**<br>Chanwoo Baek, Doyeop Lee and Chansik Park |
| | 263 | **Multiple Tower Crane Selection methodology utilizing Genetic Algorithm**<br>Preet Lodaya, Abhishek Raj Singh and Venkata Santosh Kumar Delhi |
| | 305 | **Current status of unmanned construction technology developed using a test field system**<br>Koji Ihara and Takeshi Tamura |
| | 87 | **An analysis of 4D-BIM Construction Planning: Advantages, Risks and Challenges**<br>Pedram Farnood Ahmadi and Mehrdad Arashpour |
| | | **Q&A for all papers in this session** |

| Session 18 | Paper ID | Construction management<br>Session Chair: Bharadwaj Mantha |
|---|---|---|
| 16:00 | 381 | **Scheduling Simulator by Ensemble Forecasting for Construction Duration**<br>Shigeomi Nishigaki, Katsutoshi Saibara, Takashi Ootsuki and Hirokuni Morikawa |
| | 98 | **Review of Construction Work-Space Definition and Case Studies**<br>Kuan-Fan Lai and Ying-Chieh Chan |
| | 396 | **Study on the level concept of autonomous construction in mechanized construction**<br>Hirokuni Morikawa and Takashi Otsuki |
| | 397 | **Research on standardization of construction site time-series change information as learning data for automatic generation of work plan of construction**<br>Takashi Otsuki, Hirokuni Morikawa, Yushi Shiiba, Seigo Ogata and Masaharu Moteki |
| | | **Q&A for all papers in this session** |

# Tuesday, October 27, 2020

## Track 1

### Session 19 — Mixed themes

Session Chair: Jörg Güttler

| | Paper ID | |
|---|---|---|
| 17:00 | 45 | **Real-time judgment of workload using heart rate and physical activity**<br>Nobuki Hashiguchi, Lim Yeongjoo, Cyo Sya, Kuroishi Shinichi, Yasuhiro Miyazaki, Shigeo Kitahara, Taizo Kobayashi, Kazuyoshi |
| | 121 | **A View of Construction Science and Robot technology implementation**<br>Hiroshi Yamamoto |
| | 119 | **Traffic Regulation Technology by Movable Barriers**<br>Toshiharu Tanikawa and Tohya Okishio |
| | 139 | **Web-Based Communication Platform for Decision Making in Early Design Phases**<br>Zhiwei Meng, Ata Zahedi and Frank Petzold |
| | | **Q&A for all papers in this session** |

### Session 22 — Automation and robotics

Session Chair: Wen Pan

| | Paper ID | |
|---|---|---|
| 18:00 | 43 | **Design and Synthesis of the Localization System for the On-site Construction Robot: a case in Hong Kong**<br>Wen Pan, Rui Li and Thomas Bock |
| | 69 | **Analysis of Excavation Methods and Concept for a small-scale Mining Robot**<br>Michael Berner and Nikolaus August Sifferlinger |
| | 124 | **Robotic insertion of timber joints using visual detection of fiducial markers**<br>Nicolas Rogeau, Victor Tiberghien, Pierre Latteur and Yves Weinand |
| | 55 | **Laser Scanner Automation for an Industrial Robot**<br>Petras Vestartas and Yves Weinand |
| | | **Q&A for all papers in this session** |

## Track 2

### Session 20 — Mixed themes

Session Chair: Zoubeir Lafhaj

| | Paper ID | |
|---|---|---|
| 17:00 | 25 | **Generation of orthomosaic model for construction site using unmanned aerial vehiclle**<br>Alexey Bulgakov, Daher Sayfeddine, Thomas Bock and Awny Fares |
| | 20 | **Ontological base for concrete bridge rehabilitation projects**<br>Chengke Wu, Rui Jiang, Jun Wang, Jizhuo Huang and Xiangyu Wang |
| | 294 | **Training of Yolo neural network for the detection of fire emergency asset**<br>Alessandra Corneli, Berardo Naticchia, Frederic Bosché, Massimo Vaccarini and Alessandro Carbonari |
| | 162 | **BuiltView: Integrating LiDAR and BIM for Real-Time Quality Control of Construction Projects**<br>Rana Abbas, Christian Skinner, Monica Hanus-Smith, Andrew Harris and Nathan Kirchner |
| | | **Q&A for all papers in this session** |

### Session 23 — Building information modeling (BIM)

Session Chair: Daniel Hall

| | Paper ID | |
|---|---|---|
| 18:00 | 140 | **Ontology-based Product Configuration for Modular Buildings**<br>Jianpeng Cao and Daniel Hall |
| | 141 | **On Construction-Specific Product Structure Design and Development: The BIM Enhancement Approach**<br>Solmaz Mansoori, Harri Haapasalo and Janne Härkönen |
| | 144 | **Parametric Structural Design for automated Multi-Objective Optimization of Flexible Industrial Buildings**<br>Julia Reisinger, Iva Kovacic and Maximilian Knoll |
| | 149 | **Development of an Open Source Scan&BIM Platform**<br>Enrique Valero, Dibya D. Mohanty and Frederic Bosche |
| | | **Q&A for all papers in this session** |

## Track 3

### Session 21 — Mixed themes

| | Paper ID | |
|---|---|---|
| 17:00 | | |
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| | | **Q&A for all papers in this session** |

### Session 24 — Mixed themes

Session Chair: Markus König

| | Paper ID | |
|---|---|---|
| 18:00 | 217 | **Deployment Of A Standardized BIM Modeling Guideline For The Planning And Construction Industry**<br>Manfred Helmus, Anica Meins-Becker, Gamze Hort and Daiki John Feller |
| | 100 | **BIM Based Information Delivery Controlling System**<br>Brian Klusmann, Zhiwei Meng, Anica Meins-Becker, Noemi Kremer and Manfred Helmus |
| | 67 | **Rule-Based Generation of Assembly Sequences for Simulation in Large-Scale Plant Construction**<br>Jan Weber, Jana Stolipin, Markus König, Sigrid Wenzel and Ulrich Jessen |
| | 126 | **Integrating BIM- and cost-included information container with Blockchain for construction automated payment using billing model and smart**<br>Xuling Ye, Katharina Sigalov and Markus König |
| | | **Q&A for all papers in this session** |

# Tuesday, October 27, 2020

| Track 1 | Track 2 | Track 3 |
|---|---|---|
| 19:00 | **Break** | |

| Session 25 | Paper ID | Mixed themes<br>Session Chair: Jochen Teizer | Session 26 | Paper ID | Construction management<br>Session Chair: Daniel Hall | Session 27 | Paper ID | Safety and health<br>Session Chair: Rongbo Hu |
|---|---|---|---|---|---|---|---|---|
| 20:00 | 212 | **Automatized Parametric Modeling to Enhance a data-based Maintenance Process for Infrastructure Buildings**<br>Robert Hartung, Robin Schönbach, Dominic Liepe and Katharina Klemt-Albert | 20:00 | 131 | **Incentivizing High-Quality Data Sets in Construction Using Blockchain: A Feasibility Study in the Swiss Industry**<br>Jens J. Hunhevicz, Tobias Schraner and Daniel M. Hall | 20:00 | 137 | **Developing a Windshield Display for Mobile Cranes**<br>Taufik Akbar Sitompul, Simon Roysson and José Rosa |
| | 372 | **An automated approach to digitize masonry bridges**<br>Mustafa Al-Adhami, Sagal Rooble, Song Wu, Clara Osuna-Yevenes, Veronica Ruby-Lewis, Mark. Greatrix, Yreilyn Cartagena and Saeed | | 250 | **Design for digital fabrication: an industry needs analysis of collaboration platforms and integrated management processes**<br>Ming Shan Ng, Marcella M. Bonanomi, Daniel M. Hall and Jürgen Hackl | | 32 | **Exploring Gerontechnology for Aging-Related Diseases in Design Education: An Interdisciplinary Perspective**<br>Rongbo Hu, Thomas Linner, Marc Schmaitzl, Jörg Güttler, Yuan Lu and Thomas Bock |
| | 235 | **Safe and Lean Location-based Construction Scheduling**<br>Beidi Li, Carl Schultz, Jürgen Melzner, Olga Golovina and Jochen Teizer | | 68 | **A Shared Ontology for Logistics Information Management in the Construction Industry**<br>Yuan Zheng, Müge Tetik, Seppo Törmä, Antti Peltokorpi and Olli Seppänen | | 201 | **Development of a twin model for real-time detection of fall hazards**<br>Leonardo Messi, Alessandra Corneli, Massimo Vaccarini and Alessandro Carbonari |
| | 44 | **Cyber-physical system for diagnosing and predicting the technical condition of servo-drives of a mechatronic sliding complex during the**<br>Alexey Bulgakov, Thomas Bock and Tatiana Kruglova | | 392 | **Single shared model approach for building information modelling**<br>Simo Ruokamo and Heikkilä Rauno | | 206 | **Data-Driven Worker Detection from Load-View Crane Camera**<br>Tanittha Sutjaritvorakul, Axel Vierling and Karsten Berns |
| | | **Q&A for all papers in this session** | | | **Q&A for all papers in this session** | | | **Q&A for all papers in this session** |

# Tuesday, October 27, 2020

## Track 1

| Session 28 | Paper ID | Mixed themes<br>Session Chair: Frédéreic Bosché |
|---|---|---|
| 21:00 | 150 | **A Holistic Framework for the Implementation of Big Data throughout a Construction Project Lifecycle**<br>Makram Bou Hatoum, Melanie Piskernik and Hala Nassereddine |
| | 315 | **Towards a computational approach to quantify human experience in urban design: Data collection phase**<br>Keundeok Park and Semiha Ergan |
| | 60 | **Efficient Numerical Methods for Accurate Modeling of Soil Cutting Operations**<br>Amin Haeri, Dominique Tremblay, Krzysztof Skonieczny, Daniel Holz and Marek Teichmann |
| | 276 | **Ontology-Based Decoding of Risks Encoded in the Prescriptive Requirements in Bridge Design Codes**<br>Fahad Ul Hassan and Tuyen Le |
| | | **Q&A for all papers in this session** |

## Track 2

| Session 29 | Paper ID | Construction management<br>Session Chair: Zhenhua Zhu |
|---|---|---|
| 21:00 | 94 | **A Vision for and Evaluations of Responsive Environments in Future Medical Facilities**<br>Daniel Lu, Semiha Ergan, Devin Mann and Katharine Lawrence |
| | 292 | **Construction 4.0: A roadmap to shaping the future of Construction**<br>Mahmoud El Jazzar, Harald Urban, Christian Schranz and Hala Nassereddine |
| | 92 | **Energy Performance and LCA-driven Computational Design Methodology for Integrating Modular Construction in Adaptation of Concrete**<br>Sheida Shahi, Patryk Wozniczka, Ian Trudeau, Tristan Truyens and Carl Haas |
| | 280 | **Analyzing Idling Reasons Based on Excavator-truck Relationships in Earthwork Operations**<br>Chen Chen, Zhenhua Zhu and Amin Hammad |
| | | **Q&A for all papers in this session** |

## Track 3

| Session 30 | Paper ID | Mixed themes<br>Session Chair: Vineet Kamat |
|---|---|---|
| 21:00 | 244 | **Factors affecting the implementation of AI-bsed hearing protection technology at construction workplace**<br>Yongcan Huang and Tuyen Le |
| | 271 | **A novel audio-based machine learning model for automated detection of collision hazards at construction sites**<br>Khang Dang and Tuyen Le |
| | 356 | **Real-Time Process-Level Digital Twin for Collaborative Human-Robot Construction Work**<br>Xi Wang, Ci-Jyun Liang, Carol Menassa and Vineet Kamat |
| | 412 | **Bridge Inspection with Aerial Robots and Computer Vision: A Japanese National Initiative**<br>Jacob J. Lin, Amir Ibrahim, Shubham Sarwade, Mani Golparvar-Fard, Yasushi Nitta, Hirokuni Moirkawa and Yoshihiko Fukuchi |
| | | **Q&A for all papers in this session** |

| Session 31 | Paper ID | Mixed themes<br>Session Chair: Burcu Akinci |
|---|---|---|
| 22:00 | 90 | **Parametric or Non-Parametric? Understanding the Inherent Trade-offs between forms of Object Representation**<br>Christopher Rausch, Yinghui Zhao and Carl Haas |
| | 309 | **Integrating Industry 4.0 associated technologies into Automated and tradidional Construction**<br>Fabiano Correa |
| | 253 | **Maintenance of buildings: A closer look at façades and façade inspection reports**<br>Zhuoya Shi, Keundeok Park and Semiha Ergan |
| | 247 | **Project work breakdown structure similarity estimation using semantic and structural similarity measures**<br>Navid Torkanfar and Ehsan Rezazadeh Azar |
| | | **Q&A for all papers in this session** |

| Session 32 | Paper ID | Data sensing and analysis<br>Session Chair: Yong Cho |
|---|---|---|
| 22:00 | 30 | **Automated Data Acquisition for Indoor Localization and Tracking of Materials on Site**<br>Hassan Bardareh and Osama Moselhi |
| | 57 | **Workspace Modeling: Visualization and Pose Estimation of Teleoperated Construction Equipment from Point Clouds**<br>Jing Dao Chen, Pileun Kim, Dong-Ik Sun, Chang-Soo Han, Yong Han Ahn, Jun Ueda and Yong Cho |
| | 72 | **A Deep Learning-based Approach for Detecting Construction Machinery in Jobsites Using Mask R-CNN**<br>Hamed Raoofi and Ali Motamedi |
| | 116 | **Evaluation of Spalling in Bridges Using Machine Vision Method**<br>Eslam Mohammed Abdlekader, Osama Moselhi, Mohamed Marzouk and Tarek Zayed |
| | | **Q&A for all papers in this session** |

| Session 33 | Paper ID | Mixed Realities (AR/VR)<br>Session Chair: Alessandro Carbonari |
|---|---|---|
| 22:00 | 273 | **Development of an Augmented Reality Fitness Index for Contractors**<br>Hala Nassereddine, Awad Hanna, Wafik Lotfallah and Dharmaraj Veeramani |
| | 275 | **The Impact of Integrating Augmented Reality into the Production Strategy Process**<br>Hala Nassereddine, Dharmaraj Veeramani and Awad Hanna |
| | 313 | **Using a Virtual Reality-based Experiment Environment to Examine Risk Habituation in Construction Safety**<br>Namgyun Kim and Changbum Ryan Ahn |
| | 400 | **A Framework for Augmented Reality Assisted Structural Embedment Inspection**<br>Jeffrey Kim and Darren Olsen |
| | | **Q&A for all papers in this session** |

# Wednesday, October 28, 2020

## Track 1

| Session 34 | Paper ID | Mixed themes<br>Session Chair: Vineet Kamat |
|---|---|---|
| 08:00 | 341 | **Bi-Directional Communication Bridge for State Synchronization between Digital Twin Simulations and Physical Construction Robots**<br>Ci-Jyun Liang, Wes Mcgee, Carol Menassa and Vineet Kamat |
| | 414 | **Quality Control for Concrete Steel Embed Plates using LiDAR and Point Cloud Mapping**<br>Hani Alzraiee, Robert Sprotte and Andrea Leal Ruiz |
| | 159 | **Development of simple attachment for remote control (Doka Touch)**<br>Kazuki Sumi |
| | 192 | **Towards 3D Perception and Closed-Loop Control for 3D Construction Printing**<br>Xuchu Xu, Ruoyu Wang, Qiming Cao and Chen Feng |
| | | **Q&A for all papers in this session** |

## Track 2

| Session 35 | Paper ID | Artificial intelligence and machine learning<br>Session Chair: Saiedeh Razavi |
|---|---|---|
| 08:00 | 11 | **Automated Road Pavement Defects Detection and Classification**<br>Andrea Leal Ruiz and Hani Alzraiee |
| | 270 | **Fuzzy Controller Algorithm for Automated HVAC Control**<br>Myungjin Chae, Kyubyung Kang, Dan D. Koo, Sukjoon Oh and Jae Youl Chun |
| | 302 | **Condition Prediction of Highway Assets Based on Spatial Proximity and Interrelations of Asset Classes: A Case Study**<br>Arash Karimzadeh, Sepehr Sabeti, Hamed Tabkhi and Omidreza Shoghli |
| | 310 | **Using Deep Learning for Assessment of Workers' Stress and Overload**<br>Sahel Eskandar and Saiedeh Razavi |
| | | **Q&A for all papers in this session** |

## Track 3

| Session 36 | Paper ID | Mixed themes<br>Session Chair: Yelda Turkan |
|---|---|---|
| 08:00 | 324 | **ABM and GIS for Wildfire Management**<br>Qi Sun and Yelda Turkan |
| | 314 | **Augmented Reality Sandboxes for Civil and Construction Engineering Education**<br>Joseph Louis and Jennifer Lather |
| | 398 | **A Technology Platform for a Successful Implementation of Integrated Project Delivery for Medium Size Projects**<br>Luke Posomas and Hani Alzraiee |
| | 89 | **Implementation of unsupervised learning methods in rule learning from construction schedules**<br>Boong Yeol Ryoo and Milad Ashtab |
| | | **Q&A for all papers in this session** |

| Session 37 | Paper ID | Automation and robotics<br>Session Chair: Jack C. P. Cheng |
|---|---|---|
| 09:00 | 194 | **BIM-Aided Scanning Path Planning for Autonomous Surveillance UAVs with LiDAR**<br>Changhao Song, Kai Wang and Jack C. P. Cheng |
| | 196 | **Preliminary Development of a Powerful and Backdrivable Robot Gripper Using Magnetorheological Fluids**<br>Sahil Shembekar, Mitsuhiro Kamezaki, Peizhi Zhang, Zhouyi He, Ryuichiro Tsunoda, Kenshiro Otsuki, Hiroyuki Sakamoto and Shigeki |
| | 233 | **Reaching difficulty model of swinging operations of a hydraulic excavator considering the first-order delay**<br>Kazuyuki Matsumura, Masaru Ito, Chiaki Raima, Seiji Saiki, Yoichiro Yamazaki and Yuichi Kurita |
| | 204 | **Development of fireproof coating spraying robot and Application of building construction site**<br>Yuichi Ikeda, Hirofumi Segawa and Nobuyoshi Yabuki |
| | | **Q&A for all papers in this session** |

| Session 38 | Paper ID | Mixed themes<br>Session Chair: Saiedeh Razavi |
|---|---|---|
| 09:00 | 152 | **Comparison of Shortest Path Finding Algorithms for Power and Instrument Cables in Industrial Construction Projects**<br>Fatima Alsakka, Salam Khalife, Maram Nomir, Yasser Mohamed and Rick Hermann |
| | 184 | **Financial Modeling for Modular and Offsite Construction**<br>Tarek Salama, Gareth Figgess, Mohamed Elsharawy and Hossam Elsokkary |
| | 402 | **Introduction of the new safety concept "Safety2.0"to reduce the risk of machinery accidents**<br>Hidesato Kojima, Takaya Fujii, Yasushi Mihara and Hiroaki Ihara |
| | 198 | **A Novel Methodological Framework of Smart Project Delivery of Modular Integrated Construction**<br>Wei Pan, Mi Pan and Zhenjie Zheng |
| | | **Q&A for all papers in this session** |

| Session 39 | Paper ID | Mixed themes<br>Session Chair: Yelda Turkan |
|---|---|---|
| 09:00 | 59 | **A Critical Review of Machine Vision Applications in Construction**<br>Saeed Ansari Rad and Mehrdad Arashpour |
| | 18 | **Applications of building information modeling (BIM) in disaster resilience: Present status and future trends**<br>Sadegh Khanmohammadi, Mehrdad Arashpour and Yu Bai |
| | 173 | **An Agent-based Framework for Evaluating Location-based Risk in Indoor Emergency Evacuation**<br>Tianlun Cai, Jiamou Liu, Hong Zheng, Yupan Wang and Vicente Gonzalez |
| | 259 | **Track Similarity-based Typhoon Search Engine for Disaster Preparedness**<br>Chun-Mo Hsieh, Cheng-Yu Ho, Hung-Kai Kung, Hao-Yung Chan, Meng-Han Tsai and Yun-Cheng Tsai |
| | | **Q&A for all papers in this session** |

# Wednesday, October 28, 2020

## Track 1

| Session 40 | Paper ID | Automation and robotics<br>Session Chair: Chen Feng |
|---|---|---|
| 10:00 | 345 | **Autonomous Excavation in Consideration of Soil Properties**<br>Shinya Katsuma, Ryosuke Yajima, Shunsuke Hamasaki, Pang-Jo Chun, Keiji Nagatani, Genki Yamauchi, Takeshi Hashimoto, Atsushi |
| | 349 | **Development of an algorithm for crane sway suppression**<br>Yasuhiro Yamamoto, Chunnan Wu, Hisashi Osumi, Masayuki Yano and Yusuke Hara |
| | 350 | **Analysis of energy efficiency of a backhoe during digging operation**<br>Yusuke Sano, Chunnan Wu, Hisashi Osumi, Yuki Kawashima and Tomoaki Tsuda |
| | 351 | **Remote Control Demonstration of the Construction Machine using 5G Mobile Communication System at Tunnel Construction Site**<br>Ken Takai, Hiroaki Aoki, Yusuke Tajima and Michinobu Yoshida |
| | | **Q&A for all papers in this session** |

## Track 2

| Session 41 | Paper ID | Data sensing and analysis<br>Session Chair: Koshy Varghese |
|---|---|---|
| 10:00 | 85 | **IoT-enabled dependable co-located low-cost sensing for construction site monitoring**<br>Huynh A.D. Nguyen, Lanh V. Nguyen and Quang P. Ha |
| | 125 | **IoT Enabled Framework for Real-time Management of Power-Tools at Construction Projects**<br>Ashish Kumar Saxena, Varun Kumar Reja and Koshy Varghese |
| | 128 | **Measuring adhesion strength of the wall tile to concrete by Non-contact Inspection using Electromagnetic Waves**<br>Hussain Alsalem, Takayuki Tanaka, Takumi Honda, Satoru Doi and Shigeru Uchida |
| | 155 | **Toolbox Spotter: A Computer Vision System for Real World Situational Awareness in Heavy Industries**<br>Stuart Eiffert, Alex Wendel, Peter Colborne-Veel, Nicholas Leong, John Gardenier and Nathan Kirchner |
| | | **Q&A for all papers in this session** |

## Track 3

| Session 42 | Paper ID | Safety and health<br>Session Chair: Castro-Lacouture |
|---|---|---|
| 10:00 | 199 | **Safety monitoring of construction equipment based on multi-sensor technology**<br>Ziqing Yang, Jian Yang and Enliu Yuan |
| | 362 | **Incident Detection at Construction Sites via Heart-Rate and EMG Signals of Facial Muscle**<br>Mizuki Sugimoto, Shunsuke Hamasaki, Ryosuke Yajima, Hiroshi Yamakawa, Kaoru Takakusaki, Keiji Nagatani, Atsushi Yamashita and |
| | 399 | **Development of an Automated Angle Control System to Improve Safety and Productivity**<br>Tsuyoshi Fukuda, Takumi Arai, Kousuke Kakimi and Keishi Matsumoto |
| | 197 | **Safety concept and architecture for autonomous haulage system in mining**<br>Hidefumi Ishimoto and Tomoyuki Hamada |
| | | **Q&A for all papers in this session** |

| Session 43 | Paper ID | Automation and robotics<br>Session Chair: Yasushi Nitta |
|---|---|---|
| 11:00 | 353 | **Sea Experiment on Tele-operation System of Underwater Excavator**<br>Tsukasa Kita, Taketsugu Hirabayashi, Ueyama Atsushi, Hiroshi Kinjo, Naoki Oshiro and Nobuyuki Kinjo |
| | 123 | **Development of rotary snowplow driving support system using quasi-zenit satellite on expressway in Hokkaido**<br>Atsushi Ichikawa, Katsuyoshi Abe, Toshiaki Itou and Keigo Kurihara |
| | 122 | **A Preliminary Comparison Between Manual and Robotic Construction of Wooden Structure Architecture**<br>Lu Wang, Hiroatsu Fukuda and Xinyu Shi |
| | 394 | **Automation and operation record of large overhead crane for segment transportation**<br>Yasushi Nishizaki |
| | | **Q&A for all papers in this session** |

| Session 44 | Paper ID | Data sensing and analysis<br>Session Chair: Soonwook Kwon |
|---|---|---|
| 11:00 | 160 | **Construction Method of Super Flat Concrete Slab using High Precision Height Measurement**<br>Yutaro Fukase, Ryosuke Saito, Yoshiaki Takemoto and Muramatsu Yoshiki |
| | 183 | **Single Camera Worker Detection, Tracking and Action Recognition in Construction Site**<br>Hiroaki Ishioka, Xinshuo Weng, Yunze Man and Kris Kitani |
| | 185 | **MR-based equipment remote control and 3D digital working guidance for field-oriented maintenance**<br>Jinwoo Song, Kyuhyup Lee, Minkyeong Jeong, Seojoon Lee and Soonwook Kwon |
| | 168 | **Method for estimating subgrade reaction modulus by measuring wheel-terrain interactions**<br>Yasushi Wada and Taizo Kobayashi |
| | | **Q&A for all papers in this session** |

| Session 45 | Paper ID | Mixed Realities (AR/VR)<br>Session Chair: Tomohiro Umetani |
|---|---|---|
| 11:00 | 143 | **Near Real-Time Monitoring of Construction Progress: Integration of Extended Reality and Kinect V2**<br>Ahmed Khairadeen Ali, One Jae Lee and Chansik Park |
| | 186 | **VRGlare: A Virtual Reality Lighting Performance Simulator for real-time Three-Dimensional Glare Simulation and Analysis**<br>Kieran May, James Walsh, Ross Smith, Ning Gu and Bruce Thomas |
| | 232 | **Inspection of discrepancies in Construction Temporary Safety Structures through Augmented Reality**<br>Hashim Raza Bokhari, Doyeop Lee, Numan Khan and Chansik Park |
| | 371 | **Image analysis of eye movement in VR-video based experiments for detecting dengerous situations in construction site**<br>Shunsuke Hamasaki, Mizuki Sugimoto, Ryosuke Yajima, Atsushi Yamashita, Keiji Nagatani and Hajime Asama |
| | | **Q&A for all papers in this session** |

# Wednesday, October 28, 2020

| Track 1 | | | Track 2 | | | Track 3 | | |
|---|---|---|---|---|---|---|---|---|
| **Session 46** | Paper ID | **Automation and robotics** Session Chair: Soungho Chae | **Session 47** | Paper ID | **Data sensing and analysis** Session Chair: Taizo Kobayashi | **Session 48** | Paper ID | **Data sensing and analysis** Session Chair: Hisashi Osumi |
| 12:00 | 61 | **An agent-based approach for modeling human-robot collaboration in bricklaying**<br>Ming-Hui Wu and Jia-Rui Lin | 12:00 | 188 | **Use of laser scanning, remote sensors and traffic data collection, drones and mobile application. MoEI Federal Highways network case study.**<br>Habiba Noor Aflatoon, Daniel Llort Mac Donald and Khamis Alsheyahri | 12:00 | 361 | **Development of a Workers' Behavior Estimation System Using Sensing Data and Machine Learning**<br>Rikuto Tanaka, Nobuyoshi Yabuki and Tomohiro Fukuda |
| | 76 | **Analysis on the implementation mechanism of an inspection robot for glass curtain walls in high-rise buildings**<br>Shiyao Cai, Zhiliang Ma and Jianfeng Guo | | 225 | **Autonomous UAV Flight using Total Station Navigation System in Non-GNSS Environments**<br>Akira Ishii, Takato Yasuno, Masazumi Amakata, Hiroaki Sugawara, Junichiro Fujii and Kohei Ozasa | | 380 | **Cyber Agent to Support Workers' Decision Making for Construction**<br>Shigeomi Nishigaki, Katsutoshi Saibara, Takashi Ootsuki and Hirokuni Morikawa |
| | 77 | **Curtain Wall Installation for High-Rise Buildings: Critical Review of Current Automation Solutions and Opportunities**<br>Brandon Johns, Mehrdad Arashpour and Elahe Abdi | | 245 | **Evaluating slam 2D and 3D mapping of indoor structures**<br>Yoshihiro Nitta, Derbew Yenet Bogale, Yorimasa Kuba and Zhang Tian | | 384 | **Experimental result of third person's view generation from omni-directional camera**<br>Akira Sakata, Yasushi Hada, Rei Hojo, Masahiro Munemoto, Yoshito Takeshita, Tsubasa Asuma and Shigeo Kitahara |
| | 96 | **Threat Modeling in Construction: An Example of a 3D Concrete Printing System**<br>Maahir Ur Rahman Mohamed Shibly and Borja Garcia de Soto | | 334 | **Streamlining Photogrammetry-based 3D Modeling of Construction Sites using a Smartphone, Cloud Service and Best-view Guidance**<br>Ryota Moritani, Satoshi Kanai, Kei Akutsu, Kiyotaka Suda, Abdalrahman Elshafey, Nao Urushidate and Mitsuru Nishikawa | | 340 | **Evaluation method for drainage gradient using 3D measurement data and a physics engine**<br>Kosei Ishida |
| | | **Q&A for all papers in this session** | | | **Q&A for all papers in this session** | | | **Q&A for all papers in this session** |

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|---|---|
| 13:00 | **Break** |

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|---|---|
| 14:00 | **Keynote 3 - Initiatives for Robot Introduction in Japanese Public Works**<br>Dr. Yasushi Nitta<br><br>**2021 ISARC Announcement** |

# Wednesday, October 28, 2020

## Track 1

| Session 49 | Paper ID | Automation and robotics<br>Session Chair: Borja Garcia de Soto |
|---|---|---|
| 15:00 | 147 | **Modeling and control of a 5-Dof boom crane**<br>Michele Ambrosino, Emanuele Garone, Marc Berneman, Gianluca Carbone, Rémi Crépin and Arnaud Dawans |
| | 193 | **Requirements for safe operation and facility maintenance of the construction robots**<br>Alexey Bulgakov, Thomas Bock, Jens Otto and Natalia Buzalo |
| | 213 | **Online Synchronization of Building Model for On-Site Mobile Robotic Construction**<br>Selen Ercan Jenny, Hermann Blum, Abel Gawel, Roland Siegwart, Fabio Gramazio and Matthias Kohler |
| | 218 | **A Methodology to Monitor Construction Progress Using Autonomous Robots**<br>Samuel A. Prieto, Borja Garcia de Soto and Antonio Adan |
| | | **Q&A for all papers in this session** |

## Track 2

| Session 50 | Paper ID | Automation and robotics<br>Session Chair: Kepa Iturralde |
|---|---|---|
| 15:00 | 6 | **Design-to-Robotic-Production and -Assembly for Architectural Hybrid Structures**<br>Henriette Bier, Arwin Hidding and Marco Galli |
| | 8 | **Towards Circular Economy in Architecture by Means of Data-driven Design-to- Robotic-Production**<br>Ginevra Nazzarri and Henriette Bier |
| | 21 | **Optimization of Trajectories for Cable Robots on Automated Construction Sites**<br>Roland Boumann, Tobias Bruckmann, Patrik Lemmen and Robin Heidel |
| | 40 | **Adopting off-site manufacturing, and automation and robotics technologies in energy-efficient building**<br>Wen Pan, Kepa Iturralde Lerchundi, Marcel Schlandt, Rongbo Hu, Thomas Linner and Thomas Bock |
| | | **Q&A for all papers in this session** |

## Track 3

| Session 51 | Paper ID | Education<br>Session Chair: Keiji Nagatani |
|---|---|---|
| 15:00 | 138 | **Changing Paradigm: a Pedagogical Method of Robotic Tectonics into Architectural Curriculum**<br>Xinyu Shi, Xue Fang, Zhoufan Chen, Tyson Keen Phillips and Hiroatsu Fukuda |
| | 382 | **Research and Development of Construction Technology in Social Cooperation Program "Intelligent Construction System"**<br>Shota Chikushi, Jun Younes Louhi Kasahara, Hiromitsu Fujii, Yusuke Tamura, Angela Faragasso, Hiroshi Yamakawa, Keiji Nagatani, |
| | 248 | **Gamification and BIM - Teaching the BIM method through a gamified, collaborative approach**<br>Carla Pütz, Christian Heins, Manfred Helmus and Anica Meins-Becker |
| | 390 | **Education of Open Infra BIM based Automation and Robotics**<br>Heikkilä Rauno and Kolli Tanja |
| | | **Q&A for all papers in this session** |

| Session 52 | Paper ID | Automation and robotics<br>Session Chair: Borja Garcia de Soto |
|---|---|---|
| 16:00 | 234 | **Towards High-Quality Road Construction: Using Autonomous Tandem Rollers for Asphalt Compaction Optimization**<br>Patrick Wolf, Jörg Husemann, Axel Vierling, Karsten Berns and Peter Decker |
| | 237 | **Mechatronic control system for leveling of bulldozer blade**<br>Alexey Bulgakov, Thomas Bock and Georgii Tokmakov |
| | 252 | **A Cable Driven Parallel Robot with a Modular End Effector for the Installation of Curtain Wall Modules**<br>Kepa Iturralde, Malte Feucht, Rongbo Hu, Wen Pan, Marcel Schlandt, Thomas Linner, Thomas Bock, Jean-Baptiste Izard, Ibon Eskudero, |
| | 257 | **On-site Autonomous Construction Robots: A review of research areas, technologies, and suggestions for advancement**<br>Xinghui Xu and Borja Garcia de Soto |
| | | **Q&A for all papers in this session** |

| Session 53 | Paper ID | Data sensing and analysis<br>Session Chair: Thomas Linner |
|---|---|---|
| 16:00 | 403 | **A Simulation Approach to Optimize Concrete Delivery using UAV Photogrammetry and Traffic Data**<br>Robert Sprotte and Hani Alzraiee |
| | 411 | **Mirror-aided approach for surface flatness inspection using laser scanning**<br>Fangxin Li and Min-Koo Kim |
| | 108 | **Applications of LiDAR for productivity improvement on construction projects: case studies from active sites**<br>Fredrik Westling, Rana Abbas, Christian Skinner, Monica Hanus-Smith, Andrew Harris and Nathan Kirchner |
| | 130 | **Constraint Control for a Underactuated Boom Crane System**<br>Michele Ambrosino, Emanuele Garone and Arnaud Dawans |
| | | **Q&A for all papers in this session** |

| Session 54 | Paper ID | Mixed themes<br>Session Chair: Hyoungkwan Kim |
|---|---|---|
| 16:00 | 15 | **Improving Construction Demonstrations by Integrating BIM, UAV, and VR**<br>Kun-Chi Wang, Ren-Jie Gao, Sheng-Han Tung and Yuan-Hsiu Chou |
| | 251 | **Opportunities and Challenges of Digital Twin Applications in Modular Integrated Construction**<br>Mingcheng Xie and Wei Pan |
| | 363 | **Deep Learning-based Question Answering System for Proactive Disaster Management**<br>Yohan Kim, Jiu Sohn, Seongdeok Bang and Hyoungkwan Kim |
| | 26 | **Using Virtual Reality and Augmented Reality for Presale House Customer Change**<br>Ben Amed Ouedraogo, Li-Chuan Lien, Unurjargal Dolgorsuren and Yan Ni Liu |
| | | **Q&A for all papers in this session** |

# Wednesday, October 28, 2020

| Track 1 | | | Track 2 | | | Track 3 | | |
|---|---|---|---|---|---|---|---|---|
| **Session 55** | Paper ID | **Automation and robotics**<br>Session Chair: Kazuo Ishii | **Session 56** | Paper ID | **Data sensing and analysis**<br>Session Chair: Thomas Linner | **Session 57** | Paper ID | **Mixed themes**<br>Session Chair: Ronie Navon |
| 17:00 | 279 | **A probabilistic motion control approach for teleoperated construction machinery**<br>Hyung Joo Lee and Sigrid Brell-Cokcan | 17:00 | 265 | **Depth-Camera-Based In-line Evaluation of Surface Geometry and Material Classification For Robotic Spraying**<br>Valens Frangez, David Salido-Monzú and Andreas Wieser | 17:00 | 246 | **Don't risk your real estate - Actions to realize efficient project risk management using the BIM method**<br>Maike Eilers, Carla Pütz, Manfred Helmus and Anica Meins-Becker |
| | 386 | **Oscillation reduction for knuckle cranes**<br>Michele Ambrosino, Emanuele Garone, Brent Thierens and Arnaud Dawans | | 267 | **Automatic Geometric Digital Twin Generation of Railway Overhead Line Equipment from Airborne LiDAR Data**<br>M R Mahendrini Fernando Ariyachandra and Ioannis Brilakis | | 272 | **A conceptual model for transformation of bill of materials from offsite manufacturing to onsite construction in industrialized house-building**<br>Raafat Hussamadin, Mikael Tallgren and Gustav Jansson |
| | 387 | **Automated framework for the optimisation of spatial layouts for concrete structures reinforced with robotic filament winding**<br>Robin Oval, Eduardo Costa, Diana Thomas-Mcewen, Saverio Spadea, John Orr and Paul Shepherd | | 405 | **Construction operation assessment and correction using laser scanning and projection feedback**<br>Alexei Pevzner, Saed Hasan, Rafael Sacks and Amir Degani | | 274 | **Combining Reality Capture and Augmented Reality to visualise subsurface utilities in the field**<br>Lasse Hedegaard Hansen, Simon Swanström Wyke and Erik Kjems |
| | 410 | **Parallel kinematic construction robot for AEC industry**<br>Maike Klöckner, Mathias Haage, Klas Nilsson, Anders Robertsson and Ronny Andersson | | 10 | **OpenBridgeGraph: Integrating Open Government Data for Bridge Management**<br>Jia-Rui Lin | | 277 | **A method to produce & visualize interactive work instructions for modular products within onsite construction**<br>Raafat Hussamadin, Jani Mukkavaara and Gustav Jansson |
| | | **Q&A for all papers in this session** | | | **Q&A for all papers in this session** | | | **Q&A for all papers in this session** |

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|---|---|
| 18:00 | **Awards and Closing Ceremony** |