ICCCBE 2018
Tampere, 5-7 June 2018

17TH INTERNATIONAL CONFERENCE ON COMPUTING IN CIVIL AND BUILDING ENGINEERING

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TAMPERE UNIVERSITY OF TECHNOLOGY

ISCCBE
The International Society for
Computing in Civil and Building Engineering

ICCCBE 2018

Tampere, 5-7 June 2018

ORGANIZERS

RIL Finnish Association of Civil Engineers
Tampere University of Technology
ISCCBE The International Society for Computing
in Civil and Building Engineering

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PLATINUM SPONSOR

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SOCIAL PROGRAM

Tuesday June 5

CITY RECEPTION HOSTED BY CITY OF TAMPERE

LOCATION: Vapriikki, Alaverstaanraitti 5.
Bus transportation from the conference venue at 18.30. Walking distance from the conference venue, 18 minutes.

TIME: 19.00 - 20.30

WHAT'S HAPPENING: few speeches, light food and drinks **DRESS CODE:** Business casual **PRICE:** Free for registered participants

Included in the accompanying persons program
Organized together with WASCON 2018 Conference

Wednesday June 6

CONFERENCE DINNER

LOCATION: Viikinsaari, Pakkahuoneenaukio
Departure at 18.00 Conference venue
Finishes at 23.00 in the city centre of Tampere
Includes a ferry ride to Viikinsaari

TIME: 18.00 - 23.00

WHAT'S HAPPENING: Dinner **DRESS CODE:** Business casual **PRICE:** Free for registered participants (excluding students), extra tickets can be bought for 120 EUR (inc. VAT 24%)

Included in the accompanying persons program

Accompanying Persons' Program

If you have purchased accompanying persons' program please contact registration desk for full details.

KEYNOTE SPEAKERS

Director, Business Development **PÄIVI PUNTILA** Trimble Inc
BIM Future Lies in Information Consumption
Tuesday June 5 at 9.30

Päivi has over 15 years of experience in BIM transformation of our industry. She is currently leading the business development of BIM for civil engineering at Trimble. She is also a member of the management team at the Structures division. Previous to this position, Päivi served as the Global Marketing Director of the Structures division (former Tekla Corporation) where she led the strategic marketing and global market positioning of Tekla building and construction software. Her customer centered approach focuses on value creation and change management beyond technology. Prior to Trimble, she worked for e-commerce and media relations.

Professor **RAFAEL SACKS** Technion – Israel Institute of Technology
BIM and AI: novel solutions for old problems
Tuesday June 5 at 13.15

Rafael Sacks is a Professor of Construction Engineering and Management at the Technion - Israel Institute of Technology. He is the Vice-Dean for Graduate Studies and Research in the Faculty of Civil and Environmental Engineering, and he was Head of Structural Engineering and Construction Management from 2012-2015. Rafael's research focuses on the synergies of Building Information Modeling (BIM) and Lean Construction.

CEO **HEIKKI HALTTULA** Viasys VDC Ltd.
Modelling Information Flow for a BIM-based Construction Project
Wednesday June 6 at 9.00

Mr. Heikki Halttula (M.Sc.) has over 30 years experience in civil engineering projects, CAD & GIS software development projects, BIM software development projects, BIM implementation projects, lean implementation and lean consultancy projects. He is a partner, member of the board, President and CEO of Software Development Company Viasys VDC Ltd. since 1999. Viasys VDC is today part of Topcon Position Group. He is an active member of RIL (Finnish Association of Civil Engineers) and acted as the chairperson of the RIL Data Modelling Committee for ten years and has been a member of Building Smart Finland Infra committee advisory group. The past few years he has been very active in Lean Construction Institute Finland community. He is also Ph.D. Student at the University of Oulu. His research is focusing on the simultaneous use of BIM and Lean in construction projects.

Professor **IAN F.C. SMITH** Swiss Federal Institute of Technology EPFL
Advanced measurement data interpretation for sustainable asset management
Thursday June 7 at 9.00

Ian F.C. Smith is a Professor of Structural Engineering at the Swiss Federal Institute of Technology (EPFL) in Lausanne, Switzerland. He received his PhD from Cambridge University, UK in 1982. His research interests are on intersections of computer science with structures and urban systems. Applications include advanced cyber-physical systems such as biomimetic structures and sensed civil infrastructure.

TUESDAY 5 JUNE 2018

	SMALL AUDITORIUM	SONAATTI 1	SONAATTI 2
8.00	REGISTRATION		
9.00 9.15	**OPENING OF THE CONFERENCE** Chair: Raymond Issa		
9.30 9.45 10.00	**KEYNOTE 1** "BIM Future Lies in Information Consumption" Business development director Päivi Puntila, Trimble Chair: Raymond Issa		
10.15	COFFEE		
10.45 11.00 11.15 11.30 11.45 12.00	**Building Information Modeling** (BIM) 1 Chair: Thomas Kang	**Urban/environmental planning and Architecture** Chair: Edmond Miresco	**Facility management** Chair: Shang-Hsien Hsieh
12.15	LUNCH		
13.15 13.30 13.45	**KEYNOTE 2** "BIM and AI: novel solutions for old problems" Professor Rafael Sacks Technion - Israel Institute of Technology Chair: Nashwan Dawood		
14.00	BREAK		
14.15 14.30 14.45 15.00	**Building Information Modeling** (BIM) 2 Chair: Nobuyoshi Yabuki	**Big Data and Digitalization** Chair: Eduardo Santos	**Building Evacuation** Chair: Uwe Rüppel
15.15	COFFEE		
15.45 16.00 16.15 16.30 16.45 17.00-17.15	**Visualization and Inspection** Chair: Mauri Laasonen	**Traffic and Transportation** Chair: Edmond Miresco	**Concrete Structures** Chair: Sebastian Skatulla
19.00 - 20.30	WELCOME RECEPTION AT VAPRIIKKI		

WEDNESDAY 6 JUNE 2018

	SMALL AUDITORIUM	SONAATTI 1	SONAATTI 2
8.00	**REGISTRATION**		
9.00 **9.15** **9.30**	**KEYNOTE 3** ”Modelling Information Flow for a BIM-based Construction Project” CEO Heikki Halttula, Viasys VDC Ltd. Chair: Walid Tizani		
9.45	**COFFEE**		
10.15 **10.30** **10.45** **11.00** **11.15** **11.30**	**Intelligent Computing** Chair: Kristo Mela	**Construction Management** Chair: Sami Pajunen	**Energy and Infrastructure** Chair: Eduardo Santos
11.45		**LUNCH**	
12.45 **13.00** **13.15** **13.30** **13.45** **14.00**	**Construction Process** Chair: Hee Sun Kim	**Design Automation** Chair: Eva Agapaki	**Health and Safety** Chair: Nashwan Dawood
14.15	**COFFEE**		
14.45 **15.00** **15.15** **15.30** **15.45** **16.00** **16.15**	**Intelligent Computing 2** Chair: Shang-Hsien Hsieh	**Bridges** Chair: Satoshi Kanai	**Underground construction** Chair: Tarja Mäkeläinen
18.00 - 22.00	**DINNER**		

THURSDAY 7 JUNE 2018

	SMALL AUDITORIUM	SONAATTI 1	SONAATTI 2
8.00	**REGISTRATION**		
9.00 9.15 9.30	**KEYNOTE 4** "Advanced measurement data interpretation for sustainable asset management" Professor Ian F.C. Smith Swiss Federal Institute of Technology EPFL Chair: Robert Amor		
9.45	**COFFEE**		
10.15 10.30 10.45 11.00 11.15 11.30	**Facility and Maintenance Management** Chair: Mauri Laasonen	**Numerical Simulations** Chair: Kristo Mela	**Life-Cycle and Environment** Chair: Uwe Rüppel
11.45	**LUNCH**		
12.45 13.00 13.15 13.30 13.45 14.00	**Measurement and Locating** Chair: Kristo Mela	**Housing** Chair: Sami Pajunen	
14.15	**COFFEE**		
14.45 15.00 15.15 15.30	**CLOSING SESSION** Chair: Raymond Issa		

8.00 **Registration opens**

9.00 **Opening Session**
Chair: Raymond Issa

Welcome words:
Raymond Issa, ISCCBE President
Kristo Mela and **Sami Pajunen**, Chairs of the Scientific Committee
Teemu Vehmaskoski, Chair of the Organizing Committee

9.30 **Keynote Lecture I**
Chair: Raymond Issa

"BIM Future Lies in Information Consumption"
Director, Business Development. **Päivi Puntila**, Trimble Inc.

10.15 Coffee

10.45 **Parallel Sessions**

Building Information Modeling (BIM) 1
Chair Thomas Kang **Venue** Small Auditorium

10:45 BIM Search Engine: Exploiting Interrelations between Objects when Assessing Relevance **Peter Demian**
11:00 Integration of Building Information Modelling and Discrete Event Simulation within a Game Engine **Carlos Arturo Osorio Sandoval**
11:15 Partitioning of space as basis for data structures to describe digital building models **Wolfgang Huhnt**

11:30 Parametric Information Modeling of Cyber-Physical Systems based on Industry Foundation Classes **Michael Theiler**
11:45 A tool for automating bim model elements table creation from intended bim uses and milestones **Eduardo Santos**
12:00 Building Energy-Efficiency delivered with the Help of Improved Building Information Modelling Skills **Päivi Jäväjä**

Urban/Environmental Planning and Architecture
Chair Edmond Miresco **Venue** Sonaatti 1

10:45 Information and Communication Technology for economic development and image building of South African cities **Dillip Das**
11:00 Using Context Encoders in AEC/FM **Shin-Yi Wen**
11:15 rapid urban prototyping – a goal-oriented approach **Weng Tat Chan**
11:30 Mechanism of Housing-related Urban Heat

Island Formation and Dynamic in High-density Urban Context: A Numerical Study of Hong Kong **Xiang LI**
11:45 From Technology Readiness Levels (TRL) to demonstrating Demand Response in Blocks of Buildings: Upgrading technical and social systems **Nashwan Dawood**
12:00 Realize sustainable planting by making use of BIM **Felix CHan**

Facility Management

Chair Shang-Hsien Hsieh **Venue** Sonaatti 2

10:45 What objects are most important when modelling existing industrial facilities? **Evangelia Agapaki**
11:00 Experiments in using nonlinear regression for business activity normalization in the Energy Star benchmarking method **Xuechen Lei**
11:15 A BIM-based Methodology for Implementing WELL Standard on Human Health and Comfort Analysis and Rating **Weiwei Chen**

11:30 A Methodology for Transparent Energy Management Processes in Multi-Site Organizations **Kara Hoffmann**, **Karsten Menzel**
11:45 FM-BIM Preparation Method and Quality Assessment Measures **Ali Motamedi**
12:00 A BIM/FM interface analysis for sustainable facility management **Nadine Wills**

12.15 Lunch

13.15 Keynote Lecture

Chair: Nashwan Dawood

"BIM and AI: novel solutions for old problems"
Professor **Rafael Sacks**
Technion - Israel Institute of Technology

14.00 Break

14.15 Parallel Sessions

Building Information Modeling (BIM) 2

Chair Nobuyoshi Yabuki **Venue** Small Auditorium

14:15 RSMeans-Guided Approach to Detailed Cost Estimating: A Residential Project Case **Nicolas Diaz**
14:30 Exploiting Big Data and BIM for Building Systems Commissioning **Andriy Hryshchenko, Karsten Menzel**

14:45 A BIM-Enabled Change Detection System for Assessing Impacts of Construction Change Orders **Veerasak Likhitruangsilp**
15:00 Development of the Prototype Simulation System about the Bid Rate **Satoru Yamaki**

Big Data and Digitalization

Chair Eduardo Santos **Venue** Sonaatti 1

14:15 Computational design for the construction industry: a real "Must-have"? **Nathalie Labonnote**
14:30 Digitalization of procurement will launch the disruption of construction industry **Juha Heinämäki**

14:45 Research trend analysis based on artificial intelligence technology in construction fields **Raja Issa**
15:00 Application of Machine Learning for Automated Code Compliance **Tanya Bloch**

Building Evacuation

Chair Uwe Rüppel **Venue** Sonaatti 2

14:15 Real-time Fire Emergency Evacuation Management System (RFEEM) based on BIM and Indoor Localization Technology **Rui Liu**
14:30 Simulation and Serious Game for Fire Evacuation Training **Pablo Ruffino**

14:45 A Review of Augmented Reality Applications for Building Evacuation **Ruggiero Lovreglio**
15:00 Application of BIM in Environmental Monitoring and Emergency Evacuation Management within Building Operation and Maintenance Phase: A Case Study **Yuan Shuang**

15.15 Coffee

15.45 Parallel sessions

Visualization and Inspection

Chair Mauri Laasonen **Venue** Small Auditorium

15:45 Parametric modeling–based BIM for evaluating thermal performance of building envelope with real-time energy feedback visualization **Worawan Natephra**

16:00 An AR Visualization System for Numerical Simulations using Spatial Information based on SLAM **Nao Ikeda**

16:15 Using Game Engines to Develop Building Holograms **Raja Issa**

16:30 Recognizing Symbols in Building Mechanical Drawings for Automated Building Information Models Reconstruction **Chi Yon Cho**

16:45 Improvement of the Efficiency of Object Detection **Po-Wei Lin**

Traffic and Transportation

Chair Edmond Miresco **Venue** Sonaatti 1

15:45 Vision-based Vehicle Detection and Classification **Georgios M. Hadjidemetriou, Symeon Christodoulou**

16:00 Construction and Usage of Three-dimensional Data for Road Maintenance Based on Terrestrial Laser Scanning and Photogrammetry **Chi Yuan Ho**, **Satoshi Kubota**

16:15 Application of the Simplified HMD-Based VR System to Road Design Process **Koji Makanae**

16:30 Development of a railway noise evaluation system using virtual reality technology **Kouji Kinoshita**

16:45 Requirement Analysis for Big Data & Cloud Computing Technology Application in Rail Transit Engineering **Cunxi Meng**

17:00 From Waze Reports to Resilience Measurement: Mega-events and Transportation System Response **Farrokh Jazizadeh**

Concrete Structures

Chair Sebastian Skatulla **Venue** Sonaatti 2

15:45 Modeling of Circumferential Non-uniform Corrosion Profile of Steel Bar in Concrete Induced by Chloride Penetration **Junyu Chen**

16:00 Numerical Simulation of Lateral Load-Displacement Relationships for Reinforced Concrete Shear Walls **Bin Zhang**

16:15 Effects of Individual Strand Tensile Force Deviation on Structural Behavior of Post-Tensioned Beams **Thomas Kang**

16:30 An Integrated Building Information Model (iBIM) for Design of Reinforced Concrete Structures **Jamal Abdalla**

16:45 Performance Evaluation of Fire Damaged Reinforced Concrete Beams using Machine Learning **Heesun Kim**

17:00 A computational approach for direct and a priori estimation of the required pre-stressing in RFC structures **Sebastian Skatulla**

19.00 City Reception hosted by City of Tampere
Together with Wascon 2018 Conference

WEDNESDAY 6 JUNE 2018

9.00 Keynote Lecture
Chair: Walid Tizani

"Modelling Information Flow for a BIM-based Construction Project"
CEO Heikki Halttula
Viasys VDC Ltd.

9.45 Coffee

10.15 Parallel Sessions

Intelligent Computing
Chair Kristo Mela **Venue** Small Auditorium

10:15 An Optimizing Placement of Passing Places in Mountainous Areas with Evolutionary Computing **Kazuhiro Amano**
10:30 Enhancing the accuracy of near-real-time seismic loss estimation using post-earthquake aerial images **Xinzheng Lu**
10:45 Seismic Loss Prediction of a Building Based on BIM and FEMA P-58 **Zhen Xu**
11:00 A Taxonomic Analysis of Mobile Crane Fatalities for CPS-based Simulation **Chimay Anumba**
11:15 Planning Work for a Self-Tracking Excavator Capable of Automatic Field Survey **Monjurul Hasan**
11:30 Emotion Effect on the Interaction between Caller and Dispatcher in Emergency Medical Service Dispatch Communication **Tzu-Chun Hsieh**
11:45 Pre-Processing IFC Building Models for Code Compliance Checking based on Visual Programming **André Borrmann**

Construction Management
Chair Sami Pajunen **Venue** Sonaatti 1

10:15 Real-time resource tracking on construction site: implementation practice and use cases in different projects **Jianyu Zhao**
10:30 Application Framework for On-Site Safety and Quality Inspection based on WeChat **Jiarui Lin**
10:45 The Practice of the management by the CIM team on the Construction Site **Yuichi Kobayashi**
11:00 From registration to recognition of indoor construction states using on-site videos and 4D building models **Christian Koch**
11:15 Time-Cost-Carbon Footprint Tradeoff Analysis for Heavy Construction Operations **Charinee Limsawasd**
11:30 Next Generation One-Man Construction and Smart Construction Powered by ICT Construction **Yuya Arakawa**

Energy and Infrastructure
Chair Eduardo Santos **Venue** Sonaatti 2

10:15 Information management for decommissioning of Oil & Gas facilities **Joao Patacas**
10:30 BIM-RFID Technology for Quality Management in China Wind Power Construction Project **Dan Tan**
10:45 Semantic Segmentation of Point Cloud in Liquefied Natural Gas (LNG) plants **Jian Chai**
11:00 Optimizing Lift Operations and Vessel Transport Schedules for Topsides Disassembly of Multiple Offshore Platforms Based on BIM and GIS **Yi Tan**
11:15 Enabling Geodetic Coordinate Reference Systems in Building Information Modeling for Infrastructure **Štefan Markič**
11:30 Data Science Support System for Infrastructure Maintenance on Cloud **Yuki Wakuda**

11.45 Lunch

12.45 Parallel Sessions

Construction Process

12:45 Scheduling Building projects: the Chrono-graphical modeling concept **Adel Francis**
13:00 Real-time information management for engaging users in building operation **Daniela Pasini**
13:15 A Constructability Assessment Framework for Buildings Design Using BIM **Abdelaziz Fadoul**

13:30 Identifying the critical success factors for BIM projects in Taiwan **Amarnath Chegu Badrinath, Shang-Hsien Hsieh**
13:45 The Case Study of Construction Information Modeling/Management for DAM **Yamamoto Yuusei**
14:00 Factors Influencing Advanced Construction Technology Integration **Raja Issa**

Design Automation

12:45 Factors Affecting Sizes of Paneling for Generative Design **Raja Issa**
13:00 The Future Trends of the Structural Design **Mauri Laasonen**
13:15 Algorithm assisted design in structural engineering **Ilari Pirhonen, Alex Lalla**

13:30 Advanced design and planning system of constructional scaffolding **Takashi Hara**
13:45 Parametric building object behavior of steel structures **Kristo Mela**
14:00 Automated Generation of Steel Connections of BIM by Machine Learning **Joonas Helminen**

Health and Safety

12:45 Ontology Modeling for Construction Safety Knowledge Management **Rui Liu**
13:00 vr/ar/mr based 3d immersive training system for building life safety inspections **Tan Qu**
13:15 Scenarios of Fall Hazards for automated detection in building models **Kevin Schwabe**

13:30 IoT-based Air Pollution Monitoring System for Environmental Impact Assessment of Construction Operations **Xiaoning Ren**
13:45 A framework of Realtime Flood Simulation with IoT Sensors **Shi Hao Chiu**
14:00 Computer Vision based System for Fall Detecting of Construction Workers **Mohammad Soltani**

14.15 Coffee

14.45 Parallel Sessions

Intelligent Computing 2

Chair Shang-Hsien Hsieh **Venue** Small Auditorium

14:45 Automated Generation and Layout Design of Fabrication Drawings for Building Façade Mullions Using BIM **Min Deng**

15:00 A Research on Planning and Production Control Method of Concrete formwork using BIM **Shuhei Tazawa**

15:15 BIM data exchange standard for hydro-genrated structures **Nawari Nawari**

15:30 Benefits and limits of interval constraints in acyclic constraint graphs for geometric modeling **Jakob Kirchner**

15:45 Multi-LOD 4D Simulation in Phased Rehabilitation Projects **Michel Guevremont**

16:00 Towards Non-Intrusive Metabolic Rate Evaluation for HVAC Control **Wooyoung Jung**

16:15 Indoor Testing and Simulation Platform for Close-distance Visual Inspection of Complex Structures using Micro Quadrotor UAV **Zhigang Shen**

Bridges

Chair Satoshi Kanai **Venue** Sonaatti 1

14:45 Bridge Asset Management: A Digital Approach to Modelling Asset Information **Harry Ashton, Lei Hou**

15:00 study on 3d steel bridge product model for quantity survey in japan **Teruaki Kageyama**

15:15 A new approach for improving design decision making process for bridges **Minkoo Kim**

15:30 Automated recognition and 3D CAD modeling of standardized steel bridge members in a laser scan **Satoshi Kanai**

15:45 Bridge Information Modeling based on IFC for supporting maintenance management of existing bridges **Fumiki Tanaka**

16:00 Mapping Mortar Joints in Image Textured 3D Models to Enable Automatic Damage Detection of Masonry Arch Bridges **Daniel Brackenbury**

16:15 Detection of Bridge Structural Components in Point Cloud Datasets for Modelling Existing Bridges **Ruodan Lu**

Underground Construction

Chair Tarja Mäkeläinen **Venue** Sonaatti 2

14:45 Monitoring Framework for Utility Tunnels based on BIM and IoT Technology **Kai Kang**

15:00 Development of a tunnel excavation system using 3D scanning and projection mapping **Yasuhisa Aono**

15:15 Real-time detection of sudden displacement of tunnel face surface by high-speed laser scanner **Tomohiro Mizoguchi**

15:30 Development of a design support system for geological disposal of radioactive waste using a CIM concept **Yuichi Kobayashi**

15:45 AR Visualization of Inundation in Underground Spaces Using CG-based Image Feature Points **Makoto Hirose**

16:00 Application of a hybrid modelling technique to calculate ground motions of Fennoscandian earthquakes **Vilho Jussila**

18.00 Dinner

THURSDAY 7 JUNE 2018

9.00 Keynote Lecture
Chair: Robert Amor

"Advanced measurement data interpretation for sustainable asset management"
Professor Ian F.C. Smith
Swiss Federal Institute of Technology EPFL

9.45 Coffee

10.15 Parallel Sessions

Facility and Maintenance Management
Chair Mauri Laasonen **Venue** Small Auditorium

10:15 A Methodology for Advanced Maintenance Management for Data Centers **Jürgen Bieser, Karsten Menzel**
10:30 research on cim information management platform for maintenance **Kouhei Kawano**

10:45 Federated Building Models in collaborative AEC/FM settings using IPFS **Jyrki Oraskari**
11:00 BIM Process Facilitator for EE Design Management **Tarja Mäkeläinen**
11:15 Towards a metric system to measure the BIM transition in estate management **Xin Gong**

Numerical Simulations
Chair Kisto Mela **Venue** Sonaatti 1

10:15 Numerical simulation for failure process of brick masonry at meso-scale based on discrete element method **Xingtao Jiang**
10:30 Resistance of partially intumescent covered steel member in fire **Janne Hautala**
10:45 Effect of Welding Residual Stresses on Behavior of Tubular T Joints **Marsel Garifullin**

11:00 Development of Hygro-Mechanical Finite Element Model for Shrinkage Simulation of Prefabricated Building Facades **Terry Y.P. Yuen**
11:15 BIM-based Compliant Design of Composite Structures Under Severe Fire Conditions **Robert Amor**
11:30 Longitudinal Variability of cross-sectional areas of corroded prestressing wires **Chongkai Li**

Life-Cycle and Environment
Chair Uwe Rüppel **Venue** Sonaatti 2

10:15 Approach for the IFC based Integration of Life Cycle Data and Processes in Building Information Models **Jakob Taraben**
10:30 SolConPro: An Approach for the Holistic Integration of Multi-Functional Façade Components into Buildings' Life Cycles **Anna Wagner**
10:45 BIM-based description of wastewater treatment plants **Michael Theiler**

11:00 Measurement Method and Accuracy Evaluation of Point Clouds Using UAV Photogrammetry for River Management **Satoshi Kubota**
11:15 Towards Unified Ontology for Modeling Lifecycle Inspection and Repair Information of Civil Infrastructure Systems **Amin Hammad**

11.45 Lunch

12.45 Parallel Sessions

Measurement and Locating

Chair Kristo Mela **Venue** Small Auditorium

12:45 Laser Scanning Tasks of Building Refurbishment Project **Ulrika Uotila**
13:00 Deep learning-based damage detection for sewer pipe inspection using faster R-CNN **Mingzhu Wang**
13:15 Influence Factors for Edge Line Estimation Accuracy Using Terrestrial Laser Scan Data **Qian Wang**

13:30 Point-to-point Comparison Method for Automated Scan-vs-BIM Deviation Detection **Yong Cho**
13:45 Dynamic Measurement of an Embankment Dam Shake Table Experiment using Online Image Analysis **Yuan-Sen Yang**
14:00 Automated Pile Transfer Work Cycles with a Robotic Wheel Loader **Eric Halbach**

Housing

Chair Sami Pajunen **Venue** Sonaatti 1

12:45 Exploration of the BIM Development and Application – Identifying Key Areas for the Industrialized House-Building Sector **Martin Lennartsson**
13:00 Utilising AR HoloLens to Enhance User Experience in House Selling: An Experiment Study **Yuehua Xu**
13:15 Extracting Routines of the Living Alone Occupant's Daily Activities Using Multiple Sequence Alignment **Bogyeong Lee**

13:30 Benefits of Lean Construction to Affordable Housing Projects **Ana Reinbold**
13:45 Effects of Housing Environments on Human Activity Recognition using Fine-grained WiFi Signatures **Changbum Ahn**
14:00 Use of BIM for Social Housing Management **Lyes Alileche**

14.15 Coffee

14.45 Closing Session
Chair: Raymond Issa **Venue**: Small Auditorium

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