Contents

Data, Sensing, and Analysis

4D Full-Scale Finite Element Analysis in Bridge Engineering ........................................... 1
Yi-Xin Li and Jian-Guo Nie

Agent Based Model for Resource Constrained Scheduling of Construction Projects ................................................................. 8
A. B. Senouci, K. Abdel Warith, and N. N. Eldin

Comparison between Nominal and Actual Hourly Production of Crawler-Type Dozer: A Case Study ................................................................. 17
Hamed Nabizadeh Rafsanjani

Automatic Satellite-Based Vessel Detection Method for Offshore Pipeline Safety ................................................................. 25
M. Poshtiban, L. Song, and N. Eldin

Skeleton-Based Registration of 3D Laser Scans for Automated Quality Assurance of Industrial Facilities ................................................................. 33

Mobile Proximity Sensing Technologies for Personnel and Equipment Safety in Work Zones ................................................................. 41
J. Park, E. Marks, Y. K. Cho, and W. Suryanto

Feature Extraction and Classification of Household Refrigerator Operation Cycles: A Study of Undisturbed Refrigerator Scenario ................................................................. 49
Zeyu Wang and Ravi S. Srinivasan

Automated Tolerance Analysis of Curvilinear Components Using 3D Point Clouds for Adaptive Construction Quality Control ................................................................. 57
Vamsi Sai Kalasapudi and Pingbo Tang

A Spatial Analysis of Occupant Energy Efficiency by Discrete Signal Processing on Graphs ................................................................. 66
Rishee K. Jain, Rimas Gulbinas, José M. F. Moura, and John E. Taylor

Pavement Surface Permanent Deformation Detection and Assessment Based on Digital Aerial Triangulation ................................................................. 74
Su Zhang, Susan M. Bogus, and Christopher D. Lippitt

© ASCE
A Case Study of Construction Equipment Recognition from Time-Lapse Site Videos under Low Ambient Illuminations ............................................................. 82
Xiaoning Ren, Zhenhua Zhu, Chantale Germain, Bryan Dean, and Zhi Chen

A BIM-Enabled Platform for Power Consumption Data Collection and Analysis ...................................................................................................................... 90
C. T. Chiang, T. W. Ho, and C. C. Chou

Wavelet Transform on Multi-GPU for Real-Time Pavement Distress Detection .................................................................................................................... 99
K. Georgieva, C. Koch, and M. König

Real-Time Location Data for Automated Learning Curve Analysis of Linear Repetitive Construction Activities................................................................. 107
H. Ergun and N. Pradhananga

An Empirical Comparison of Internal and External Load Profile Codebook Coverage of Building Occupant Energy-Use Behavior ........................................ 115
Ardalan Khosrowpour, Rimas Gulbinas, and John E. Taylor

Challenges in Data Management When Monitoring Confined Spaces Using BIM and Wireless Sensor Technology .................................................................. 123
Z. Riaz, M. Arslan, and F. Peña-Mora

GIS-Based Decision Support System for Smart Project Location ..................... 131
A. Komeily and R. Srinivasan

Thermal Comfort and Occupant Satisfaction of a Mosque in a Hot and Humid Climate ........................................................................................................ 139
Gulben Calis, Berna Alt, and Merve Kuru

Threshold-Based Approach to Detect Near-Miss Falls of Iron Workers Using Inertial Measurement Units ........................................................................ 148
K. Yang, H. Jebelli, C. R. Ahn, and M. C. Vuran

A Framework for Model-Driven Acquisition and Analytics of Visual Data Using UAVs for Automated Construction Progress Monitoring .......................... 156
Jacob J. Lin, Kevin K. Han, and Mani Golparvar-Fard

Semantic Annotation for Context-Aware Information Retrieval for Supporting the Environmental Review of Transportation Projects .................. 165
Xuan Lv and Nora M. El-Gohary

Automated Extraction of Information from Building Information Models into a Semantic Logic-Based Representation ....................................................... 173
J. Zhang and N. M. El-Gohary
Electrical Contractors’ Safety Risk Management: An Attribute-Based Analysis
Pouya Gholizadeh and Behzad Esmaeili

Ontology-Based Information Extraction from Environmental Regulations for Supporting Environmental Compliance Checking
Peng Zhou and Nora El-Gohary

Laser Scanning Intensity Analysis for Automated Building Wind Damage Detection
A. G. Kashani, M. J. Olsen, and A. J. Graettinger

Recognition and 3D Localization of Traffic Signs via Image-Based Point Cloud Models
Vahid Balali and Mani Golparvar-Fard

Automated Cycle Time Measurement and Analysis of Excavator’s Loading Operation Using Smart Phone-Embedded IMU Sensors

Deviation Analysis of the Design Intent and Implemented Controls of HVAC Systems Using Sensor Data: A Case Study
R. Sunnam, S. Ergan, and B. Akinci

Implications of Micro-Management in Construction Projects: An Agent Based Modeling Approach
Jing Du and Mohamed El-Gafy

A Data Quality-Driven Framework for Asset Condition Assessment Using LiDAR and Image Data
Pedram Oskouie, Burcin Becerik-Gerber, and Lucio Soibelman

Efficient Management of Big Datasets Using HDF and SQLite: A Comparative Study Based on Building Simulation Data
Wael M. Elhaddad and Bulent N. Alemdar

Trip Characteristics Study through Social Media Data
Chuan-Heng Lin and Albert Y. Chen

A Non-Invasive Sensing System for Decoding Occupancy Behaviors Affecting Building Energy Performance
Triana S. Carmenate, Diana Leante, Sebastian A. Zanlongo, Leonardo Bobadilla, and Ali Mostafavi
Visual Complexity Analysis of Sparse Imageries for Automatic Laser Scan Planning in Dynamic Environments .................................................................271
Cheng Zhang and Pingbo Tang

Automated Post-Production Quality Control for Prefabricated Pipe-Spools...280
Mahdi Safa, Arash Shahi, Mohammad Nahangi, Carl Haas, and Majeed Safa

Characterizing Travel Time Distributions in Earthmoving Operations Using GPS Data .................................................................................................................288
Sanghyung Ahn, Jiwon Kim, Phillip S. Dunston, Amr Kandil, and Julio C. Martinez

Education

A Qualitative Study on the Impact of Digital Technologies on Building Engineering Design Offices ........................................................................................................296
Graham Hayne, Bimal Kumar, and Billy Hare

Learning about Performance of Building Systems and Facility Operations through a Capstone Project Course .............................................................................305
Miguel Mora, Semih Ergan, Hanzhi Chen, Hengfang Deng, An-Lei Huang, Jared Maurer, and Nan Wang

Integrated Target Value Approach Engaging Project Teams in an Iterative Process of Exploration and Decision Making to Provide Clients with the Highest Value ..............................................................................................................313
Renate Fruchter, Flavia Grey, Norayr Badasyan, Sarah Russell-Smith, and Fernando Castillo

Enhancing Spatial and Temporal Cognitive Ability in Construction Education through the Effect of Artificial Visualizations ........................................322
Ivan Mutis

Visualization, Information Modeling, and Simulation

A Real-Time Building HVAC Model Implemented as a Plug-In for SketchUp ..................................................................................................................330
Zaker A. Syed and Thomas H. Bradley

Visualization of Indoor Thermal Conditions Using Augmented Reality for Improving Thermal Environment .................................................................339
Nobuyoshi Yabuki, Masahiro Hosokawa, Tomohiro Fukuda, and Takashi Michikawa
A Conceptual Framework for Modeling Critical Infrastructure Interdependency: Using a Multilayer Directed Network Model and Targeted Attack-Based Resilience Analysis .................................................................347
Chen Zhao, Nan Li, and Dongping Fang

Jin Zhu and Ali Mostafavi

Information Representation Schema for Tower Crane Planning in Building Construction Projects ...........................................................363
Yuanshen Ji and Fernanda Leite

An eeBIM-Based Platform Integrating Carbon Cost Evaluation for Sustainable Building Design .................................................................371
Qiuchen Lu and Sanghoon Lee

Optimizing Disaster Recovery Strategies Using Agent-Based Simulation ....379
Mohamed S. Eid and Islam H. El-Adaway

An Analytical Approach to Evaluating Effectiveness of Lift Configuration ....387
Seokyon Hwang

A Case Study of BIM-Based Model Adaptation for Healthcare Facility Management—Information Needs Analysis ..........................................................395
Zhulin Wang, Tanyel Bulbul, and Jason Lucas

Estimating Fuel Consumption from Highway-Rehabilitation Program Implementation on Transportation Networks .....................................................403
Charinee Limsawasd, Wallied Orabi, and Sitthapon Pumpichet

GPU-Powered High-Performance Computing for the Analysis of Large-Scale Structures Based on OpenSees .................................................................411
Yuan Tian, Linlin Xie, Zhen Xu, and Xinzheng Lu

Automated Underground Utility Mapping and Compliance Checking Using NLP-Aided Spatial Reasoning .................................................................419
Shuai Li and Hubo Cai

Information Extraction for Freight-Related Natural Language Queries ....427
Dan P. K. Seedah and Fernanda Leite

BIM-Based Planning of Temporary Structures for Construction Safety ....436
Kyungki Kim and Yong Cho

© ASCE
Applying a Reference Collection to Develop a Domain Ontology for Supporting Information Retrieval .................................................................445
Nai-Wen Chi, Yu-Huei Jin, and Shang-Hsien Hsieh

BIM-Driven Islamic Construction: Part 1—Digital Classification ..................453
A. M. Almaimani and N. O. Nawari

BIM-Driven Islamic Construction: Part 2—Digital Libraries .........................460
A. M. Almaimani and N. O. Nawari

Integration of BIM and GIS: Highway Cut and Fill Earthwork Balancing .....468
Hyunjoo Kim, Zhenhua Chen, Chung-Suk Cho, Hyounseok Moon, Kibum Ju, and Wonsik Choi

Towards Understanding End-User Lighting Preferences in Office Spaces by Using Immersive Virtual Environments .........................................................475
Arsalan Heydarian, Evangelos Pantazis, Joao P. Carneiro, David Gerber, and Burcin Becerik-Gerber

Temporal and Spatial Information Integration for Construction Safety Planning ..........................................................................................................................483
Sooyoung Choe and Fernanda Leite

Modeling Construction Processes: A Structured Graphical Approach Compared to Construction Simulation .................................................................491
I. Flood

A Hybrid Control Mechanism for Stabilizing a Crane Load under Environmental Wind on a Construction Site .................................................................499
Bin Ren, A. Y. T. Leung, Jiayu Chen, and Xiaowei Luo

Regional Seismic Damage Simulation of Buildings: A Case Study of the Tsinghua Campus in China .................................................................507
Xiang Zeng, Zhen Xu, and Xinzheng Lu

Construction Operation Simulation Reflecting Workers’ Muscle Fatigue ......515
J. Seo, M. Moon, and S. Lee

Construction Productivity Impacts of Forecasted Global Warming Trends Utilizing an Integrated Information Modeling Approach ........................................523
Yongwei Shan, Paul M. Goodrum, and M. Phil Lewis

Towards Automated Constructability Checking: A Case Study of Aligning Design Information with Formwork Decisions ........................................531
Li Jiang, Robert M. Leicht, and John I. Messner

© ASCE
A Hierarchical Computer Vision Approach to Infrastructure Inspection
Ali Khaloo and David Lattanzi

Advancing in Object-Based Landscape Information Modeling: Challenges and Future Needs
Hamid Abdirad and Ken-Yu Lin

BIM and QR Code for Operation and Maintenance
Pavan Meadati and Javier Irizarry

Measuring End-User Satisfaction in the Design of Building Projects Using Eye-Tracking Technology
Atefeh Mohammadpour, Ebrahim Karan, Somayeh Asadi, and Ling Rothrock

Automated Rule-Based Checking for the Validation of Accessibility and Visibility of a Building Information Model
Y. C. Lee, C. M. Eastman, and J. K. Lee

Using Building Energy Simulation and Geospatial Analysis to Determine Building and Transportation Related Energy Use
Ebrahim Karan, Somayeh Asadi, Atefeh Mohammadpour, Mehrzad V. Yousefi, and David Riley

A Simulation Framework for Network Level Cost Analysis in Infrastructure Systems
M. Batouli, O. A. Swei, J. Zhu, J. Gregory, R. Kirchain, and A. Mostafavi

BIM-Assisted Structure-from-Motion for Analyzing and Visualizing Construction Progress Deviations through Daily Site Images and BIM
Kevin K. Han and Mani Golparvar-Fard

Using BIM for Last Planner System: Case Studies in Brazil
M. C. Garrido, R. Mendes Jr., S. Scheer, and T. F. Campestrini

Collecting Fire Evacuation Performance Data Using BIM-Based Immersive Serious Games for Performance-Based Fire Safety Design
Jun Zhang and Raja R. A. Issa

Automatic Construction Schedule Generation Method through BIM Model Creation
Jaehyun Park and Hubo Cai

Data-Driven Analysis Framework for Activity Cycle Diagram-Based Simulation Modeling of Construction Operations
Sanghyung Ahn, Phillip S. Dunston, Amr Kandil, and Julio C. Martinez
Process Mining Technique for Automated Simulation Model Generation Using Activity Log Data ..........................................................636
Sanghyung Ahn, Phillip S. Dunston, Amr Kandil, and Julio C. Martinez

Towards the Integration of Inspection Data with Bridge Information Models to Support Visual Condition Assessment ..........................................................644
V. Kasireddy and B. Akinci

Methodology for Crew-Job Allocation Optimization in Project and Workface Scheduling ..........................................................652
Ming-Fung Francis Siu, Ming Lu, and Simaan AbouRizk

Error Assessment of Machine Vision Techniques for Object Detection and Evaluation ..........................................................660
S. German Paal and I. F. C. Smith

An Integrated BIM-GIS Framework for Utility Information Management and Analyses ..........................................................667
Jack C. P. Cheng and Yichuan Deng

The Benefits of BIM Integration with Facilities Management: A Preliminary Case Study ..........................................................675
S. Terreno, C. J. Anumba, E. Gannon, and C. Dubler

A Computational Procedure for Generating Specimens of BIM and Point Cloud Data for Building Change Detection ..........................................................684
Ling Ma, Rafael Sacks, Reem Zeibak-Shini, and Sagi Filin

Understanding the Science of Virtual Design and Construction: What It Takes to Go beyond Building Information Modeling ..........................................................692
David K. H. Chua and Justin K. W. Yeoh

Crane Load Positioning and Sway Monitoring Using an Inertial Measurement Unit ..........................................................700
Yihai Fang and Yong K. Cho

Sustainable Construction Enhanced through Building Information Modeling ..........................................................708
L. Alvarez-Anton, J. Diaz, and D. Castro-Fresno