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Editorial

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Editorial: In Focus of 2022 EC3 Conference

Athanasios P. Chassiakos PhD

Professor, Department of Civil Engineering, University of Patras, Patras, Greece

The management of construction, operation and maintenance of projects and infrastructure faces high challenges associated with a wide variety of subjects and application fields. In recent years, it becomes more and more evident that effective management can be highly affected and improved by incorporating advanced computing techniques, processes, and tools that are being developed on the way and are applicable to several and diverse disciplines. These techniques and tools allow researchers and professionals to move on to automation in construction, leading to what is stated as smart construction and infrastructure. The importance of introducing advanced hardware and information management components has now been identified by all stakeholders in the construction and management process. Current technological development, decision making needs, and competitiveness concerns are considered as major incentives for their adoption. On the other hand, implications such as the implementation cost, the lack of expertise, and the resistance to change are among the main challenges for such adoption.

The present themed issue of the *Proceedings of the Institution of Civil Engineers – Smart Infrastructure and Construction* is entitled 'In Focus of the 2022 EC3 Conference' and includes articles mainly coming from the 2022 European Conference on Computing in Construction (EC³) held in 2022 in Rhodes Island in Greece and others submitted to the Journal in the typical way within the same research and application area. These articles vividly imprint a wide range of management applications that employ emerging technologies to overcome existing barriers and provide improved management schemes within the smart infrastructure and construction real-world environment. Among the included articles, the current state of acceptance of automation in construction along with the main barriers and challenges are reviewed. Further, cases concerning the implementation and evaluation of hardware and software tools (e.g., micro-controllers, digital twins) for improving specific management processes are presented. The employment of artificial intelligence (AI) technology to develop tools for assisting decision making when existing data and modelling do not provide adequate insight to management problems is highlighted. This becomes more important in cases of high impact, such as in natural disasters. Finally, going back to the design phase of a project, several and not fully explored challenges regarding the compliance checking of building requirements against regulations are examined and the potential of automated rule-capture process development is

discussed. A short description of the articles comprising this themed issue is provided below.

The automation of information collection and analysis from construction sites is of major importance for project implementation success. The paper by Bozorgzadeh and Umar (Bozorgzadeh and Umar, 2023) explores the status of CV-based construction progress monitoring (CV-CPM) adoption and the main barriers to and incentives for its adoption within the UK construction sites. In this direction, a questionnaire-based survey was administered to UK construction professionals. The study indicates that CV-CPM adoption can improve decision making and competitiveness, but its adoption faces the challenges of implementation cost, lack of expertise and resistance to change.

The paper by Burse, Doycheva, Aicher, Walther and Ringert (Burse *et al.*, 2023) investigates the applicability and usability of low-cost new microcontrollers in sensor-based monitoring applications. Following experimentation concerning power consumption and performance evaluation, the study concludes that promising low-cost microcontrollers can be applied to reduce cost and energy consumption per node or to increase the number of nodes used simultaneously in one monitoring system.

Digital twin technology has been increasingly employed in many aspects of operations and management processes. The paper by Merino, Xie, Moretti, Chang and Parlikad (Merino *et al.*, 2023) proposes a low-latency data integration method that supports actuation and decision making in facility management, including construction, operation and maintenance data, and internet of things. The proposed approach is demonstrated upon a case study figuring fault detection and diagnosis of the heating, ventilation, and air-conditioning system for facility management.

To improve flood response and evacuation process, prompt and reliable flood depth information is needed. The paper by Alizadeh and Behzadan (Alizadeh Kharazi and Behzadan, 2023) presents a deep convolutional neural network that is used to determine flood depth through the analysis of crowdsourced images of submerged stop signs. The performance of the developed model is tested on two flooding case studies from USA and Canada and compared to readings from flood gauges. The proposed approach has been found to be low-cost, accurate, and geographically scalable for real-time flood-risk mapping.

The paper by Zhang, Ma and Broyd (Zhang *et al.*, 2023) presents a literature review regarding current developments in the automated compliance checking of building requirements against regulations at the design phase. While traditionally this is done in a manual way, which is time consuming and error prone, the paper aims to identify challenges faced in this field and concludes that the rule capture process has been introduced in semi-automated and automated methods; however, existing representations lack the ability to deal with ambiguous rules. Further the understanding of rules, representations, and the relationships among them is insufficient.

REFERENCES

- Alizadeh Kharazi B and Behzadan AH (2023) Mapping of 2021–2022 floods in North America from street photos with artificial intelligence. *Proceedings of the Institution of Civil Engineers – Smart Infrastructure and Construction* **176(4)**: 212–223, <https://doi.org/10.1680/jsmic.22.00029>.
- Bozorgzadeh A and Umar T (2023) Automated progress measurement using computer vision technology in UK construction. *Proceedings of the Institution of Civil Engineers – Smart Infrastructure and Construction* **176(4)**: 165–182, <https://doi.org/10.1680/jsmic.22.00026>.
- Burse B, Doycheva K, Aicher A, Walther C and Ringert JO (2023) Evaluation of low-cost microcontroller-based systems for simple sensor applications. *Proceedings of the Institution of Civil Engineers – Smart Infrastructure and Construction* **176(4)**: 183–193, <https://doi.org/10.1680/jsmic.22.00031>.
- Merino J, Xie X, Moretti N, Chang JY and Parlikad A (2023) Data integration for digital twins in the built environment based on federated data models. *Proceedings of the Institution of Civil Engineers – Smart Infrastructure and Construction* **176(4)**: 194–211, <https://doi.org/10.1680/jsmic.23.00002>.
- Zhang Z, Ma L and Broyd T (2023) Rule capture of automated compliance checking of building requirements: a review. *Proceedings of the Institution of Civil Engineers – Smart Infrastructure and Construction* **176(4)**: 224–238, <https://doi.org/10.1680/jsmic.23.00005>.