DigitalTWIN to improve future gridshell installations

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Abstract

Gridshell structures are able to span big areas and are well suited to provide protection for public spaces like shopping malls or infrastructure hubs. To ensure an optimized design and a timely execution of such assemblies without compromising, optimization of geometry, tools and workflows are set up mostly parametrically. Nevertheless, there are many interfaces in the life cycle of such constructions without a continuous and automated exchange of information. This prevents the flexible and easy-to-use operation of new digital tools and integrated analysis nowadays. [1]

The authors provide an overview on the challenges of the design and on constantly changing partners in design, fabrication and operation. In a research project due for completion in 2021, renowned project partners representing industry and research are developing digital tools and technologies to enable the integration and automation of services, processes and workflows along the value-creation chain in the construction industry. The aim is that an open platform architecture, more advanced broadband communication systems and computer vision technologies should simplify planning, production and coordination with the building site and provide users with a reliable, flexible and upgradable communication and management infrastructure for a complete project. [2]

Based on these results, the consortium developed three Use cases that address relevant issues and the interfaces between planning, production and building operation:
- Use case 1: Real-time monitoring of multilayer facades for building operation and maintenance
- Use case 2: Fully digitalized quality assurance for welding using virtual tracking and inspection
- Use case 3: Assembly support for gridshell on site with real-time measurements and visualization

Especially the assembly support with Augmented Reality technology is reviewed within the paper. First demos were realized to evaluate the user interface for the workers on site and to develop the easy-to-use computer infrastructure on site. The authors will highlight positive and negative experiences gained with new technologies and propose procedures to aid a future integration of these tools in the project flow and to ensure an intuitive, safe and secure data and knowledge exchange.

Fig. 1-2: Typical gridshell installation | Fig. 3: Demo of an AR-supported steel node installation

References

[1] F. Schmid, S. Marinitsch, M. Teich and C. Timm, "Metal and Glass Grid-Shell Design: Flexible Integration of Digital Design and Fabrication Tools" in Creativity in Structural Design: Proceedings of the IASS Annual Symposium 2018, Boston, USA, July 16-20, 2018, IASS 2018.

[2] „Digital tools for the building sector". [Online]. Accesibility: https://d-twin.eu/en/. [23-Jan-2019]