Chair of Computing in Civil and Building Engineering
TUM School of Engineering and Design
Technical University of Munich

Master's Thesis:

Optimizing BIM Data Integration and Digital Twin Workflows for Sustainable Construction

Description

Efficient construction management increasingly relies on digital solutions such as Building Information Modeling (BIM) and Digital Twin technologies. Accurate integration of heterogeneous BIM data, combined with cost and emissions information, enables real-time monitoring of construction progress, resource optimization, and sustainable building practices. This project aims to investigate and optimize the process of BIM-based data integration during the construction phase at Siemens Real Estate (SRE), with a focus on enhancing planning accuracy, efficiency, and sustainability.
This thesis will explore opportunities to streamline workflows across the entire value chain, from 3D scans and BIM models to automated calculation of life cycle costs and CO_2 footprints. It will assess technological interfaces to Siemens products like Building X and DESIGO CC, and propose practical solutions for improving project outcomes while ensuring data integrity and process transparency.

Task

- Analyze current BIM integration and construction progress monitoring processes; identify bottlenecks and efficiency potential.
- Research best practices for BIM-based cost, CO2 accounting, and Digital Twin implementation in construction.
- Develop a roadmap for optimized data integration and automated cost/emissions calculations, including Siemens tool interfaces.
- Evaluate technological solutions and interfaces for process improvement.
- Implement a pilot or proof-of-concept for a selected sub-process to demonstrate feasibility.
- Derive recommendations for organizational and technological implementation.
- Document methods, findings, and proposed solutions in the thesis report.

Expected Outcome

The thesis will deliver a unified, evidence-based framework that allows Siemens Real Estate to seamlessly merge diverse BIM and 3-D-scan datasets, automate cost and carbon accounting throughout the construction phase, improve planning precision by consolidating bill-of-quantities, material lists, and lifecycle-assessment data, and embed the entire workflow within Siemens' digital-twin platforms such as Building X and DESIGO CC. This comprehensive solution will give SRE a solid basis for choosing appropriate scanning technologies and refining BIM-to-digital-twin processes.

Supervisors

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