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Abstract

Graph-Based Version Control of BIM Models in an Event-Driven Collaboration Environment †

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Interdisciplinary collaboration and communication are two essential aspects of Building Information Modeling (BIM). Current practice and international standards rely on exchanging entire domain models, which are managed as separated files and coordinated in a primarily manual fashion. The concept lacks version control, as the granularity of change tracking remains on the level of complete monolithic files. Hence, high manual effort is necessary to coordinate model modifications across the domains involved in a project.

To overcome the limitations addressed, the keynote presents a novel approach that enables modification tracking on object level instead of tracking monolithic model files. As BIM models contain not only objects but also various dependencies forming a complex network structure, formalisms of graph theory and graph transformation are applied to identify and deploy model changes in a vendor- and schema-neutral fashion [1]. The communication among project partners is ultimately implemented using event-driven network architectures, which provide a flexible means to realize scalable asynchronous collaboration [2]. Once an authoring party reaches a new shareable state of its discipline model, an update event is raised and deployed through a central project hub. Each event contains a set of transformation rules and additional information relevant to project management purposes. Applying the transformations to an outdated model copy, concurrency among all existing replicas of a particular discipline model is obtained again. As a key advantage, the updates are much smaller compared to repeatedly exchanging entire BIM models. Furthermore, the approach provides a responsive and scalable system where each design unit can subscribe to specific events like modifications of specific object types or models of a particular discipline. Finally, the approach fits into existing standards of model-based collaboration such as ISO 19650 or the concept of Information Containers for linked Document Delivery (ICDD) defined in ISO 21597.

The application of the proposed collaboration environment is demonstrated using BIM models implementing the Industry Foundation Classes (IFC) as their underlying data model.

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