





Software Lab:

Modeling:	
Mathematics:	
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Extending ConMan2: Multi-Domain Data Model Support and Visual Interface Development

Description

The Architecture, Engineering, Construction, and Operations (AECO) industry increasingly relies on model-based workflows and Building Information Modeling (BIM) to manage complex infrastructure projects. Unlike traditional document-centric approaches, these workflows generate rich, interconnected data models that evolve continuously as designs mature and stakeholders collaborate. However, current BIM tools lack robust version-control capabilities comparable to those in software engineering, leading to coordination failures, data loss, and inefficient manual workarounds. Establishing proper version control for construction models is therefore essential to enable transparent collaboration, ensure traceability, and support integration across disciplinary boundaries.

This project aims to transform ConMan2¹ from a command-line tool into a comprehensive version control system with server connectivity and an intuitive user interface for presenting model increments in a human-friendly, interpretable way. Students are asked to extend the system's capabilities by implementing user interfaces for client and server functions. Furthermore, parsers for additional infrastructure-related data models, including CityGML, PlanPro, and RailML, shall be added to the version management system (the exact data models to be discussed with the supervisors; no prior knowledge of their application domains is required).

The technical deliverables will include a deployable Docker image containing all the necessary components for exchanging version increments and starting the collaboration hub.

Task

- Familiarize yourself with recently developed graph-based version control principles from various PhD projects.
- Build user interfaces for existing CLI tools and develop a proper project hub platform using modern web-based programming frameworks.
- Add parsers for at least two data models that have not been supported so far.
- Test and deploy the system as part of a case study.

Related Works and Getting Started Information

S. Esser, S. Vilgertshofer, and A. Borrmann, "Graph-based version control for asynchronous BIM collaboration," *Advanced Engineering Informatics*, vol. 53, p. 101664, Aug. 2022, doi: 10.1016/j.aei.2022.101664.

S. Esser and A. Borrmann, "Utilizing Interdisciplinary Object Dependencies for Semi-automated Model Updates," in *2025 European Conference on Computing in Construction and CIB W78 Conference on IT in Construction*, Porto, Portugal, Jul. 2025. doi: 10.35490/EC3.2025.296.

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¹ <https://github.com/seb-esser/conman2>