Automatic Semantic Comparison of STEP Product Models
Application to IFC product models

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Abstract: This paper introduces an original method to compare IFC models and more generally any STEP models. Unlike common “diff-like” tools which compare textual files by proceeding line against line, our approach compares actual graphs created from STEP-files. Therefore added, removed, and changed objects can be tracked between two versions of the model. Besides, this standalone tool does not need any heavy database to work so it is fully adapted to design methods of construction projects, where actors are free to modify a local version of their project without any dependence on the database. Moreover it is reusable for other industrial fields thanks to its compatibility with any STEP model. This tool is a part from a more global project which tends to improve accessibility and sustainability of IFC therefore it can be used as a support for VR based design tools.

1. INTRODUCTION

Our team carries out research on Industry Foundation Classes visualization and real-time simulations in virtual environments, in order to improve accessibility and sustainability of IFC. We investigate a major issue in this paper which delays the use of IFC in the AEC community: comparison and merging of IFC models. After a short reminder of IFC and design process in a construction project, we will address the main problem of our research: semantic comparison of product models.
1.1 Interoperable Project

In normal practice, information is exchanged between engineers, architects and clients, in the form of verbal and hardcopy programs, sketches, diagrams and drawings. This often requires interpreting, re-documenting and re-entering information into software and systems to make it usable for the project team. Great loss and corruption of data may occur during this translation.

Thanks to the Industry Foundation Classes data model specified by the International Alliance for Interoperability, software can exchange standardized product models during a civil engineering project. This standard avoids multiple specialized interfaces between stakeholders specific tools as shown in the figure 1.

Central IFC databases support such models (Cruz, Nicolle et al., 2002) (Vanlande, Cruz et al., 2003). They bring the project team a significant help for document management. But services provided by these databases are not fully adapted to usual design methods of a construction project. Therefore many AEC stakeholders are still reluctant to exploit IFC in their own project. Next subsection is dedicated to a study of the typical workflow during a construction project.

![Figure 1. Model of a shared project with IFC (Lebegue, 2004).](image-url)

1.2 Design Process

Common design processes usually exploit the repeated succession of two important phases (Hanser, 2003):

- Co-design
- Distributed design.