BIM IN STRUCTURAL ENGINEERING: A STUDY OF INTEROPERABILITY BETWEEN BIM PLATFORM AND FEM SOFTWARE ON STRUCTURAL MODELLING, ANALYSIS AND DESIGN

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Abstract

Building Information Modelling (BIM) shows exceptional advantages and potentials in the field of structural engineering as well. These potentials, e.g., productivity, coordination, visualization, documentation, and waste reduction, cannot be achieved without an appropriate mechanism to ensure the smooth transfer of data from the BIM platform to structural analysis or Finite Element Modelling (FEM) software. Challenges in data transfer or interoperability to be among the key factors hindering the full participation of structural engineers in BIM workflow.

This thesis seeks to examine the possibilities of conversion from the Revit BIM platform to FEM software by exchanging a central Revit model, supplemented by appropriate load-bearing data, with each of the following commonly used FEM programs: SOFiSTiK, Dlubal (RFEM) and SCIA (SCIA Engineer). We first reviewed in detail the use of BIM in structural engineering, focusing on the impacts on structural design and workflow, key benefits, and some challenges during use. The three main levels of interoperability between BIM and FEM software are then defined and theoretically researched and explained in detail. These interoperability levels are direct native file exchange (exchange between the same commercial software providers), direct link or bi-directional data exchange, and IFC (Industry Foundation Class). Two case studies are conducted to support the conclusions of this thesis. The first case study tests the capability of direct link interoperability (data exchange via add-on/plug-in) between the Revit BIM platform and the FEM software. The second case study uses the Revit-SOFiSTiK interface to analyse the efficiency of BIM workflows in structural engineering. This study found that the exchange of data via this interface is well synchronized and efficient. The efficiency of the interface in terms of structural engineering BIM workflow is proven with a high degree of reliability.

The results of this thesis provide relevant information on the interoperability of BIM in structural engineering. In addition, the study confirms the results of previous studies showing that interoperability (most especially direct link interoperability level) is the most effective means of communicating data between the Revit BIM platform and structural engineering software.

Dissertation:
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Presentation video:
https://youtu.be/bugTuTtsPpY

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