Chair of Computational Modeling and Simulation
TUM School of Engineering and Design
Technical University of Munich

Modeling:
Mathematics:
Programming:
Science:

# Software Lab:

# IFC model analysis to gain insights into design processes

## Description

Analysing IFC models from practice can provide valuable insights into the information required in the design and construction processes. It also offers the opportunity to better identify frequently used structures and derive suggestions for optimising future design processes. The aim of this work is to develop analysis methods for IFC models to provide a basis for:

- comparing model data with best practices based on statistical distribution of values and

- specifying information exchange requirements.

An important aspect of this work is the communication with the user and the visualization of the results.
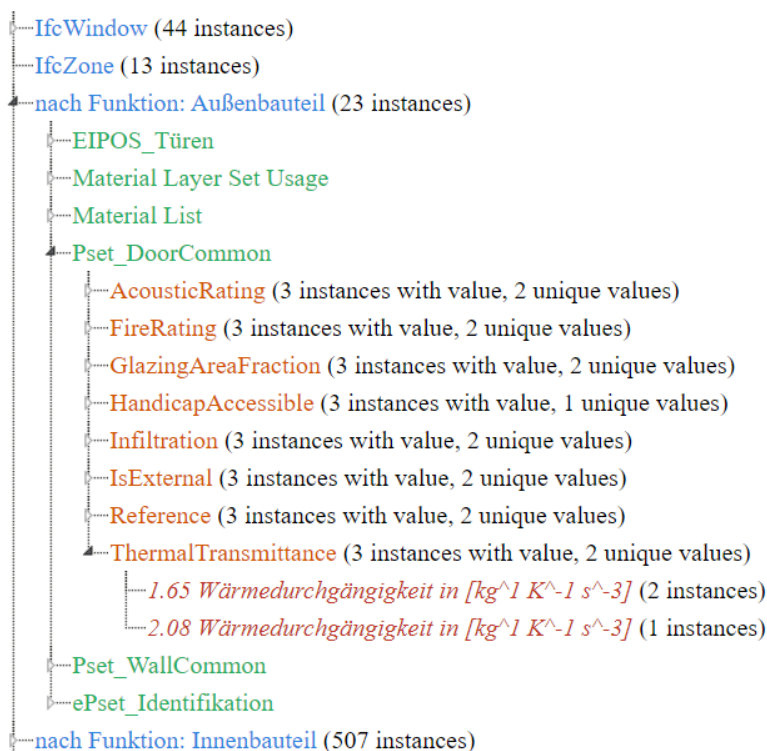


Figure 1: Basic evaluation of IFC models, showing properties of external building elements

## Task

The model analysis should make it possible to work either with the predefined classes of IFC (e.g. IfcWall) or with a simple configuration file for property-based classification of objects (e.g. all objects of type IfcWall with IsExternal=true) in order to enable statistical evaluation of property values (see results shown in Fig.1 for all objects of type IfcWindow and all objects being classified by the IsExternal property = true). For example, all external walls shall be checked for their properties where

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we for instance expect to have a thermal transmittance value that is required for energy simulations. Furthermore, a statistical analysis of all thermal transmittance values will show if they are within a reasonable range or whether there are implausible deviations. Based on this simple evaluation method there are several questions to be investigated:

- what is a proper grouping of objects (classification system) to identify similarities that can be transferred into exchange information requirements

- what is the data to be extracted for objects (e.g. properties, attributes, material, etc.) and how to deal with more complex data (containment, aggregation etc.)

- how to best identify deviations from expected distribution of values (e.g. select objects of the 5% quantile for a specific property or group of properties)

- how to visualize results to easily identify potential issues within the model (e.g. spider diagram)

GENERAL INSTRUCTIONS:

- Understand IFC standards and its default classification via entities and inheritance

- Use IfcOpenShell and Python programming language to evaluate IFC models
  (initial script already available to be refined and improved)

- Design a simple JSON configuration file to control the evaluation process

- Use HTML or similar ways to show results as alphanumeric or graphical data
  (initial script for HTML export with tree structure already available)…

**Supervisor**

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