THE GENERALIZATION OF BIM/IFC MODEL FOR MULTI-SCALE   
3D GIS/CITYGML MODELS

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**Abstract:**

The development of BIM (Building Information Modeling) is important trend in different disciplines. It is not only a 3-D model for visualization. It can also exchange building models’ geometry and attribute information smoothly. In order to respond to the BIM’s concepts of sharing informations and sustainable development, studies about integrating BIM with GIS field and follow-up applications are increasing. The integration of BIM and GIS is not only increase the data interoperability, but also save lots of time for data collection and financial resources. Both IFC and CityGML are based on 3-D geometric and object-oriented. These 3-D objects also contain both geometry and attribute information. Hence, the conversion of BIM/IFC and GIS is an important study for the integration of these two fields.

In this study, we generate different CityGML LOD models from BIM/IFC model, which includes the relationship between the coordinate systems, fields, geometries, attributes, and topologies. As the BIM model is a detailed model, we can simplify the BIM model into different LODs in CityGML. First, we use 3-D similarity transformation to convert user-defined coordinate system into world coordinate system in BIM. Then, the fields of IFC and CityGML are used to convert geometry and semantic information. For geometry property, we convert and simplify a BIM model to four different LODs in CityGML. For attribute property, we extract the information in IFC entities and link to the 3-D object in CityGML. Finally, the topology properties such as connectivity, containment and intersection are calculated for further analysis.

This study will convert the geometry, attribute and topology properties from IFC model into four types of CityGML LOD models. This research imports BIM into GIS for building development, management, and applications. Different LOD models can be used for different applications, for example, LOD 1 models support urban planning while LOD 4 detailed-models can use for indoor navigation.