Abstract:
A city may have multiple CityGML documents recorded at different times or surveyed by different users. To analyse the city’s evolution over a given period of time, as well as to update or edit the city model without negating modifications made by other users, it is of utmost importance to first compare, detect and locate spatio-semantic changes between CityGML datasets. This is however difficult due to the fact that CityGML elements belong to a complex hierarchical structure containing multi-level deep associations, which can basically be considered as a graph. Moreover, CityGML allows multiple syntactic ways to define an object leading to syntactic ambiguities in the exchange format. Furthermore, CityGML is capable of including not only 3D urban objects’ graphical appearances but also their semantic properties. Since to date, no known algorithm is capable of detecting spatio-semantic changes in CityGML documents, a frequent approach is to replace the older models completely with the
newer ones, which not only costs computational resources, but also loses track of collaborative and chronological changes. Thus, this research proposes an approach capable of comparing two arbitrarily large-sized CityGML documents on both semantic and geometric level. Detected deviations are then attached to their respective sources and can easily be retrieved on demand. As a result, updating a 3D city model using this approach is much more efficient as only real changes are committed. To achieve this, the research employs a graph database as the main data structure for storing and processing CityGML datasets in three major steps: mapping, matching and updating. The mapping process transforms input CityGML documents into respective graph representations. The matching process compares these graphs and attaches edit operations on the fly. Found changes can then be executed using the Web Feature Service (WFS), the standard interface for updating geographical features across the web.

Stichworte: GISPro_CityGML; GISTop_Semantic_modeling_and_transformation; GISTop_CityModeling; GISTop_Software; LOCen; LOCen_Urban_Information_Modeling_Virtual_3D_City_Model

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