Integration of BIM and GIS for Indoor and Outdoor Combined Route Planning

Kuan-Hsun Cho[a] and Tee-Ann Teo[b]

[a] Graduate Student, Department of Civil Engineering, National Chiao Tung University, 1001 University Road, Hsinchu, Taiwan 30010; Tel: + 886-3-5712121#54982;
E-mail: rotar13b@hotmail.com

[b] Associate Professor, Department of Civil Engineering, National Chiao Tung University, 1001 University Road, Hsinchu, Taiwan 30010; Tel: + 886-3-5712121#54929;
E-mail: tateo@mail.nctu.edu.tw

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Abstract: There are a growing number of studies that focus on the integration of the Building Information Model (BIM) and Geographic Information Systems (GIS). BIM has become an important geospatial data source for GIS applications. There are several ways to achieve the interoperability between BIM and GIS, for example, OGC CAD/GIS/BIM services (CGB), IFC for GIS (IFG), BIM for Geo-Analysis (BIM4GeoA) and Unified Building Model (UBM). Many studies transform the BIM exchange standards Industry Foundation Classes (IFC) to CityGML for indoor applications. In reality, the integration of indoor BIM and outdoor GIS is closer to the needs of the real applications.

This research develops a procedure to combine the geospatial models from BIM and GIS. It is used to integrate the building-scale and city-scale models for a route planning. The proposed method is a coarse-to-fine route planning. The hybrid models provide the detailed route from indoor to indoor through outdoor road networks. This study integrates three types of dataset, i.e. city-scale road network, OGC CityGML LOD1 and BIM/IFC data. The city-scale route planning is relying on the road network and CityGML LOD1 by graph model. The LOD1 building is just a node in city-scale planning. In the building-scale planning, BIM/IFC elements such as storey (from IfcBuildingStorey), room (from IfcSpace), door (from IfcDoor), stairs (from IfcStair) are used to plan the route from a particular location to outdoor. The final results are paths from building to building through road networks.

The test area is in NCTU campus. The dataset includes two BIM models, CityGML LOD1 building models and GIS road network. The study developed a graph-based hybrid model (include BIM, CityGML and road network data), which can generate an optimal routes through a multi-level structure of building and the outdoor road network.