Storage, Update and Dissemination of Massive 3D City Models

Keywords: Massive TINs, CityGML, ADE, Cesium.

Department of Urbanism/Chair 3D Geoinformation

Area of Research: 3D Geoinformation

Research Summary:

A 3D city model is a digital representation of the geographical objects within a city. In addition to buildings, terrains form an important part of 3D city models. Although in GIS terrains are most often represented with 2D grids, but TINs are also increasingly being used for representing terrains. For instance, 3DTOP10NL, the 3D city model of the Netherlands, stores terrain as a constrained TIN with more than 1 billion triangles. Due to massive size of such datasets, the main problem that arises is: how to efficiently store and maintain them. In the view of existing limitations, we propose a CityGML/GML extension (an ADE (Application Domain Extension) for the compact representation of terrains. So far we have achieved a compression up to a factor of ~25 with massive real-world terrains. The goal of this research is to develop and prototype a robust schema for the compact and efficient storage of massive terrain in the context of 3D city models.

Research Methodology:

The 3D GIS standard CityGML stores terrains as TINs. We made tests with 3DTOP10NL and found that to store only the terrains, 686 GB of storage space is required with current CityGML solution. Based on the weaknesses of the current CityGML/GML schema in storing massive terrains, we propose an alternative representation to represent TINs, Terrains@CityGML, modelled as an extension to CityGML constructed by adding new geometry encoding schemes for TINs in the CityGML/GML schema. Furthermore, a prototype for 3D visualization and downloading of 3D city models will be explored, e.g. massive triangulations over Cesium web globe.

Key Publications: