

Web-based Interface Development for 3D Geospatial Data Visualization – An Open-source and Plug-in free Approach

Akila Sriramulu¹, Jochen Wendel², Syed Monjur Murshed², Alexandru Nichersu²

¹ Karlsruhe University of Applied Sciences, Karlsruhe, Germany

² European Institute for Energy Research (EIFER), Karlsruhe, Germany

Extended Abstract

The visualization of results from urban energy simulations is a crucial part in the field of energy research as they act as the main communication tool between scientists and decisions makers. Results from energy modelling and simulations are usually directly linked to spatial objects such as buildings or city furniture. Therefore, the visualization in 3D plays a significant role as results are usually not only aggregated by the building object itself but at a finer scale such as building wall or building roof surfaces. This requires a higher grade of visualization and therefore 3D becomes a necessity (Nouvel et al. 2014). Furthermore, the display of energy simulation model results in 3D enables the decision maker to better emerge into the problem and to view results from multiple perspectives.

While recent years have seen numerous 3D web Application Programming Interfaces (API) ranging from GoogleEarth to Unity's Game Engine, most of the currently available web mapping services that do visualize 3D are based on browser plug-ins and require the user to install one or more programs locally on their computing device. Furthermore, they also do not provide a wide range of custom functionalities specific to the application area of urban energy analysis and the cartographic visualization of those results. This research explores the usage of freely available open-source resources for the creation of a plug-in free web-application interface for 3D geospatial data to display energy related modelling and simulation results. The objective is to provide an alternative to current browser based interfaces which rely on browser plug-ins. A Level of Detail 1 (LoD 1) CityGML 3D model of the city of Karlsruhe, Germany consisting of over 87000 buildings is used as a test data set. The data set was compiled using OpenStreetMap (OSM) data and

outputs from energy simulation models. All spatial and non-spatial data is hosted in a PostgreSQL database with a PostGIS extension that provides spatial capabilities (Simons and Nichersu 2014). As the main requirement is independence from browser plug-ins, HTML5 and freely available JavaScript libraries are used for the web-application creation while the 3D aspect is controlled by WebGL through the JavaScript library Three.js. As a proof of concept multiple cartographic and GIS functions have been implemented in this interface including classification of building attributes, attribute selection and manipulation, descriptive statistics, spatial buffer analysis and the retrieval of simulation results from a PostgreSQL and PostGIS data infrastructure.

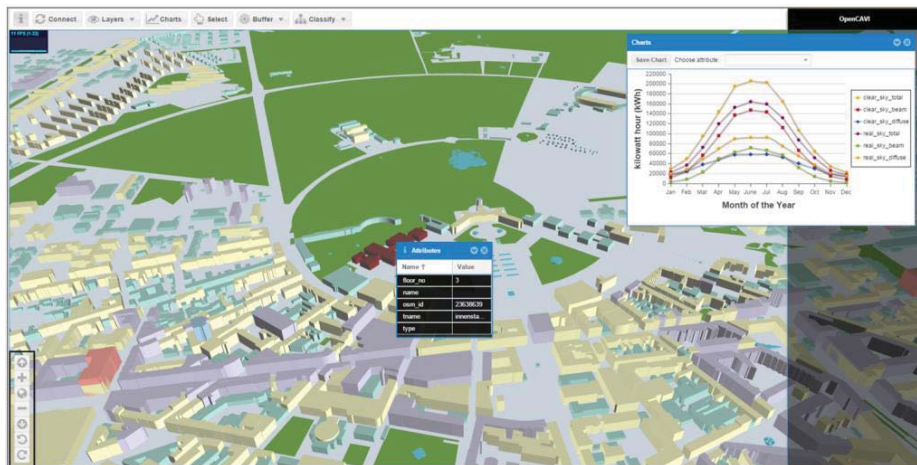


Figure 1. 3D web interface showing energy mode outputs in a web browser

The presentation and the full paper will discuss case studies and future enhancement opportunities for the proposed interface. Furthermore, lessons learned during the development process will be discussed in regards to recent new Web3D developments.

References

- Nouvel R, Zirak M, Dastageeri, H, Coors, V, Eicker, U (2014) Urban Energy Analysis based on 3D City Model for National Scale Applications. In: IBPSA Germany Conference.
- Simons A and Nichersu A (2014) Development of a CityGML infrastructure for the implementation of an energy demand method with different data sources. GIScience 2014. Viena, Austria, 25th September 2014.