



Title: Development of a multi-touch 3D web-based dynamic tool for analytical visualization of energy related simulation results

Introduction

Data visualization plays a significant role in decision making and in providing a better understanding of results and scenarios. Nevertheless with the development of software and hardware technologies, 3D has become the current trend of data visualization. Several open source and proprietary software are dedicated into this field, each displaying its pros and cons.

Objective

At EIFER (European Institute For Energy Research), different energy modelling tools are deployed in energy simulations. These are implemented on CityGML data with LOD1 and LOD2. The results are saved in the form of tables, stored in the database and therefore requires a method of visualization. These results are time dynamic (Annual, Monthly and Daily), and can be calculated per surface or per building. With these considerations in mind, different data formats were needed for proper visualization. The objective is developing an interface, Figure 1, which will facilitate the visualization of these results in a multi-touch and interactive interface, deployed on Desktop monitors and tablet touchscreens.

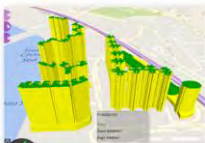


Figure 2: Using the aggregation tool with GeoJSON format in the case study Hoi Fai Rd, Hong Kong.



Figure 3: 3D Tiles displaying Karlsruhe Oststadt.



Figure 1: The developed interface based on the Cesium Virtual

Approach

Cesium Virtual Globe, is an open source JavaScript-based library, used for 3D geo-visualization, deploying different data formats and is equipped to handle time dynamic data. It is utilized in this thesis as the base on which an interface is built. The interface provides the possibility of selecting and zooming to several cases of study and then implementing various functionalities, such as setting data categorizations displaying color schemas, legends and providing aggregation tools. These services aim to provide better understanding energy data and aid in decision making.

Implementation

Several data formats have been utilized in this interface such as **GeoJSON**, which is used for representing buildings and building-surfaces of static data. **3D Tiles**, also used for static visualization but with considerably huge volume datasets. **CZML**, the Cesium language format is the used for visualizing time-dynamic data. Examples are shown in Figures 2, 3 and 4 respectively.

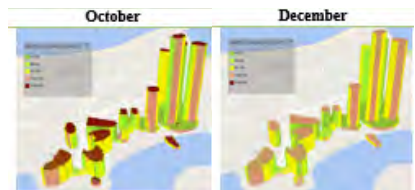


Figure 4: CZML data displaying the change in Irradiance energy in Etihad Towers, Abu Dhabi in the months October and December.

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