

Laser Scanning for 3D Vegetation Characterization: Web-based Infrastructure for Exploration and Analysis of Vegetation Signatures

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Abstract

Mapping and characterization of the three-dimensional nature of vegetation is increasingly gaining in importance. Deeper insight is required for e.g. forest management, biodiversity assessment, habitat analysis, precision agriculture, renewable energy production or the analysis of interaction between biosphere and atmosphere. However the potential of 3D vegetation characterization has not been exploited so far and new technologies are needed. Laser scanning has evolved into the state-of-the-art technology for highly accurate 3D data acquisition. By now several studies indicated a high value of 3D vegetation description by using laser data. The laser sensors provide a detailed geometric presentation (geometric information) of scanned objects as well as a full profile of laser energy that was scattered back to the sensor (radiometric information). In order to exploit the full potential of these datasets, profound knowledge on laser scanning technology for data acquisition, geoinformation technology for data analysis and objects of interest (e.g. vegetation) for data interpretation have to be joined. Along with the sensor development and the ever increasing volume and availability of data, various research communities increased efforts to develop new methods for management, processing and analysis as well as visualization of these dense, large 3D point clouds. There is still a lack of geoprocessing methods and analysis workflows already available for GIS raster and vector data, which can be applied to huge point clouds. This fact hampers the utilization of LiDAR data in many domains where the extraction of (3D) information from the point cloud would be beneficial. Great chances and challenges in this respect are given by the rapidly developing Geospatial Web with its infrastructures. The last decade has witnessed heavily increasing research effort on improving sensor technology, data quality enhancement and stimulating new applications of the valuable datasets. Research initiatives and the respective results are strongly fragmented into isolated applications. Spatial Data Infrastructures (SDIs) play an important role in sharing, accessing, visualizing and distributing spatial data in decentralized way connecting multiple levels of competence and authorities. However, the integration of 3D laser scanning point cloud data and processing workflows into SDIs has not been discussed in an interdisciplinary scientific context and the broader benefits have not been assessed yet. This poster shows the importance of 3D geodata and the potential of analyzing the data in a broader GeoWeb context. Web-based tools for visualization and analysis of 3D vegetation objects derived from laser scanning will be presented.

Keywords: 3D GIS, Laser Scanning, LiDAR Point Cloud, GeoWeb, Spatial Data Infrastructures

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