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"WHAT ARE THE MOST CHALLENGING RESEARCH ISSUES IN THE GEOSPATIAL COMMUNITY?"

Extraction of large scale geospatial information from imagery and point clouds is the focus of most research within ISPRS Commission II. For the years to come I would expect major challenges related to two important changes: changes in the sensors available for mapping and changes due to the surge of machine learning.

Ubiquitous sensing

In the past decades we've been primarily designing methods to extract geospatial information from datasets which were acquired for the very purpose of mapping. Some research has been conducted as well to reconstruct buildings or city parts from imagery available from the internet in repositories like Flickr, though this typically was restricted to locations well visited by tourists. With the arrival of the internet of things, more and more sensors become accessible. Of a particular interest are sensors mounted on cars. Be it for autonomous driving or just for parking assistance, data of such sensors have the potential to become a major resource for mobile mapping. Apart from challenges related to privacy and data ownership, more technical challenges will arise related to the tremendous amount of data to be processed, the understanding of very high resolution sensor data, and the filtering of monitored objects into those that are relevant for a particular purpose and those that can be ignored.

Machine learning

When it comes to 3D reconstruction or semantic segmentation of images and point clouds, algorithms based on the latest machine learning approaches are leading all main benchmark charts. Developments continue to go very rapidly. Leading algorithms are frequently superseded by various new algorithms within a matter of weeks. Based on end-to-end learning from original sensor data to the final output, deep learning networks do away with the need for handcrafted interest operators, feature descriptors, and cost functions characteristic for earlier research. This learning, however, requires the availability of large amounts of labelled data. To satisfy this need would be an interesting challenge for our community. After all, the mapping industry invested numerous man years in the creation of geospatial information, like topographic maps and digital terrain models. In essence, this is labelled data of very high quality and in principle valuable for learning. However, learning algorithms will then need to cope with differences caused by object definitions in geospatial data (e.g. generalisation, roof overhangs) as well as those caused by changes in between the time of capturing the data used for the production of the geospatial information and the time of capturing the data to be labelled. If these challenges can be overcome to a satisfactory degree, a lot of training data can be made available to further advance machine learning.