DATA DRIVEN ALIGNMENT OF 3D BUILDING MODELS AND DIGITAL AERIAL IMAGES

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ABSTRACT:

Now-a-days various types of data taken from different sensors or from different viewpoints at different times are used to cover the same area. This abundance of heterogeneous data requires the integration and therefore the co-registration of these data in many applications such as data fusion and change detection for monitoring of urban infrastructure and land resources. While many data registration methods have been introduced, new automatic methods are still needed due to the increasing data volumes and the introduced new type of data. In addition, large-scale 3D building models have been already constructed for mapping or 3D city models. These valuable 3D data can also be used a geometric reference in sensor registration process. This paper addresses data fusion and conflation issues by proposing a data-driven method for the automatic alignment of newly acquired image data with existing large scale 3D building models. The proposed approach is organised in several steps: primitive extraction in the 3D building model and image domains, correspondence of primitives, matching of primitives, similarity assessment, and adjustment of the exterior orientation parameters of the images. First, optimal building primitives are extracted in the existing 3D building model by defining a priority function consisting of orientation of building, complexity of building, inner angle of building, and geometric building type. Then the optimally extracted building primitives are projected into image space for matching with extracted image straight lines data sets followed by a similarity assessment. For the initial localization, the straight lines from digital image are assessed based on their location with respect to the corresponding optimal building primitives in the search area. The straight line location having the highest score is determined. In that designated area location, new straight lines are extracted by weighting straight lines representing each vector of optimal building primitives. The corresponding vertices of the optimal building model are determined in the image by the intersection of straight lines. Finally, the EO parameters of the images can be efficiently adjusted based on the existing 3D building model and any new image features can then be integrated in the 3D building model. An evaluation of the proposed method over various data sets will be also presented.

TOPIC: Data fusion and data assimilation
ALTERNATIVE TOPIC: Lidar and laser scanning