Editorial

Theme Issue: Integration of Geodata and Imagery for Automated Refinement and Update of Spatial Databases

Photogrammetric and remote sensing imagery is since a long time considered as the primary data source for topographic mapping. Traditionally, the sequence of operations was well defined: the images were captured, relevant features were manually extracted and plotted using stereo compilation or digitised in orthophotos, and finally these features were cartographically post-processed to produce a line map as the final result. With the availability of digital imagery, laser scanner data and geo-spatial databases, all stored in computer readable form, two important trends have emerged: (a) based on image analysis techniques feature extraction is becoming more and more automatic. Automatic and semi-automatic feature extraction has been a focus of research for a few decades, and results are now starting to enter into the commercial market. (b) The linear chain of processes has given way to a cycle of steps. Features already contained in the database are superimposed onto the imagery to determine, whether the landscape has changed and thus an update is necessary. At the same time, a refinement of the existing features in terms of an increased degree of detail, better geometric accuracy, further attributes and possibly also the third dimension is being carried out. In addition, the image data have acquired a new role, as orthophotos have come to constitute a nearly mandatory layer in topographic Geographic Information Systems (GIS), and for photo-realistic and possibly dynamic three-dimensional visualisation.

The described developments have set the scene for this theme issue of the ISPRS Journal of Photogrammetry and Remote Sensing. The theme issue has its roots in the work of the Intercommission Working Group II/IV of ISPRS entitled "Systems for automated geo-spatial data production and updating from imagery", for which the guest editors are responsible in the current inter-congress period. Papers in this issue deal with the integration of topographic geo-spatial data in vector format (and in particular roads and buildings) with non-interpreted airborne imagery and digital terrain and surface models, for automated refinement and update of the vector data. While integration for the purpose of data acquisition from different data sources is not an explicit focus of the theme issue, this topic is also relevant and is thus treated to some degree.

The first paper by *Manos Baltsavias* gives a broad introduction and a good overview of the state-of-the-art. He specifically elaborates on the advantages and challenges involved in using prior knowledge such as GIS data for image analysis. The following paper by *Markus Gerke* et al. describes work on automatic verification and update of road data from orthophotos using the German ATKIS BasisDLM as an example. The work is directed towards practical use in mapping agencies. A similar approach is described by *Chunsun Zhang*. Zhang reports on his work about updating and refining the road information of the Swiss geo-spatial database VEC25 using multiple cues. Particular attention is paid to the fact that the VEC25 data are cartographically generalised and thus show geometric displacements with respect to the imagery. Change detection of buildings from multi-temporal stereo imagery for updating a geo-spatial database is the topic of the paper by *Franck Jung*. For solving this problem, Jung combines image matching and a classification technique to decide whether a particular region in the images should be labelled as a building. The paper by *Ildiko*

Suveg and George Vosselman deals with the reconstruction of building models from aerial images and large scale two-dimensional GIS data. As in the approaches by Gerke and Zhang, the GIS data are used to restrict the search space in the image. Based on simple models from a building library, constructive solid geometry (CSG) is used to represent the individual objects. The actual reconstruction itself is formulated as a tree search. Rather than relying on edge and line extraction, as is often done in large-scale photogrammetric image analysis, *Volker Walter* uses supervised multi-spectral classification for updating an existing GIS database. The training samples are automatically provided by the GIS features under the assumption that the amount of change is small with respect to the complete scene. Besides multi-spectral information, Walter also introduces texture channels in order to improve his results. The final paper by *Ursula Benz* et al. describes the system eCognition, one of the few systems for knowledge-based interpretation and update of remote sensing imagery being commercially available. The key elements of the system are a multi-scale segmentation followed by a fuzzy classification scheme.

Together, this set of seven papers very well illustrates the current state of research and development in the area, and demonstrates that while the general problem of automatic image interpretation and updating remains unsolved (and probably will remain so for the foreseeable future), well defined and less ambitious tasks such as automatic quality control, refinement and updating of some object classes are already well within today's possibilities, although it must be emphasized that a human operator should have the final say, at least for the time being.

We would like to thank everybody who has had a share in realising this theme issue for his and her contribution. A big thank you goes to the authors for their interest in the topic, for submitting the papers, for keeping the rather strict deadlines, and for the smooth communication all along. We are also grateful to the reviewers, who have invested lots of time reading and commenting on the submitted drafts and have thus significantly improve the material of the theme issue. Finally, we would like to express our sincere thanks to the journal's Editor-in-Chief for all the freedom and support he gave us in preparing and finalising this theme issue.

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