Foreword
Special Issue: High-Resolution Earth Imaging for Geospatial Information
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This edition of Photogrammetric Engineering & Remote Sensing is a special issue on “High Resolution Earth Imaging for Geospatial Information”. Images of the Earth from above have always fascinated the human race, both because of their inherent beauty and because of the possibility of using them in a multitude of disciplines, a principal example being the acquisition and updating of geospatial information. In recent years, new techniques such as digital imaging from the air, laser scanning (lidar), and the advent of synthetic aperture radar (SAR) imagery have served to increase this fascination and have opened up new possibilities and challenges for science, technological development and real-world applications. Today we see many different countries launching Earth observation satellites; we learn about requirements for real-time processing, for example in disaster management, which are being met successfully; and, we see different virtual globes such as Google Earth and Microsoft Bing Maps available to us and extending the use of Earth imagery to a degree nobody could have anticipated even a few short years ago. Thus, the theme of this special issue seems both timely and appropriate.

The science of acquiring, interpreting and automatically processing satellite imagery was originally termed remote sensing; in contrast to photogrammetry which at the time was considered exclusively to address aerial and terrestrial images, and dealt mostly with geometrical questions. In the era of digital imaging from air and space at ever higher resolution — for instance, the first commercial satellite delivering spaceborne imagery with a ground sample distance of 0.5 m was successfully launched in 2007 — the geometry and the interpretation components of these previously separate disciplines have long since merged. Thus, we simply note that, in order to derive accurate and reliable information and products in object space, sensor modelling, sensor calibration and image orientation have to be dealt with appropriately, regardless of the imaging platform. Similarly, the automatic interpretation of images is carried out using image processing and analysis procedures, many of which are sensitive to the ground resolution, but again no distinction is made with respect to the platform as such. This integration of photogrammetry and remote sensing is also reflected in the ISPRS strapline of Information from Imagery where no distinction is made as to how the primary image data was originally acquired.

The papers are based on presentations given at the ISPRS Hannover Workshop with the same topic held from 2nd to 5th June 2009 at the Institute for Photogrammetry and Geoinformation (IPI), Leibniz Universität Hannover in Germany (see ISPRS 2009 for the papers presented at the workshop and. Butenuth and Jutzi 2009 for a report on the workshop). The workshop, held biennially in Hannover for more than two decades, was organised on this occasion by ISPRS Working Groups I/2, “LIDAR, SAR and Optical Sensors for Airborne and Spaceborne Platforms”, I/4 “Geometric and Radiometric Modelling of Optical Spaceborne Sensors”, IV/2 “Automatic Geospatial Data Acquisition and Image-Based Databases”, IV/3, “Mapping from High Resolution Data”, and VII/2 “SAR Interferometry”. This time the workshop was organized in conjunction with the 12th AGILE International Conference on Geographic Information Science. Altogether, the ISPRS Workshop was attended by 118 participants from 24 different countries.
surface deformation phenomena. They also compare traditional C-Band (ERS, ENVISAT) data and high-resolution X-Band (TerraSAR-X) for such purpose. Using C-band data, PS densities of up to 800-1000 PS/km² were achieved compared to about 39000 PS/km² for TerraSAR-X. In the latter case also the residual topographic error of the estimated 3D position of the PS is improved. The authors demonstrate this effect impressively by mapping a large number of PS which were caused by facade elements of skyscrapers on 3D models of these buildings.

Wegner et al. deal also with SAR data, but their focus is on object recognition from amplitude images, i.e., such analysis is feasible even if only a single SAR image is available. Often linear object primitives like edges or lines are the fundament for further reasoning aiming at more complex objects, be it building recognition or road extraction. The authors provide insight about the spatial accuracy we can expect from segmented linear features in SAR data, which limits the overall accuracy by error propagation. They model the geometrical accuracy of extracted lines using real TerraSAR-X data of an urban scene and simulations.

Modern SAR sensors are capable of acquiring simultaneously several SAR images of different polarization. Reflection at surfaces may alter the signal’s polarization plane depending, for example, on the object geometry and the number of reflections. Ronny Hänsch applies multilayer perceptrons for land cover classification from high-resolution, fully-polarimetric SAR data of an airborne sensor. The author proposes a complex version of a neural network for such purpose because SAR data are complex valued, too. The approach is applied successfully using airborne SAR data.

Obviously, this special issue would not have been possible without the authors who have submitted their papers, and who at various stages of the publishing process have had to keep to the rather strict deadlines of the iterative review process. We are also grateful to the reviewers, who have invested substantial amounts of time in reading and commenting on the submitted drafts and have thus significantly improved the final material published in the special issue. We would like to thank Russ Congalton, Editor-in-Chief of Photogrammetric Engineering & Remote Sensing, and his team from the American Society for Photogrammetry and Remote Sensing for all the advice, support and the freedom they extended to us in the preparation and realization of the special issue.

Hannover, Germany, June 2010

References