Heipke C., 2021: Preface. In: Hinz S., Braun A., Weinmann M. (Eds.), Object and pattern recognition in remote sensing, Whittels Publishing, p. vii-ix.

# Preface

*An image says more than a thousand words* – this well-known proverb, which has its origin in the advertisement industry, describes much of the fascination of photogrammetry and remote sensing and in particular of its images. In sharp contrast to machines – and the statement remains true also in today's era of deep learning and artificial intelligence - humans are capable of interpreting images and videos, and of extracting the information contained therein without much effort and in real-time. However, we don't know just how we accomplish this task, which perhaps explains some of the fascination of aerial and satellite images.

Major characteristics of photogrammetry and remote sensing are:

- contact-free data acquisition,
- short image acquisition time which allows to capture dynamic processes,
- derivation of 3D information from stereoscopic images,
- complete iconic documentation of the whole scene,
- the possibility to measure and monitor objects of arbitrary size; our methods are in use from microscopy all the way to planetary remote sensing.

Traditionally, remote sensing deals with earth observation from space, monitoring of processes on the Earth surface as well as in the atmosphere are of prime interest, while the focus of photogrammetry is the 3D geometric and thematic exploitation of images of all kind. Technical innovations, however, have led to more and more overlap between the two disciplines. Photogrammetry was of course established long before satellites became available, nevertheless it is today regarded as part of the wider field of remote sensing. Moreover, photogrammetry forms one of the foundations of modern computer vision.

In recent years, photogrammetry and remote sensing have witnessed great changes in virtually every stage of image acquisition and processing. These developments have had a profound impact on the theory, development and operational use of photogrammetry and remote sensing. Examples include:

- new and better sensors and platforms such as 3D cameras, flash lidars, unmanned aerial vehicles and mobile mapping vehicles,
- the deployment of satellite constellations with the aim to image the earth in high resolution every single day,
- a shift from single sensors to integrated sensor systems, e. g. for assisted and autonomous driving,
- an increasing use of and integration with methods developed in computer science and computer vision, both for geometric and sematic tasks,
- a shift from mapping to monitoring and to dynamic geospatial services, e.g. for sustainable development.

Innovation in our field has been strongly influenced by progress in information and communication technology, and terms like ubiquitous computing, geosensor networks, digital earth, big data, deep learning, cloud computing, the semantic web, the internet of things and crowd sourcing have become part of our discipline. Besides a large variety of new applications, all the way from robotics

and driver-assistance systems to animal behaviour studies and environmental monitoring, new methodologies for automatic, reliable information extraction and cooperative decision making employing concepts from data mining and machine learning, are now commonplace in our field.

This observation directly leads to the title of this book – *Object and pattern recognition in remote sensing*. The book reports on research and development projects which were carried out in the last approximately 10 years at the Institute of Photogrammetry and Remote Sensing of the Karlsruhe Institute of Technology (KIT) under the leadership of Professor Stefan Hinz, and it gives an excellent overview of the current state-of-the-art in photogrammetry and remote sensing. For decades KIT has been one of the first addresses in this area, and the work documented in this books proves that things did not change in the last 10 years. While the book is not designed as a text book, it is of high relevance to students and other people wanting to learn about photogrammetry and remote sensing, as the individual chapters discuss a number of important topics and, at the same time, also show a clear direction of research in the current KIT activities in photogrammetry and remote sensing.

I believe such success has basically two ingredients: (a) individual excellence, which the KIT group greatly possess, and (b) and international network to be able to share and learn from latest trends in the own discipline and in neighbouring fields. With his group Stefan Hinz is very active in the network, set up and maintained the International Society of Photogrammetry and Remote Sensing (ISPRS).

ISPRS, www.isprs.org, is an international non-governmental organization that promotes international cooperation between the worldwide organizations with interests in the photogrammetry, remote sensing and spatial information sciences. Established in 1910, ISPRS is the oldest international umbrella organization in its field, which may be summarized as addressing “information from imagery”. The ISPRS scientific and technical programmes are organized by five Commissions. Each Commission is sponsored by an ISPRS Member organization for the four-year period between Congresses. The Commissions have established more than 60 Working Groups which are responsible for particular topics within the Commissions’ areas of responsibility.

KIT has been active in ISPRS for a very long time. As early as 1964 Kurt Schwidefsky, one of the predecessors of Stefan Hinz and later an ISPRS Honorary Member, became President of the ISPRS Commission II, then entitled “Theory, methods, instruments of restitution”. Between 2016 – 2020 Stefan Hinz is President of Commission I, “Sensor systems”; in the preceding period Boris Jutzi held the position of Vice President of the same Commission. In addition, scientists from KIT chaired ISPRS working groups, organised ISPRS events and presented numerous papers at the ISPRS Congresses, Symposia and Workshops. As mentioned, such engagement is an essential ingredient in modern science and development, which in the days of open science, open source, open data and open access is heavily influenced by international and interdisciplinary cooperation.

I congratulate the authors, and in particular the editors under the leadership of Stefan Hinz, to this nice piece of work and hope that the readers will find the material as interesting as I did.

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Hannover, September 30, 2018