IMAGING UNDERSTANDING

INTRODUCTION

BY DR.-ING. EBERHARD GÜLCH & HELMUT MAYER

Image Understanding is currently a major topic in photogrammetry and remote sensing. The growing interest was evident during the Symposium of Commission III, "Theory and Algorithms," of the International Society for Photogrammetry and Remote Sensing (ISPRS), held in Columbus, Ohio, July 7-10, 1998. The Symposium, entitled "Object Recognition and Scene Classification from Multispectral and Multisensor Pixels," attracted 160 participants from 16 countries. To promote the presented work, ISPRS Commission III President, Prof. Toni Schenk, arranged a special issue on Image Understanding in this journal. Thirteen of the published and presented papers from the areas of Feature Extraction and Grouping (Working Group III/3) and Image Understanding/Object Recognition (Working Group III/4) of ISPRS Commission III were selected and the authors were asked for an updated version of their papers. All submitted papers have been reviewed by two colleagues from the following review committee consisting of experienced researchers from both photogrammetry and computer vision.

- Kim Boyer, Ohio State University, USA
- Ian Dowman, University College London, UK
- Wolfgang Eckstein, Technische Universität München, Germany
- Wolfgang Förstner, University of Bonn, Germany
- Dieter Fritsch, University of Stuttgart, Germany
- Armin Grün, ETH Zurich, Switzerland
- Wilson Harvey, Carnegie Mellon University, USA
- Christian Heipke, University of Hanover, Germany
- Olivier Jamet, Institut Géographique National, France
- Henri Maître, Ecole National Supérieure des Télécommuncations, France
- Dave McKeown, Carnegie Mellon University, USA
- Ram Nevatia, University of Southern California, USA
- Tapani Sarjakoski, Finnish Geodetic Institute, Finland
- Toni Schenk, Ohio State University, USA

From the 13 papers, the six best were selected according to their originality, significance, application, and presentation. These six papers cover several aspects of feature extraction and object recognition. They reveal relations to mapping, remote sensing and virtual reality.

The first two papers exemplify a major issue in photogrammetric research; namely object recognition in aerial images focusing on the extraction of buildings and roads. Vosselman and Veldhuis developed new methods to efficiently fit wireframe models to image data, which is used to support user interaction, e.g., when correcting the extraction. The authors provide a detailed analysis of the application of their methods for building extraction from aerial imagery on several real examples. Baumgartner et al. reconstruct roads and their intersections from aerial imagery. They not only apply multi-scale analysis, but explicitly use context information. Other features of their method are high quality line extraction, sophisticated grouping, and the exploitation of so-called "snakes" to bridge gaps caused by obstacles. Experimental results give quantitative estimates of the performance.

Two other main issues treated in the remaining four papers are the usage of new types of sensor data, e.g., digital surface models from airborne laser altimetry, and the exploitation of outdated, but still useful data, such as existing maps. Haala has developed methods to automatically generate 3D building data from airborne laser altimeter data and given 2D ground plans. A newly developed user interface allows for their correction and for the inclusion of additional details. In combination with texture mapping, highly realistic 3D city models are derived which are ideally suited for virtual reality applications. Cheng and Molenaar treat the problem of object recognition in coastal geomorphological analysis using airborne laser altimeter data from the point of view of uncertain information. New methods for boundary determination of fuzzy objects are presented and discussed. Hsiao and Wong detect common buildings in two vector data files for supporting the automatic updating of existing data bases in the absence of survey control points. They have developed robust methods to handle different scales and poor matches. T(njes et al. combine prior knowledge about the object structure, existing GIS data, and multi-sensor information in the form of visual and infrared aerial images as well as SAR data, to reconstruct roads and complex 3D objects.

We hope that this exciting issue will attract still more interest to the wide field of Image Understanding, that it will strengthen the participation in ISPRS Commission III activities, and possibly induce new, interesting contributions and discussions to the forthcoming ISPRS Congress in Amsterdam in 2000. We thank all authors for the preparation of high-quality papers for the review process and the reviewers for their valuable contributions. Particularly, we want to express our gratitude to Toni Schenk for initiating this issue and to Stan Morain and Jim Case from PE&RS not only for inviting ISPRS Commission III, but also for all their efforts to perform the final editing of the manuscripts.

Eberhard Gülch and Helmut Mayer were Chairpersons of ISPRS Working Groups III/4 and III/3

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