科技資料

Progress in Image Analysis and Processing II

Proceedings of the 6th International Conference on Image Analysis and Processing

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PROGRESS IN IMAGE ANALYSIS AND PROCESSING II
Proceedings of the 6th International Conference on Image Analysis and Processing

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PREFACE

This volume contains the proceedings of the 6th International Conference on Image Analysis and Processing held in Como (Italy) on September 4 –6, 1991.

The Conference was organized by the Italian Chapter of IAPR through the following academic institutions: Dipartimento di Informatica e Sistemistica of Università di Pavia, Dipartimento di Elettronica of Politecnico di Milano and Dipartimento di Matematica of Università di Roma "La Sapienza". Villa Olmo in Como, the magnificent building where the Secretariat Centro di Cultura Scientifica "A. Volta" is situated, served as the venue of the event.

The over 130 attendants from 15 countries brought with them significant contributions to the field of image analysis and succeeded in offering the audience a perspective on the most recent advances in a wide range of industrial and academic institutions.

The over 100 contributions were selected from the 170 which were originally submitted. The selection was carried out using three referees per paper. At the conference they were personally presented by the authors, either as oral presentations or as posters. They have been printed in this book in five sections: 2D and 3D Image Analysis; Active Vision, Depth and Motion Analysis; Methods and Software Platforms for Vision Systems; Special Algorithms and Architectures; and Image Processing Techniques and Applications.

Each section opens with a special contribution from one of the five speakers invited, who each presented a lecture giving a wide overview of the main topics in current research. Per-Erik Danielsson, Herbert Freeman, André Gagalowicz, Josef Kittler and Bertrand Zavidovique helped in making the Conference a valuable source of up-to-date information.

The Conference was made possible only thanks to the generous financial support of the sponsoring companies and institutions. It is well known that money alone is no guarantee of success; the experience and highly professional work of the staff of Centro di Cultura Scientifica "A. Volta" proved to be a key contribution to the smooth running of the Conference, and to the especially pleasant set of "social events" that accompanied the scientific sessions.

We wish to thank all those that contributed to the event: the colleagues and friends who served in the scientific committee and those who helped in many other tasks.

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2D AND 3D IMAGE ANALYSIS

ROBUST METHODS OF 2D AND 3D IMAGE DESCRIPTION

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ABSTRACT

In this paper the problem of image feature extraction is considered with emphasis on developing methods which are resilient in the presence of data contamination. The issue of robustness of estimation procedures has received considerable attention in the statistics community[1][2][3] but its results are only recently being applied to specific image analysis tasks[4][5][6][7]. In this paper we show how the design of robust methods applies to image description tasks posed within a statistical hypothesis testing and parameter estimation framework. The methodology is illustrated by applying it to finding robust, optimal estimation kernels for line detection and edge detection. We then discuss the relationship of these optimal solutions to both the well established Hough Transform technique and the standard estimation kernels developed in the statistics literature. The application of standard robust kernels to image analysis tasks is illustrated by two examples which involve circular arc detection in gray-level imagery and planar surface segmentation in depth data. Robust methods are found to be effective general tools for generating 2D and 3D image descriptions.

1. Introduction

High level image analysis, scene modelling, scene description and scene interpretation are invariably carried out not by recourse to the raw sensor data but instead they are based on significant data groupings extracted from the image. Such groupings (percepts) can provide a more succinct, and from the information theoretic point of view more efficient, 2D and 3D image description. A hierarchy of such groupings may include edges, 2D and 3D lines and curves, planar and curved surfaces. Their detection and extraction is often formulated as hypothesis testing or parameter estimation problems. Accordingly, the parameters of an assumed geometric or distributional form of a feature are estimated from a lower level description.

One of the main problems in dealing with visual data is that features contained in it are subject not only to corruption by noise but more importantly are surrounded by background structure (clutter) and neighboring objects, or affected by occlusion. In data analysis terms, these structures give rise to extreme observations which cannot be interpreted as normal (Gaussian) errors from the feature being detected. Consequently, standard parameter estimation procedures such as the least squares method cannot be used as a basis for feature extraction and modelling.