Lecture Notes in Computer Science 3926

Commenced Publication in 1973
Founding and Former Series Editors:
Gerhard Goos, Juris Hartmanis, and Jan van Leeuwen

Wenyin Liu Josep Lladós (Eds.)

Graphics Recognition

Ten Years Review and Future Perspectives

6th International Workshop, GREC 2005
Hong Kong, China, August 25-26, 2005
Revised Selected Papers

Springer

Volume Editors

Wenyin Liu
City University of Hong Kong
Department of Computer Science
83 Tat Chee Ave., Kowloon, Hong Kong
E-mail: csliuwy@cityu.edu.hk

Josep Lladós
Universitat Autònoma de Barcelona
Computer Vision Center, Department of Computer Science
Edifici O, campus UAB, 08193 Bellaterra, Spain
E-mail: josep@cvc.uab.es

Library of Congress Control Number: 2006929221

CR Subject Classification (1998): I.5, I.4, I.3.5, I.2.8, G.2.2, F.2.2, H.4

LNCS Sublibrary: SL 6 – Image Processing, Computer Vision, Pattern Recognition, and Graphics

ISSN 0302-9743
ISBN-10 3-540-34711-9 Springer Berlin Heidelberg New York
ISBN-13 978-3-540-34711-8 Springer Berlin Heidelberg New York

Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India
Printed on acid-free paper SPIN: 11767978 06/3142 5 4 3 2 1 0

Preface

This book contains refereed and improved papers presented at the 6th IAPR Workshop on Graphics Recognition (GREC 2005). This year is the tenth anniversary of GREC, which was started in 1995 and has been held every 2 years: GREC 1995 in Penn State University, USA (LNCS Volume 1072, Springer, 1996); GREC 1997 in Nancy, France (LNCS Volume 1389, Springer, 1998); GREC 1999 in Jaipur, India (LNCS Volume 1941, Springer, 2000); GREC 2001 in Kingston, Canada (LNCS Volume 2390, Springer, 2002); and GREC 2003 in Barcelona, Spain (LNCS Volume 3088, Springer, 2004).

GREC is the main event of IAPR TC-10 (the Technical Committee on Graphics Recognition within the International Association for Pattern Recognition) and provides an excellent opportunity for researchers and practitioners at all levels of experience to meet colleagues and to share new ideas and knowledge about graphics recognition methods. Graphics recognition is a particular field in the domain of document analysis, which combines pattern recognition and image processing techniques for the analysis of any kind of graphical information in documents from either paper or electronic formats. In its 10 year history, the graphics recognition community has extended its research topics from the analysis and understanding of graphic documents (including engineering drawings vectorization and recognition), to graphics-based information retrieval and symbol recognition, to new media analysis, and even stepped into research areas of other communities, e.g., sketchy interfaces and on-line graphics recognition, so as to face up to new challenges. These continuous changes show that we are a dynamic, active, and promising scientific community.

The program of GREC 2005 was organized in a single-track 2-day workshop. It comprised several sessions dedicated to specific topics. For each session, there was an overview talk, followed by a number of short presentations and concluded by a panel discussion. Session topics included "Engineering Drawings Vectorization and Recognition," "Symbol Recognition," "Graphic Image Analysis," "Structural Document Analysis," "Sketching and On-Line Graphics Recognition," and "Curve and Shape Processing." In addition, a special session of panel discussion was dedicated to the 10th anniversary of GREC, which focused on the summary of the achievements of GREC in the past 10 years and the planning of GREC in the next 10 years.

Continuing with the tradition of past GREC workshops, the program of GREC 2005 also included two graphics recognition contests: a symbol recognition contest, organized by Ernest Valveny and Philippe Dosch, and an arc segmentation contest, organized by Liu Wenyin. In these contests, test images and ground truths are prepared in order for contestants to have objective performance evaluation conclusions on their methods.

After the workshop, all the authors were invited to submit enhanced versions of their papers for this edited volume. The authors were encouraged to include ideas and suggestions that arose in the panel discussions of the workshop. Every paper was evaluated by two or three reviewers. At least one reviewer was assigned from the attendees of the workshop. Papers appearing in this volume were selected and most of

them were thoroughly revised and improved based on the reviewers' comments. The structure of this volume is organized in eight sections, reflecting the workshop session topics.

We want to thank all paper authors and reviewers, contest organizers and participants, and workshop attendees for their contributions to the workshop and this volume. Special thanks go to the following people: Miranda Lee for her great efforts in managing all logistic work; Wan Zhang, Tianyong Hao, and Wei Chen for their help in preparing the workshop proceedings and this volume; Karl Tombre for leading the panel discussion session dedicated to the tenth anniversary of GREC and providing an insightful summary of the discussion. Finally, we gratefully acknowledge the support of our sponsors: The City University of Hong Kong, IAPR, K. C. Wong Education Foundation, and The Hong Kong Web Society.

During the review process, we received the extremely sad news of the unexpected passing away of Adnan Amin. Adnan was an active researcher in the graphics recognition community. He participated in several GREC Workshops and was a member of the Program Committee of GREC 2005. He will be sorely missed by all of us. We would like to dedicate this book to the memory of Adnan.

The 7th IAPR Workshop on Graphics Recognition (GREC 2007) is planned to be held in Curitiba, Brazil, together with ICDAR 2007.

April 2006

Liu Wenyin
Josep Lladós

Organization

General Chair

Liu Wenyin, China

Program Co-chair

Josep Lladós, Spain

Program Committee

Sergei Ablameyko, Belarus
Gady Agam, USA
Adnan Amin, Australia
Dorothea Blostein, Canada
Eugene Bodansky, USA
Horst Bunke, Switzerland
Atul Chhabra, USA
Luigi Cordella, Italy
Bertrand Coüasnon, France
David Doermann, USA
Dave Elliman, UK
Georgy Gimelfarb, New Zealand
Jianying Hu, USA
Joaquim Jorge, Portugal
Young-Bin Kwon, Korea
Gerd Maderlechner, Germany
Daisuke Nishiwaki, Japan
Jean-Marc Ogier, France
Lawrence O'Gorman, USA
Tony Pridmore, UK
Eric Saund, USA
Jiqiang Song, China
Chew-Lim Tan, Singapore
Karl Tombre, France
Ernest Valveny, Spain
Toyohide Watanabe, Japan
Marcel Worring, Netherlands
Su Yang, China

Additional Referees

Thomas Breuel, Germany
Shijie Cai, China
Philippe Dosch, France
Alexander Gribov, USA
Xavier Hilaire, France
Pierre Leclercq, Belgium
Enric Martí, Spain
Jean-Yves Ramel, France
Gemma Sánchez, Spain
Alan Sexton, UK
Feng Su, China
Zhenxing Sun, China
Eric Trupin, France
Nicole Vincent, France
Zhiyan Wang, China

Table of Contents

Engineering Drawings Vectorization and Recognition

Symbol Recognition

Graphic Image Analysis

Structural Document Analysis

Sketching and On-Line Graphics Recognition

Curve and Shape Processing

Reports of Contests

Panel Discussion