

LNCS 3287

Alberto Sanfeliu

José Francisco Martínez Trinidad

Jesús Ariel Carrasco Ochoa (Eds.)

Progress in Pattern Recognition, Image Analysis and Applications

9th Iberoamerican Congress on Pattern Recognition, CIARP 2004
Puebla, Mexico, October 2004
Proceedings



Springer

Alberto Sanfeliu
José Francisco Martínez Trinidad
Jesús Ariel Carrasco Ochoa (Eds.)

Progress in Pattern Recognition, Image Analysis and Applications

9th Iberoamerican Congress
on Pattern Recognition, CHARP 2004
Puebla, Mexico, October 25/29, 2004
Proceedings

江苏工业学院图书馆
藏书章

Volume Editors

Alberto Sanfeliu

Universitat Politècnica de Catalunya

Institut de Robòtica i Informàtica Industrial (IRI)

Dept. d'Enginyeria de Sistemes, Automàtica e Informàtica Industrial (ESAI)

Parc Tecnològic de Barcelona, Edifici U

St. Llorens i Artigas 4-6, 08028 Barcelona, Spain

E-mail: sanfeliu@iri.upc.es

José Francisco Martínez Trinidad

Jesús Ariel Carrasco Ochoa

National Institute of Astrophysics, Optics and Electronics (INAOE)

Computer Science Department

Luis Enrique Erro No. 1, 72840 Sta. Maria Tonantzintla, Puebla, Mexico

E-mail: {fmartine, ariel}@inaoe.mx

Library of Congress Control Number: 2004113938

CR Subject Classification (1998): I.5, I.4, I.2.10, I.2.7

ISSN 0302-9743

ISBN 3-540-23527-2 Springer Berlin Heidelberg New York

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, re-use of illustrations, recitation, broadcasting, reproduction on microfilms or in any other way, and storage in data banks. Duplication of this publication or parts thereof is permitted only under the provisions of the German Copyright Law of September 9, 1965, in its current version, and permission for use must always be obtained from Springer. Violations are liable to prosecution under the German Copyright Law.

Springer is a part of Springer Science+Business Media

springeronline.com

© Springer-Verlag Berlin Heidelberg 2004

Printed in Germany

Typesetting: Camera-ready by author, data conversion by Olgun Computergrafik

Printed on acid-free paper SPIN: 11335887 06/3142 5 4 3 2 1 0

Commenced Publication in 1973

Founding and Former Series Editors:

Gerhard Goos, Juris Hartmanis, and Jan van Leeuwen

Editorial Board

David Hutchison

Lancaster University, UK

Takeo Kanade

Carnegie Mellon University, Pittsburgh, PA, USA

Josef Kittler

University of Surrey, Guildford, UK

Jon M. Kleinberg

Cornell University, Ithaca, NY, USA

Friedemann Mattern

ETH Zurich, Switzerland

John C. Mitchell

Stanford University, CA, USA

Moni Naor

Weizmann Institute of Science, Rehovot, Israel

Oscar Nierstrasz

University of Bern, Switzerland

C. Pandu Rangan

Indian Institute of Technology, Madras, India

Bernhard Steffen

University of Dortmund, Germany

Madhu Sudan

Massachusetts Institute of Technology, MA, USA

Demetri Terzopoulos

New York University, NY, USA

Doug Tygar

University of California, Berkeley, CA, USA

Moshe Y. Vardi

Rice University, Houston, TX, USA

Gerhard Weikum

Max-Planck Institute of Computer Science, Saarbruecken, Germany

Lecture Notes in Computer Science

For information about Vols. 1–3184

please contact your bookseller or Springer

Vol. 3305: P.M.A. Sloot, B. Chopard, A.G. Hoekstra (Eds.), *Cellular Automata*. XV, 883 pages. 2004.

Vol. 3293: C.-H. Chi, M. van Steen, C. Wills (Eds.), *Web Content Caching and Distribution*. IX, 283 pages. 2004.

Vol. 3287: A. Sanfeliu, J.F. Martínez Trinidad, J.A. Carasco Ochoa (Eds.), *Progress in Pattern Recognition, Image Analysis and Applications*. XVII, 703 pages. 2004.

Vol. 3286: G. Karsai, E. Visser (Eds.), *Generative Programming and Component Engineering*. XIII, 491 pages. 2004.

Vol. 3284: A. Karmouch, L. Korba, E.R.M. Madeira (Eds.), *Mobility Aware Technologies and Applications*. XII, 382 pages. 2004.

Vol. 3274: R. Guerraoui (Ed.), *Distributed Computing*. XIII, 465 pages. 2004.

Vol. 3273: T. Baar, A. Strohmeier, A. Moreira, S.J. Mellor (Eds.), *<<UML>> 2004 - The Unified Modelling Language*. XIII, 454 pages. 2004.

Vol. 3271: J. Vicente, D. Hutchison (Eds.), *Management of Multimedia Networks and Services*. XIII, 335 pages. 2004.

Vol. 3270: M. Jeckle, R. Kowalczyk, P. Braun (Eds.), *Grid Services Engineering and Management*. X, 165 pages. 2004.

Vol. 3269: J. López, S. Qing, E. Okamoto (Eds.), *Information and Communications Security*. XI, 564 pages. 2004.

Vol. 3266: J. Solé-Pareta, M. Smirnov, P.V. Mieghem, J. Domingo-Pascual, E. Monteiro, P. Reichl, B. Stiller, R.J. Gibbens (Eds.), *Quality of Service in the Emerging Networking Panorama*. XVI, 390 pages. 2004.

Vol. 3265: R.E. Frederking, K.B. Taylor (Eds.), *Machine Translation: From Real Users to Research*. XI, 392 pages. 2004. (Subseries LNAD).

Vol. 3264: G. Paliouras, Y. Sakakibara (Eds.), *Grammatical Inference: Algorithms and Applications*. XI, 291 pages. 2004. (Subseries LNAI).

Vol. 3263: M. Weske, P. Liggesmeyer (Eds.), *Object-Oriented and Internet-Based Technologies*. XII, 239 pages. 2004.

Vol. 3262: M.M. Freire, P. Chemouil, P. Lorenz, A. Gravey (Eds.), *Universal Multiservice Networks*. XIII, 556 pages. 2004.

Vol. 3261: T. Yakhno (Ed.), *Advances in Information Systems*. XIV, 617 pages. 2004.

Vol. 3260: I.G.M.M. Niemegeers, S.H. de Groot (Eds.), *Personal Wireless Communications*. XIV, 478 pages. 2004.

Vol. 3258: M. Wallace (Ed.), *Principles and Practice of Constraint Programming – CP 2004*. XVII, 822 pages. 2004.

Vol. 3257: E. Motta, N.R. Shadbolt, A. Stutt, N. Gibbins (Eds.), *Engineering Knowledge in the Age of the Semantic Web*. XVII, 517 pages. 2004. (Subseries LNAI).

Vol. 3256: H. Ehrig, G. Engels, F. Parisi-Presicce, G. Rozenberg (Eds.), *Graph Transformations*. XII, 451 pages. 2004.

Vol. 3255: A. Benczúr, J. Demetровics, G. Gottlob (Eds.), *Advances in Databases and Information Systems*. XI, 423 pages. 2004.

Vol. 3254: E. Macii, V. Paliouras, O. Koufopavlou (Eds.), *Integrated Circuit and System Design*. XVI, 910 pages. 2004.

Vol. 3253: Y. Lakhnech, S. Yovine (Eds.), *Formal Techniques, Modelling and Analysis of Timed and Fault-Tolerant Systems*. X, 397 pages. 2004.

Vol. 3250: L.-J. (LJ) Zhang, M. Jeckle (Eds.), *Web Services*. X, 301 pages. 2004.

Vol. 3249: B. Buchberger, J.A. Campbell (Eds.), *Artificial Intelligence and Symbolic Computation*. X, 285 pages. 2004. (Subseries LNAI).

Vol. 3246: A. Apostolico, M. Melucci (Eds.), *String Processing and Information Retrieval*. XIV, 332 pages. 2004.

Vol. 3245: E. Suzuki, S. Arikawa (Eds.), *Discovery Science*. XIV, 430 pages. 2004. (Subseries LNAD).

Vol. 3244: S. Ben-David, J. Case, A. Maruoka (Eds.), *Algorithmic Learning Theory*. XIV, 505 pages. 2004. (Subseries LNAI).

Vol. 3243: S. Leonardi (Ed.), *Algorithms and Models for the Web-Graph*. VIII, 189 pages. 2004.

Vol. 3242: X. Yao, E. Burke, J.A. Lozano, J. Smith, J.J. Merelo-Guervós, J.A. Bullinaria, J. Rowe, P. Tiño, A. Kabán, H.-P. Schwefel (Eds.), *Parallel Problem Solving from Nature – PPSN VIII*. XX, 1185 pages. 2004.

Vol. 3241: D. Kranzlmüller, P. Kacsuk, J.J. Dongarra (Eds.), *Recent Advances in Parallel Virtual Machine and Message Passing Interface*. XIII, 452 pages. 2004.

Vol. 3240: I. Jonassen, J. Kim (Eds.), *Algorithms in Bioinformatics*. IX, 476 pages. 2004. (Subseries LNBI).

Vol. 3239: G. Nicosia, V. Cutello, P.J. Bentley, J. Timmis (Eds.), *Artificial Immune Systems*. XII, 444 pages. 2004.

Vol. 3238: S. Biundo, T. Frühwirth, G. Palm (Eds.), *KI 2004: Advances in Artificial Intelligence*. XI, 467 pages. 2004. (Subseries LNAI).

Vol. 3236: M. Núñez, Z. Maamar, F.L. Pelayo, K. Poustchi, F. Rubio (Eds.), *Applying Formal Methods: Testing, Performance, and M/E-Commerce*. XI, 381 pages. 2004.

Vol. 3235: D. de Frutos-Escrig, M. Nunez (Eds.), *Formal Techniques for Networked and Distributed Systems – FORTE 2004*. X, 377 pages. 2004.

- Vol. 3232: R. Heery, L. Lyon (Eds.), *Research and Advanced Technology for Digital Libraries*. XV, 528 pages. 2004.
- Vol. 3231: H.-A. Jacobsen (Ed.), *Middleware 2004*. XV, 514 pages. 2004.
- Vol. 3230: J.L. Vicedo, P. Martínez-Barco, R. Muñoz, M. Saiz Noeda (Eds.), *Advances in Natural Language Processing*. XII, 488 pages. 2004. (Subseries LNAI).
- Vol. 3229: J.J. Alferes, J. Leite (Eds.), *Logics in Artificial Intelligence*. XIV, 744 pages. 2004. (Subseries LNAI).
- Vol. 3226: M. Bouzeghoub, C. Goble, V. Kashyap, S. Spaccapietra (Eds.), *Semantics for Grid Databases*. XIII, 326 pages. 2004.
- Vol. 3225: K. Zhang, Y. Zheng (Eds.), *Information Security*. XII, 442 pages. 2004.
- Vol. 3224: E. Jonsson, A. Valdes, M. Almgren (Eds.), *Recent Advances in Intrusion Detection*. XII, 315 pages. 2004.
- Vol. 3223: K. Slind, A. Bunker, G. Gopalakrishnan (Eds.), *Theorem Proving in Higher Order Logics*. VIII, 337 pages. 2004.
- Vol. 3222: H. Jin, G.R. Gao, Z. Xu, H. Chen (Eds.), *Network and Parallel Computing*. XX, 694 pages. 2004.
- Vol. 3221: S. Albers, T. Radzik (Eds.), *Algorithms – ESA 2004*. XVIII, 836 pages. 2004.
- Vol. 3220: J.C. Lester, R.M. Vicari, F. Paraguaçu (Eds.), *Intelligent Tutoring Systems*. XXI, 920 pages. 2004.
- Vol. 3219: M. Heisel, P. Liggesmeyer, S. Wittmann (Eds.), *Computer Safety, Reliability, and Security*. XI, 339 pages. 2004.
- Vol. 3217: C. Barillot, D.R. Haynor, P. Hellier (Eds.), *Medical Image Computing and Computer-Assisted Intervention – MICCAI 2004*. XXXVIII, 1114 pages. 2004.
- Vol. 3216: C. Barillot, D.R. Haynor, P. Hellier (Eds.), *Medical Image Computing and Computer-Assisted Intervention – MICCAI 2004*. XXXVIII, 930 pages. 2004.
- Vol. 3215: M.G. Negoita, R.J. Howlett, L.C. Jain (Eds.), *Knowledge-Based Intelligent Information and Engineering Systems*. LVII, 906 pages. 2004. (Subseries LNAI).
- Vol. 3214: M.G. Negoita, R.J. Howlett, L.C. Jain (Eds.), *Knowledge-Based Intelligent Information and Engineering Systems*. LVIII, 1302 pages. 2004. (Subseries LNAI).
- Vol. 3213: M.G. Negoita, R.J. Howlett, L.C. Jain (Eds.), *Knowledge-Based Intelligent Information and Engineering Systems*. LVIII, 1280 pages. 2004. (Subseries LNAI).
- Vol. 3212: A. Campilho, M. Kamel (Eds.), *Image Analysis and Recognition*. XXIX, 862 pages. 2004.
- Vol. 3211: A. Campilho, M. Kamel (Eds.), *Image Analysis and Recognition*. XXIX, 880 pages. 2004.
- Vol. 3210: J. Marcinkowski, A. Tarlecki (Eds.), *Computer Science Logic*. XI, 520 pages. 2004.
- Vol. 3209: B. Berendt, A. Hotho, D. Mladenic, M. van Someren, M. Spiliopoulou, G. Stumme (Eds.), *Web Mining: From Web to Semantic Web*. IX, 201 pages. 2004. (Subseries LNAI).
- Vol. 3208: H.J. Ohlbach, S. Schaffert (Eds.), *Principles and Practice of Semantic Web Reasoning*. VII, 165 pages. 2004.
- Vol. 3207: L.T. Yang, M. Guo, G.R. Gao, N.K. Jha (Eds.), *Embedded and Ubiquitous Computing*. XX, 1116 pages. 2004.
- Vol. 3206: P. Sojka, I. Kopecek, K. Pala (Eds.), *Text, Speech and Dialogue*. XIII, 667 pages. 2004. (Subseries LNAI).
- Vol. 3205: N. Davies, E. Mynatt, I. Siio (Eds.), *UbiComp 2004: Ubiquitous Computing*. XVI, 452 pages. 2004.
- Vol. 3204: C.A. Peña Reyes, *Coevolutionary Fuzzy Modeling*. XIII, 129 pages. 2004.
- Vol. 3203: J. Becker, M. Platzner, S. Vernalde (Eds.), *Field Programmable Logic and Application*. XXX, 1198 pages. 2004.
- Vol. 3202: J.-F. Boulicaut, F. Esposito, F. Giannotti, D. Pedreschi (Eds.), *Knowledge Discovery in Databases: PKDD 2004*. XIX, 560 pages. 2004. (Subseries LNAI).
- Vol. 3201: J.-F. Boulicaut, F. Esposito, F. Giannotti, D. Pedreschi (Eds.), *Machine Learning: ECML 2004*. XVIII, 580 pages. 2004. (Subseries LNAI).
- Vol. 3199: H. Schepers (Ed.), *Software and Compilers for Embedded Systems*. X, 259 pages. 2004.
- Vol. 3198: G.-J. de Vreede, L.A. Guerrero, G. Marín Raventós (Eds.), *Groupware: Design, Implementation and Use*. XI, 378 pages. 2004.
- Vol. 3196: C. Stary, C. Stephanidis (Eds.), *User-Centered Interaction Paradigms for Universal Access in the Information Society*. XII, 488 pages. 2004.
- Vol. 3195: C.G. Puntonet, A. Prieto (Eds.), *Independent Component Analysis and Blind Signal Separation*. XXIII, 1266 pages. 2004.
- Vol. 3194: R. Camacho, R. King, A. Srinivasan (Eds.), *Inductive Logic Programming*. XI, 361 pages. 2004. (Subseries LNAI).
- Vol. 3193: P. Samarati, P. Ryan, D. Gollmann, R. Molva (Eds.), *Computer Security – ESORICS 2004*. X, 457 pages. 2004.
- Vol. 3192: C. Bussler, D. Fensel (Eds.), *Artificial Intelligence: Methodology, Systems, and Applications*. XIII, 522 pages. 2004. (Subseries LNAI).
- Vol. 3191: M. Klusch, S. Ossowski, V. Kashyap, R. Unland (Eds.), *Cooperative Information Agents VIII*. XI, 303 pages. 2004. (Subseries LNAI).
- Vol. 3190: Y. Luo (Ed.), *Cooperative Design, Visualization, and Engineering*. IX, 248 pages. 2004.
- Vol. 3189: P.-C. Yew, J. Xue (Eds.), *Advances in Computer Systems Architecture*. XVII, 598 pages. 2004.
- Vol. 3188: F.S. de Boer, M.M. Bonsangue, S. Graf, W.-P. de Roever (Eds.), *Formal Methods for Components and Objects*. VIII, 373 pages. 2004.
- Vol. 3187: G. Lindemann, J. Denzinger, I.J. Timm, R. Unland (Eds.), *Multiagent System Technologies*. XIII, 341 pages. 2004. (Subseries LNAI).
- Vol. 3186: Z. Bellahsene, T. Milo, M. Rys, D. Suciu, R. Unland (Eds.), *Database and XML Technologies*. X, 235 pages. 2004.
- Vol. 3185: M. Bernardo, F. Corradini (Eds.), *Formal Methods for the Design of Real-Time Systems*. VII, 295 pages. 2004.

Preface

First of all, we want to congratulate two new research communities from Mexico and Brazil that have recently joined the Iberoamerican community and the International Association for Pattern Recognition. We believe that the series of congresses that started as the “Taller Iberoamericano de Reconocimiento de Patrones (TIARP)”, and later became the “Iberoamerican Congress on Pattern Recognition (CIARP)”, has contributed to these group consolidation efforts. We hope that in the near future all the Iberoamerican countries will have their own groups and associations to promote our areas of interest; and that these congresses will serve as the forum for scientific research exchange, sharing of expertise and new knowledge, and establishing contacts that improve cooperation between research groups in pattern recognition and related areas.

CIARP 2004 (9th Iberoamerican Congress on Pattern Recognition) was the ninth in a series of pioneering congresses on pattern recognition in the Iberoamerican community. As in the previous year, CIARP 2004 also included worldwide participation. It took place in Puebla, Mexico. The aim of the congress was to promote and disseminate ongoing research and mathematical methods for pattern recognition, image analysis, and applications in such diverse areas as computer vision, robotics, industry, health, entertainment, space exploration, telecommunications, data mining, document analysis, and natural language processing and recognition, to name a few.

CIARP 2004 was organized by the Computer Science Department of the National Institute of Astrophysics, Optics and Electronics (INAOE), the Center for Computing Research of the National Polytechnic Institute (CIC-IPN) and the University of Las Americas, Puebla (UDLAP), and was sponsored by the Institute of Cybernetics, Mathematics and Physics of Cuba (ICIMAF), the Center of Applications of Advanced Technology of Cuba (CENATAV), the University of La Salle, Mexico (ULSA), the Autonomous University of Puebla (BUAP), the International Association for Pattern Recognition (IAPR), the Cuban Association for Pattern Recognition (ACRP), the Portuguese Association for Pattern Recognition (APRP), the Spanish Association for Pattern Recognition and Image Analysis (AERFAI), the Special Interest Group on Pattern Recognition of the Brazilian Computer Society (SIGPR-SBC), and the Mexican Association for Computer Vision, Neurocomputing and Robotics (MACVNR).

We received contributions from 18 countries. In total 158 papers were submitted, out of which 87 were accepted for publication in these proceedings and for presentation at the conference. The review process was carried out by the Scientific Committee, each paper being assessed by at least two reviewers who, in conjunction with other reviewers prepared an excellent selection dealing with ongoing research. We are especially indebted to them for their efforts and the quality of the reviews.

Three professors were invited to give keynote addresses on topics in pattern recognition: Dr. Josef Kittler, Professor at the School of Electronics and Physical Sciences, University of Surrey, UK, Dr. Alberto Del Bimbo, University of Florence, Italy, and Dr. Eduardo Bayro Corrochano, Computer Science Department, Center of Research and Advanced Studies, Guadalajara, Mexico.

We would like to thank the members of the organizing committee for their enormous efforts that allowed for an excellent conference and proceedings.

October 2004

Alberto Sanfeliu
José Francisco Martínez-Trinidad
Jesús Ariel Carrasco-Ochoa

Organization

CIARP 2004 was organized by the Computer Science Department of the National Institute of Astrophysics Optics and Electronics (INAOE), the Center for Computing Research of the National Polytechnic Institute (CIC-IPN) and the University of Las Americas, Puebla (UDLAP).

General Conference Co-chairs

José Francisco Martínez-Trinidad	Computer Science Department, National Institute of Astrophysics, Optics and Electronics (INAOE), Mexico
Jesús Ariel Carrasco-Ochoa	Computer Science Department, National Institute of Astrophysics, Optics and Electronics (INAOE), Mexico
Alberto Sanfeliu	Institute of Robotics and Informatics (IRI), Department of Automatic Control (ESAI), Universitat Politècnica de Catalunya, Spain
Juan Luis Díaz de León Santiago	Center for Computing Research (CIC), National Polytechnic Institute (IPN), Mexico
Ma. del Pilar Gómez Gil	University of Las Americas, Puebla (UDLAP), Mexico

Iberoamerican Committee

José Ruiz-Shulcloper	Cuban Association for Pattern Recognition (ACRP)
Nicolás Pérez de la Blanca	Spanish Association for Pattern Recognition and Image Analysis (AERFAI)
Aurélio Campilho	Portuguese Association for Pattern Recognition (APRP)
Eduardo Bayro-Corrochano	Mexican Association for Computer Vision, Neurocomputing and Robotics (MACVNR)
Díbio Leandro Borges	Special Interest Group on PR of the Brazilian Computer Society (SIGPR-SBC)
Gregory Randall	University of the Republic, Uruguay
Gonzalo Rojas	Pontifical Catholic University of Chile
Bertille Adelaïde-Louviers	Université des Antilles et de la Guyane, Guadeloupe, France

Local Committee

Aurelio López López	INAOE, Mexico
Carlos Alberto Reyes García	INAOE, Mexico
Jesús Antonio González Bernal	INAOE, Mexico
Guillermo de Ita Luna	INAOE, Mexico
Leopoldo Altamirano Robles	INAOE, Mexico
Luis Villaseñor Pineda	INAOE, Mexico
Manuel Montes y Gómez	INAOE, Mexico
Olac Fuentes Chávez	INAOE, Mexico
Rodrigo Montufar Chaveznavia	INAOE, Mexico

Local Arrangements Committee

Carmen Meza Talpan	INAOE, Mexico
Gorgonio Cerón Benítez	INAOE, Mexico
Gabriela López Lucio	INAOE, Mexico

Scientific Committee

Alarcón, V.	UDLAP, Mexico
Alquézar Mancho, R.	Universitat Politècnica de Catalunya, Spain
Altamirano, L.	INAOE, Mexico
Araújo, H.	Universidade de Coimbra, Portugal
Bayro-Corrochano, E.	Centro de Investigación y Estudios Avanzados-Gdl, Mexico
Bloch, I.	École Nationale Supérieure des Télécomm., France
Borges, D.L.	Pontifícia Universidade Católica do Paraná, Brazil
Caldas Pinto, J.R.	Instituto Superior Técnico, Portugal
Campilho, A.	Universidade do Porto, Portugal
Cano-Ortiz, S.D.	Universidad de Oriente, Cuba
d'Ávila-Mascarenhas, N.D.	Universidade Federal de São Carlos, Brazil
Del Bimbo, A.	Università di Firenze, Italy
Desachy, J.	Université des Antilles et de la Guyane, Guadeloupe, France
Díaz de León Santiago, J.L.	CIC-IPN, Mexico
Escalante Ramírez, B.	Universidad Nacional Autónoma de México, Mexico
Facon, J.	Pontifícia Universidade Católica do Paraná, Brazil
Fuentes, O.	INAOE, Mexico

- Gibert, K.
 Goldfarb, L.
 Gómez Gil, M.P.
 Gómez-Ramírez, E.
 Gordillo, J.L.
- Grau, A.
 Guzmán Arenas, A.
 Kirschning, I.
 Kasturi, R.
 Kittler, J.
 Koschan, A.
 Lazo-Cortés, M.
- Levashkine, S.
 Lira-Chávez, J.
- López López, A.
 Lorenzo-Ginori, J.V.
 Marques, J.S.
 Medioni, G.
 Moctezuma, M.
- Novovicova, J.
- Padilha, A.J.M.N.
 Pérez de la Blanca, N.
 Pina, P.
 Pla, F.
 Randall, G.
 Reyes, C.A.
 Riazanov, V.
- Ritter, G.
 Rodríguez, R.
 Rojas Costa, G.M.
 Ruiz-Shulcloper, J.
- Sanfeliu, A.
 Sanniti di Baja, G.
 Serra, J.
 Shirai, Y.
- Universitat Politècnica de Catalunya, Spain
 University of New Brunswick, Canada
 UDLAP, Mexico
 Universidad La Salle, Mexico
 Instituto Tecnológico y de Estudios Superiores
 de Monterrey, Mexico
 Universitat Politècnica de Catalunya, Spain
 CIC-IPN, Mexico
 UDLAP, Mexico
 University of South Florida, USA
 University of Surrey, UK
 University of Tennessee, USA
 Instituto de Cibernética, Matemática y Física,
 Cuba
 CIC-IPN, Mexico
 Universidad Nacional Autónoma de México,
 Mexico
 INAOE, Mexico
 Universidad Central de Las Villas, Cuba
 Instituto Superior Técnico, Portugal
 University of Southern California, USA
 Universidad Nacional Autónoma de México,
 Mexico
 Institute of Information Theory and
 Automation, Czech Republic
 Universidade do Porto, Portugal
 Universidad de Granada, Spain
 Instituto Superior Técnico, Portugal
 Universidad Jaume I, Spain
 Universidad de la República, Uruguay
 INAOE, Mexico
 Computing Center of Russian Academy of
 Sciences, Russia
 University of Florida, USA
 ICIMAF, Cuba
 PUC, Chile
 Instituto de Cibernética, Matemática y Física,
 Cuba
 Universitat Politècnica de Catalunya, Spain
 Istituto di Cibernetica, CNR, Italy
 École des Mines de Paris, France
 Osaka University, Japan

Sossa Azuela, J.H.	CIC-IPN, Mexico
Starostenko, O.	UDLAP, Mexico
Taboada Crispi, A.	Universidad Central de Las Villas, Cuba
Valev, V.	Saint Louis University, USA
Vidal, E.	Universidad Politécnica de Valencia, Spain
Villanueva, J.J.	Universidad Autónoma de Barcelona, Spain

Additional Referees

Aguado Behar, Alberto	Montes y Gómez, Manuel
Arias Estrada, Miguel O.	Montufar Chaveznava, Rodrigo
Biscay Lirio, Rolando	Pons Porrata, Aurora
Fernández, Luis Miguel	Sánchez Díaz, Guillermo
García-Reyes, Edel B.	Sierra Martínez, Gerardo
Gelbukh, Alexander	Silva-Mata, Francisco J.
Gil-Rodríguez, José Luis	Urcid Serrano, Gonzalo
Medina Urrea, Alfonso	Villaseñor Pineda Luis

Sponsoring Institutions

Institute of Cybernetics, Mathematics and Physics of Cuba (ICIMAF)
Center of Applications of Advanced Technology of Cuba (CENATAV)
University of La Salle, Mexico (ULSA)
Autonomous University of Puebla, Mexico (BUAP)
International Association for Pattern Recognition (IAPR)
Cuban Association for Pattern Recognition (ACRP)
Portuguese Association for Pattern Recognition (APRP)
Spanish Association for Pattern Recognition and Image Analysis (AERFAI)
Special Interest Group on PR of the Brazilian Computer Society (SIGPR-SBC)
Mexican Association for Computer Vision,
Neurocomputing and Robotics (MACVNR)

Table of Contents

Use of Context in Automatic Annotation of Sports Videos	1
<i>Ilias Kolonias, William Christmas, and Josef Kittler</i>	
Content Based Retrieval of 3D Data	13
<i>Alberto Del Bimbo and Pietro Pala</i>	
Clifford Geometric Algebra: A Promising Framework for Computer Vision, Robotics and Learning	25
<i>Eduardo Bayro-Corrochano</i>	
Adaptive Color Model for Figure-Ground Segmentation in Dynamic Environments	37
<i>Francesc Moreno-Noguer and Alberto Sanfeliu</i>	
Real-Time Infrared Object Tracking Based on Mean Shift	45
<i>Cheng Jian and Yang Jie</i>	
Optimal Positioning of Sensors in 2D	53
<i>Andrea Bottino and Aldo Laurentini</i>	
Computer Vision Algorithms Versus Traditional Methods in Food Technology: The Desired Correlation	59
<i>Andrés Caro Lindo, Pablo García Rodríguez, María Mar Ávila, Teresa Antequera, and R. Palacios</i>	
Radiance Function Estimation for Object Classification	67
<i>Antonio Robles-Kelly and Edwin R. Hancock</i>	
Detecting and Ranking Saliency for Scene Description	76
<i>William D. Ferreira and Dívio L. Borges</i>	
Decision Fusion for Object Detection and Tracking Using Mobile Cameras	84
<i>Luis David López Gutiérrez and Leopoldo Altamirano Robles</i>	
Selection of an Automated Morphological Gradient Threshold for Image Segmentation	92
<i>Francisco Antonio Pujol López, Juan Manuel García Chamizo, Mar Pujol López, Ramón Riza Aldeguer, and M.J. Pujol</i>	
Localization of Caption Texts in Natural Scenes Using a Wavelet Transformation	100
<i>Javier Jiménez and Enric Martí</i>	

A Depth Measurement System with the Active Vision of the Striped Lighting and Rotating Mirror	108
<i>Hyongsuk Kim, Chun-Shin Lin, Chang-Bae Yoon, Hye-Jeong Lee, and Hongrak Son</i>	
Fast Noncontinuous Path Phase-Unwrapping Algorithm Based on Gradients and Mask	116
<i>Carlos Díaz and Leopoldo Altamirano Robles</i>	
Color Active Contours for Tracking Roads in Natural Environments	124
<i>Antonio Marín-Hernández, Michel Devy, and Gabriel Aviña-Cervantes</i>	
Generation of N-Parametric Appearance-Based Models Through Non-uniform Sampling	132
<i>Luis Carlos Altamirano, Leopoldo Altamirano Robles, and Matías Alvarado</i>	
Gaze Detection by Wide and Narrow View Stereo Camera	140
<i>Kang Ryoung Park</i>	
A New Auto-associative Memory Based on Lattice Algebra	148
<i>Gerhard X. Ritter, Laurentiu Iancu, and Mark S. Schmalz</i>	
Image Segmentation Using Morphological Watershed Applied to Cartography	156
<i>Nílcelene das Graças Medeiros, Erivaldo Antonio da Silva, Danilo Aparecido Rodrigues, and José Roberto Nogueira</i>	
3D Object Surface Reconstruction Using Growing Self-organised Networks	163
<i>Carmen Alonso-Montes and Manuel Francisco González Penedo</i>	
Single Layer Morphological Perceptron Solution to the N -Bit Parity Problem	171
<i>Gonzalo Urcid, Gerhard X. Ritter, and Laurentiu Iancu</i>	
Robust Self-organizing Maps	179
<i>Héctor Allende, Sebastián Moreno, Cristian Rogel, and Rodrigo Salas</i>	
Extended Associative Memories for Recalling Gray Level Patterns	187
<i>Humberto Sossa, Ricardo Barrón, Francisco Cuevas, Carlos Aguilar, and Héctor Cortés</i>	
New Associative Memories to Recall Real-Valued Patterns	195
<i>Humberto Sossa, Ricardo Barrón, and Roberto A. Vázquez</i>	

Feature Maps for Non-supervised Classification of Low-Uniform Patterns of Handwritten Letters	203
<i>Pilar Gómez-Gil, Guillermo de-los-Santos-Torres, and Manuel Ramírez-Cortés</i>	
Learning Through the KRKa2 Chess Ending	208
<i>Alejandro González Romero and René Alquézar</i>	
One-Class Support Vector Machines and Density Estimation: The Precise Relation	216
<i>Alberto Muñoz and Javier M. Moguerza</i>	
Fuzzy Model Based Control Applied to Path Planning Visual Servoing ...	224
<i>Paulo J. Sequeira Gonçalves, Luís F. Mendonça, João Costa Sousa, and João Rogério Caldas Pinto</i>	
A Color Constancy Algorithm for the Robust Description of Images Collected from a Mobile Robot	232
<i>Jaume Vergés-Llahí and Alberto Sanfeliu</i>	
Unconstrained 3D-Mesh Generation Applied to Map Building	241
<i>Diego Viejo and Miguel Cazorla</i>	
A Model of Desertification Process in a Semi-arid Environment Employing Multi-spectral Images	249
<i>Jorge Lira</i>	
A Gesture-Based Control for Handheld Devices Using Accelerometer	259
<i>Ikjin Jang and Wonbae Park</i>	
A Method for Re-illuminating Faces from a Single Image	267
<i>Mario Castelán and Edwin R. Hancock</i>	
Unsupervised Font Clustering Using Stochastic Versio of the EM Algorithm and Global Texture Analysis	275
<i>Carlos Avilés-Cruz, Juan Villegas, René Arechiga-Martínez, and Rafael Escarela-Perez</i>	
Structural Pattern Recognition for Industrial Machine Sounds Based on Frequency Spectrum Analysis	287
<i>Yolanda Bolea, Antoni Grau, Arthur Pelissier, and Alberto Sanfeliu</i>	
An Extended Speech De-noising Method Using GGM-Based ICA Feature Extraction	296
<i>Wei Kong, Yue Zhou, and Jie Yang</i>	
Spanning Tree Recovery via Random Walks in a Riemannian Manifold ...	303
<i>Antonio Robles-Kelly and Edwin R. Hancock</i>	

Discriminant Projections Embedding for Nearest Neighbor Classification . .	312
<i>Petia Radeva and Jordi Vitrià</i>	
Regularization Kernels and Softassign	320
<i>Miguel Angel Lozano and Francisco Escolano</i>	
Pattern Recognition via Vasconcelos' Genetic Algorithm	328
<i>Angel Kuri-Morales</i>	
Statistical Pattern Recognition Problems and the Multiple Classes Random Neural Network Model	336
<i>Jose Aguilar</i>	
New Bounds and Approximations for the Error of Linear Classifiers	342
<i>Luis Rueda</i>	
A Graphical Model for Human Activity Recognition	350
<i>Rocío Díaz de León and Luis Enrique Sucar</i>	
A Fuzzy Relational Neural Network for Pattern Classification	358
<i>Israel Suaste-Rivas, Orion F. Reyes-Galaviz, Alejandro Diaz-Mendez, and Carlos A. Reyes-Garcia</i>	
Speaker Verification Using Coded Speech	366
<i>Antonio Moreno-Daniel, Biing-Hwang Juang, and Juan A. Nolasco-Flores</i>	
A Radial Basis Function Network Oriented for Infant Cry Classification . . .	374
<i>Sergio D. Cano Ortiz, Daniel I. Escobedo Beceiro, and Taco Ekkel</i>	
On the Use of Automatic Speech Recognition for Spoken Information Retrieval from Video Databases	381
<i>Luis R. Salgado-Garza and Juan A. Nolasco-Flores</i>	
Acoustical Analysis of Emotional Speech in Standard Basque for Emotions Recognition	386
<i>Eva Navas, Inmaculada Hernández, Amaia Castelruiz, Jon Sánchez, and Iker Luengo</i>	
Scaling Acoustic and Language Model Probabilities in a CSR System	394
<i>Amparo Varona and M. Inés Torres</i>	
Parallel Algorithm for Extended Star Clustering	402
<i>Reynaldo Gil-García, José M. Badía-Contelles, and Aurora Pons-Porrata</i>	
Hidden Markov Models for Understanding in a Dialogue System	410
<i>Fernando Blat, Sergio Grau, Emilio Sanchis, and María José Castro</i>	

Unsupervised Learning of Ontology-Linked Selectional Preferences	418
<i>Hiram Calvo and Alexander Gelbukh</i>	
Advanced Relevance Feedback Query Expansion Strategy for Information Retrieval in MEDLINE	425
<i>Kwangcheol Shin, Sang-Yong Han, Alexander Gelbukh, and Jaehwa Park</i>	
Detecting Inflection Patterns in Natural Language by Minimization of Morphological Model	432
<i>Alexander Gelbukh, Mikhail Alexandrov, and Sang-Yong Han</i>	
Study of Knowledge Evolution in Parallel Computing by Short Texts Analysis	439
<i>Pavel Makagonov and Alejandro Ruiz Figueroa</i>	
JERARTOP: A New Topic Detection System	446
<i>Aurora Pons-Porrata, Rafael Berlanga-Llavori, José Ruiz-Shulcloper, and Juan Manuel Pérez-Martínez</i>	
Fractal-Based Approach for Segmentation of Address Block in Postal Envelopes	454
<i>Luiz Felipe Eiterer, Jacques Facon, and David Menoti</i>	
A Proposal for the Automatic Generation of Instances from Unstructured Text	462
<i>Roxana Danger, I. Sanz, Rafael Berlanga-Llavori, and José Ruiz-Shulcloper</i>	
An Electronic Secure Voting System Based on Automatic Paper Ballot Reading	470
<i>Iñaki Goirizelaia, Koldo Espinosa, Jose Luis Martín, Jesus Lázaro, Jagoba Arias, and Juan J. Igarza</i>	
A Fast Algorithm to Find All the Maximal Frequent Sequences in a Text .	478
<i>René A. García-Hernández, José Fco. Martínez-Trinidad, and Jesús Ariel Carrasco-Ochoa</i>	
Refined Method for the Fast and Exact Computation of Moment Invariants	487
<i>Humberto Sossa and Jan Flusser</i>	
Skeletonization of Gray-Tone Images Based on Region Analysis	495
<i>Luca Serino</i>	
JSEG Based Color Separation of Tongue Image in Traditional Chinese Medicine	503
<i>Yonggang Wang, Yue Zhou, Jie Yang, and Yiqin Wang</i>	