

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

Roberto Moreno Díaz Franz Pichler
Alexis Quesada Arencibia (Eds.)

Computer Aided Systems Theory – EUROCAST 2005

10th International Conference on Computer Aided Systems Theory
Las Palmas de Gran Canaria, Spain, February 7 – 11, 2005
Revised Selected Papers



Springer

Volume Editors

Roberto Moreno Díaz
Universidad de Las Palmas de Gran Canaria
Instituto Universitario de Ciencias y Tecnológicas Cibernéticas
Campus de Tafira, 35017, Las Palmas de Gran Canaria, Las Palmas, Spain
E-mail: rmoreno@ciber.ulpgc.es

Franz Pichler
Johannes Kepler University Linz
Institute of Systems Science
Austria
E-mail: pichler@cast.uni-linz.ac.at

Alexis Quesada Arencibia
Universidad de Las Palmas de Gran Canaria
Instituto Universitario de Ciencias y Tecnológicas Cibernéticas
Campus de Tafira, 35017, Las Palmas de Gran Canaria, Las Palmas, Spain
E-mail: aquesada@dis.ulpgc.es

Library of Congress Control Number: 2005932551

CR Subject Classification (1998): J.6, I.6, I.2, J.7, J.3, C.1.m, C.3, F.4, F.3

ISSN	0302-9743
ISBN-10	3-540-29002-8 Springer Berlin Heidelberg New York
ISBN-13	978-3-540-29002-5 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 2005
Printed in Germany

Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India
Printed on acid-free paper SPIN: 11556985 06/3142 5 4 3 2 1 0

Preface

The concept of CAST, computer aided systems Theory, was introduced by F. Pichler of Linz in the late 1980s to include those computer theoretical and practical developments used as tools to solve problems in system science. It was considered as the third component (the other two being CAD and CAM) that would provide for a complete picture of the path from computer and systems sciences to practical developments in science and engineering.

The University of Linz organized the first CAST workshop in April 1988, which demonstrated the acceptance of the concepts by the scientific and technical community. Next, the University of Las Palmas de Gran Canaria joined the University of Linz to organize the first international meeting on CAST (Las Palmas February 1989), under the name EUROCAST 1989, a very successful gathering of systems theorists, computer scientists and engineers from most European countries, North America and Japan.

It was agreed that EUROCAST international conferences would be organized every two years. Thus, the following EUROCAST meetings took place in Krems (1991), Las Palmas (1993), Innsbruck (1995), Las Palmas (1997), Vienna (1999), Las Palmas (2001) and Las Palmas (2003) in addition to an extra-European CAST conference in Ottawa in 1994. Selected papers from those meetings were published as Springer Lecture Notes in Computer Science vols. 410, 585, 763, 1030, 1333, 1728, 2178 and 2809 and in several special issues of *Cybernetics and Systems: an International Journal*. EUROCAST and CAST meetings are definitely consolidated, as has been demonstrated by the number and quality of the contributions over the years.

EUROCAST 2005 (Las Palmas, February 2005) continued with a new approach to the conferences which was adopted in 2001. Besides the classical core on generic CAST, chaired by Pichler and Moreno-Díaz, there were workshops on Computation and Simulation in Modelling Biological Systems, chaired by Ricciardi (Naples); Cryptography, chaired by Müller (Klagenfurt); Intelligent Information Processing, chaired by Freire (A Coruña); Robotics and Robot Soccer, chaired by Kopacek (Vienna) and Pfalgraf (Salzburg); Spectral Methods, chaired by Astola (Tampere); and Computer Vision and Intelligent Vehicular Systems, chaired by Maravall and García Rosa (Madrid).

This volume contains the full papers selected after the oral presentations of the different sessions. The editors would like to thank all contributors for their quickness in providing their material in hard and electronic forms. Special thanks are due to the staff of Springer Heidelberg for their valuable support.

July 2005

Roberto Moreno-Díaz, Franz Pichler and Alexis Quesada-Arencibia

Table of Contents

Formal Approaches in Modelling

On the Physical Formal and Semantic Frontiers Between Human
Knowing and Machine Knowing

José Mira Mira 1

Approximation Problems Categories

*Liara Aparecida dos Santos Leal, Dalcidio Moraes Claudio,
Laira Vieira Toscani, Paulo Blauth Menezes* 9

Computation of Partial Automata Through Span Composition

*Karina Girardi Roggia, Marnes Augusto Hoff,
Paulo Blauth Menezes* 15

Degenerate Arrays: A Framework for Uncertain Data Tables

Margaret Miró-Julià 21

Neural Network Sensitivity Analysis Applied for the Reduction of the
Sensor Matrix

*Przemysław M. Szecówka, Andrzej Szczurek, Maciej Mazurowski,
Benedykt W. Licznarski, Franz Pichler* 27

Fuzzy Modeling for Coal Seams A Case Study for a Hard-Coal Mine

*José Antonio Martín, Teresa de Pedro, Carlos González,
Ricardo García, Luís Argüelles, Jose M. Rivas, Javier Toraño* 33

Optimization of a Class of Uncertain Systems Based on Uncertain
Variables

Zdzisław Bubnicki 38

Computational Simulation of Categorical Constructions

Rodrigo Born Vieira, Paulo Blauth Menezes 44

Composing Transitions into Transactions in UML Diagrams

Júlio Pereira Machado, Paulo Blauth Menezes 50

Theory-Building with System Dynamics: Principles and Practices

Markus Schwaninger, Thomas K. Hamann 56

Ontology Integration for Statistical Information

Wilfried Grossmann, Markus Moschner 63

Intelligent Information Systems

On Recursive Functions and Well-Founded Relations in the Calculus of Constructions

José L. Freire, Enrique Freire, Antonio Blanco 69

Longest Sorted Sequence Algorithm for Parallel Text Alignment

Tiago Ildefonso, Gabriel Pereira Lopes 81

Information Retrieval and Large Text Structured Corpora

Fco. Mario Barcala, Miguel A. Molinero, Eva Domínguez 91

Meteorological Image Descriptors

*José L. Crespo, Pilar Bernardos, Marta E. Zorrilla,
Eduardo Mora* 101

Towards a Certified and Efficient Computing of Gröbner Bases

*J. Santiago Jorge, Víctor M. Gulías, José L. Freire,
Juan J. Sánchez* 111

CheapTB: A Low Cost of Operation Distributed Filesystem

Javier París, Victor M. Gulías, Carlos Abalde 121

Spelling Correction on Technical Documents

Manuel Vilares, Juan Otero, Jorge Graña 131

Verification of Language Based Fault-Tolerance

Clara Benac Earle, Lars-Åke Fredlund 140

Applying Stacking and Corpus Transformation to a Chunking Task

*José A. Troyano, Víctor J. Díaz, Fernando Enríquez,
Vicente Carrillo, Fermín Cruz* 150

Extracting Computer Algebra Programs from Statements

Jesús Aransay, Clemens Ballarín, Julio Rubio 159

Integrating Syntactic Information by Means of Data Fusion Techniques

Francisco J. Ribadas, Jesús Vilares, Miguel A. Alonso 169

Unsupervised Learning in Information Retrieval Using NOW Architectures

*E.F. Combarro, J. Ranilla, R. Mones, N. Vázquez, I. Díaz,
E. Montañés* 179

An Iterative Method for Mining Frequent Temporal Patterns

Francisco Guil, Antonio Bailón, Alfonso Bosch, Roque Marín 189

Information Applications Components

Data Mining with Scatter Search <i>I.J. García del Amo, M. García Torres, B. Melián Batista, J.A. Moreno Pérez, J.M. Moreno Vega, Raquel Rivero Martín</i>	199
Web Usage Mining Project for Improving Web-Based Learning Sites <i>M.E. Zorrilla, E. Menasalvas, D. Marín, E. Mora, J. Segovia</i>	205
Similarity Queries in Data Bases Using Metric Distances - from Modeling Semantics to Its Maintenance <i>Josef Küng, Roland Wagner</i>	211
A WEB-CASE Tool Prototype for Hybrid Software Development <i>Francisco J. Orellana, Francisco Guil, Isabel M. del Aguila, Samuel Túnez</i>	217
An Augmentative Communication System Based on Adaptive Evolutionary Hypermedia Systems <i>M. Visitación Hurtado, Nuria Medina, Lina García-Cabrera, María L. Rodríguez</i>	223
The Gaps of the Thesaurus Wordnet Used in Information Retrieval <i>Javier de la Mata, Jose A. Olivas, Jesús Serrano-Guerrero</i>	229
Fuzzy Adaptive Objects (Logic of Monitors) <i>Germano Resconi, Javier Alonso, Raul Izquierdo</i>	235
A Model-Based Architecture for Fuzzy Temporal Diagnosis <i>José M. Juarez, José Palma, Manuel Campos, José Salort, Antonio Morales, Roque Marín</i>	241
Extension of Ontologies Assisted by Automated Reasoning Systems <i>Joaquín Borrego-Díaz, Antonia M. Chávez-González</i>	247
A Software Architecture for Effective Document Identifier Reassignment <i>Roi Blanco, Álvaro Barreiro</i>	254
An Ontology for Reusing Synthetic Tasks <i>Abraham Rodríguez-Rodríguez, Francisca Quintana-Domínguez</i>	263
A Tractable Subclass of Fuzzy Constraint Networks <i>Alfonso Bosch, Francisco Guil, Roque Marín</i>	269

Parallel State Space Generation and Exploration on Shared-Memory Architectures	
<i>Milan Češka, Bohuslav Křena, Tomáš Vojnar</i>	275
Towards Automated Controlling of Human Projectworking Based on Multiagent Systems	
<i>Manfred Mauerkirchner, Gerhard Hoefer</i>	281
Cryptography and Spectral Analysis	
Tree-Structured Legendre Multi-wavelets	
<i>Ekaterina Pogossova, Karen Egiazarian, Atanas Gotchev, Jaakko Astola</i>	291
Remarks on Calculation of Autocorrelation on Finite Dyadic Groups by Local Transformations of Decision Diagrams	
<i>Radomir S. Stanković, Mark G. Karpovsky</i>	301
A New Pseudo-Random Generator Based on Gollmann Cascades of Baker-Register-Machines	
<i>Dominik Jochinger, Franz Pichler</i>	311
An Excellent Permutation Operator for Cryptographic Applications	
<i>Josef Scharinger</i>	317
Fault Cryptanalysis of ElGamal Signature Scheme	
<i>Janusz Biernat, Maciej Nikodem</i>	327
Complexity-Theoretical Approaches to the Design and Analysis of Cryptographical Boolean Functions	
<i>Juan David González Cobas, José Antonio López Brugos</i>	337
Algorithm for Proving the Knowledge of an Independent Vertex Set	
<i>Pino Caballero-Gil, Candelaria Hernández-Goya</i>	346
Improvement of the Edit Distance Attack to Clock-Controlled LFSR-Based Stream Ciphers	
<i>Pino Caballero-Gil, Amparo Fúster-Sabater</i>	355
Protocol Analysis for Concrete Environments	
<i>Dieter Gollmann</i>	365

Computer Vision

Pattern Recognition in AVHRR Images by Means of Hibryd and Neuro-fuzzy Systems <i>Jose Antonio Piedra, Francisco Guindos, Alberto Molina, Manuel Canton</i>	373
Image Processing Techniques for Braille Writing Recognition <i>Néstor Falcón, Carlos M. Travieso, Jesús B. Alonso, Miguel A. Ferrer</i>	379
Retinal Based Authentication via Distributed Web Application <i>Castor Mariño, Manuel G. Penedo, Marta Penas</i>	386
Skeleton Extraction of 2D Objects Using Shock Wavefront Detection <i>Rubén Cárdenes, Juan Ruiz-Alzola</i>	392
Cue Combination for Robust Real-Time Multiple Face Detection at Different Resolutions <i>Modesto Castrillón-Santana, Oscar Déniz-Suárez, Cayetano Guerra-Artal, José Isern-González</i>	398
Evolutionary Color Constancy Algorithm Based on the Gamut Mapping Paradigm <i>Cristian Munteanu, Agostinho Rosa, Manuel Galan, Enrique Rubio Royo</i>	404
Vision Based Automatic Occupant Classification and Pose Recognition for Smart Airbag Deployment <i>Min-Soo Jang, Yong-Guk Kim, Sang-Jun Kim, Jeong-Eom Lee, Soek-Joo Lee, Gwi-Tae Park</i>	410

Biocomputing

A Wiener Neuronal Model with Refractoriness <i>Virginia Giorno, Amelia G. Nobile, Luigi M. Ricciardi</i>	416
On Myosin II Dynamics: From a Pulsating Ratchet to a Washboard Potential <i>Aniello Buonocore, Ludovico Caputo, Enrica Pirozzi, Luigi M. Ricciardi</i>	426
Feedback Effects in Simulated Stein's Coupled Neurons <i>Antonio Di Crescenzo, Barbara Martinucci, Enrica Pirozzi</i>	436

Upcrossing First Passage Times for Correlated Gaussian Processes <i>Virginia Giorno, Amelia G. Nobile, Enrica Pirozzi</i>	447
Convergence of Iterations <i>Paul Cull</i>	457
Semiautomatic Snake-Based Segmentation of Solid Breast Nodules on Ultrasonography <i>Miguel Alemán-Flores, Patricia Alemán-Flores, Luis Álvarez-León, M. Belén Esteban-Sánchez, Rafael Fuentes-Pavón, José M. Santana-Montesdeoca</i>	467
Parallel Progressive Multiple Sequence Alignment <i>Erik Pitzer</i>	473
Concepts and Systems Tools for Modelling Signal Processing in Vertebrate Retina <i>Roberto Moreno-Díaz, Gabriel de Blasio, Arminda Moreno-Díaz</i>	483
Application of Multichannel Vision Concepts and Mechanisms in an Artificial Industrial Vision System <i>A. Quesada-Arencia, J.C. Rodríguez-Rodríguez, Roberto Moreno-Díaz Jr</i>	492
Intelligent Vehicular Systems	
Soft Computing and Geometrical Control for Computer Aided Driving <i>Javier Alonso Ruiz, Teresa de Pedro, Carlos González, Ricardo García</i>	501
A Monocular Solution to Vision-Based ACC in Road Vehicles <i>Miguel Ángel Sotelo, Jesús Nuevo, Manuel Ocaña, Luis Miguel Bergasa</i>	507
Multi-objective Dynamic Optimization for Automatic Parallel Parking <i>Javier de Lope, Darío Maravall</i>	513
Electric Power Steering Automation for Autonomous Driving <i>José E. Naranjo, Carlos González, Ricardo García, Teresa de Pedro</i>	519
Computer Vision Application: Real Time Smart Traffic Light <i>Ángel Serrano, Cristina Conde, Licesio J. Rodríguez-Aragón, Raquel Montes, Enrique Cabello</i>	525

Permanency Memories in Scene Depth Analysis <i>Miguel A. Fernández, José M. López-Valles, Antonio Fernández-Caballero, María T. López, José Mira, Ana E. Delgado</i>	531
Pedestrian Detection for Intelligent Vehicles Based on Active Contour Models and Stereo Vision <i>C. Hilario, J.M. Collado, J. Ma Armingol, A. de la Escalera</i>	537
Fast Road Sign Detection Using Hough Transform for Assisted Driving of Road Vehicles <i>Miguel Ángel García-Garrido, Miguel Ángel Sotelo, Ernesto Martín-Gorostiza</i>	543
Robotic Soccer, Robotics and Control	
Advances in Robotics <i>Peter Kopacek</i>	549
Current and Future Trends and Challenges in Robot Soccer <i>Norman Weiss, Bernd Reusch</i>	559
Strategy and Communication in Robotic Soccer Game <i>Bobumil Horák, Marek Obitko, Jan Smid, Václav Snášel</i>	565
Rete Algorithm Applied to Robotic Soccer <i>Manuel Palomo, Francisco J. Martín-Mateos, José A. Alonso</i>	571
Towards a Biomathematical Model of Intentional Autonomous Multiagent Systems <i>Jochen Pfalzgraf, Bernhard Mitterauer</i>	577
A Controller Network for a Humanoid Robot <i>Peter Kopacek, Edmund Schierer, Markus Wuerzl</i>	584
Programming by Integration in Robotics <i>José L. Fernández-Pérez, Antonio C. Domínguez-Brito, Daniel Hernández-Sosa, Jorge Cabrera-Gámez</i>	590
A Mathematical Formalism for the Evaluation of C-Space for Redundant Robots <i>Roberto Therón, Vidal Moreno, Belén Curto, Francisco J. Blanco</i>	596

Global Modal Logics for Multiagent Systems: A Logical Fiber-
ing Approach
Johann Edtmayr 602

Improved Non-standard Discretization Methods for Nonlinear
Dynamical Control Systems
Jesús Rodríguez-Millán, Carla González, Anna Patete 608

Hierarchical Control of a Distributed Solar Collector Field
*Manuel Berenguel, Cristina M. Cirre, Ryszard Klempous,
Henryk Maciejewski, Maciej Nikodem, Jan Nikodem, Imre Rudas,
Loreto Valenzuela* 614

Explanatory Analysis of Data from a Distributed Solar Collector Field
*Manuel Berenguel, Ryszard Klempous, Henryk Maciejewski,
Jan Nikodem, Maciej Nikodem, Loreto Valenzuela* 621

Author Index 627