Special Issue on “Pattern Recognition for Autonomous Manipulation in Robotic Systems”

This SPECIAL issue contains a collection of papers addressing recent techniques and applications from Pattern Recognition and Sensory Information in the context of robotics. The issue focuses on novel applications of these techniques to challenging problems from several real-world domains. Bear in mind that it is unthinkable for emergent applications in robotics to show successful performance in unpredictable and unstructured environments without sophisticated perceptual capabilities.

This special issue will provide a comprehensive overview of the key topics and state of the art of pattern recognition for autonomous robots, their user interfaces, aspects related to the performance of the manipulation and navigation capabilities, and also real applications.

The 11 contributions to this issue have been selected following a strict peer review through a double blind reviewing process by reputed international referees. The papers in this special issue cover some of the topics aforementioned and constitute a representative sample of the latest developments in robotics by using tools from Pattern Recognition and Sensory Information.

In particular, the first paper in this issue presents a new method based on visual and force sensing fusion with the aim to manipulate three-dimensional (3-D) objects in unstructured environments. The second contribution addresses the problem of autonomous compliant motion under uncertainty by using statistical model-based solutions to model recognition. The third work proposes the use of visual quality measures in order to assess three finger grips of two-dimensional (2-D) parts performed in a real environment. The fourth research focuses on the imitation of human-hand movements in order to learn complex manipulation tasks by means of a cognitive architecture to control an anthropomorphic robotic hand. The fifth paper presents a new approach from biological inspiration to derive qualitative rules for the manipulator mechanics that demonstrate a next generation of manipulators namely “soft arm.” The sixth work shows recent progress of the rehabilitation robotic system FRIEND by using visual perceptual capabilities to get the maximum autonomous degree in some specific tasks. The seventh work addresses a new approach directed to automatic mosaics manufacturing combining advanced robotics, machine vision, and artificial intelligence. The eighth contribution presents the advantages to use automatic recognition capabilities based on neural networks within the online robots domain.

While all of these aforementioned papers are making use of robotic manipulation as the goal from different points of view, the last three papers show new approaches directed to other robotic areas. Thus, the ninth paper proposes an Internet-based security robot system implemented over a real mobile platform. The tenth work addresses a new approach directed to the problem of mapping for autonomous mobile robots by means of data fusion. And, finally, the eleventh contribution demonstrates the reconstruction of 3-D environment from perspective 2-D images using a single camera, a method that can be applied to real-life application problems such as traffic management.

Although it is impossible to entirely cover the very active field of pattern recognition and sensory information techniques applied to robotics in one special issue as is presented here, we think that these papers included and highlighted some examples of the potential and recent developments in different applied domains. We hope that this issue provides useful information for further research in robotics based on pattern recognition and sensory information techniques, and that it will be followed by other researchers reporting new developments in this field. We would like to thank all of the authors who submitted their papers to this special issue, for without their effort, interest and valuable collaboration, this issue would not have been possible. We are also very grateful to the Reviewers for their advice and expertise: J. Fernández, L. Zollo, M. Frigola, S. Glass, J. Leupold, J. Domingo, L. Bruzzone, M. Vincze, J. M. Sanchiz, M. A. García, P. Renaud, G. Recatalá, A. Morales, F. Ferri, A. Miller, R. Carloni, B. Stenger, E. Chintellato, E. Cervera, and D. Kragic.

Finally, as guest editors of this special issue, we would especially like to express our gratitude to the Editor-in-Chief Prof. Chelsea C. White, III for giving the authors the opportunity to present their work to the appreciated readership of the international journal IEEE TRANSACTIONS ON SYSTEMS, MAN, AND CYBERNETICS: PART C. We would also like to extend our thanks to the Editor-in-Chief’s Assistant, Ms. Jerri White, for her invaluable support.

PEDRO J. SANZ, Guest Editor
Universitat Jaume I
Department Ingeniería y Ciencia de los Computadores
Castellón E-12071, Spain

RAÚL MARÍN, Guest Editor
Universitat Jaume I
Department Ingeniería y Ciencia de los Computadores
Castellón E-12071, Spain

J. SALVADOR SÁNCHEZ, Guest Editor
Universitat Jaume I
Department Ingeniería y Ciencia de los Computadores
Castellón E-12071, Spain

Digital Object Identifier 10.1109/TSMCC.2004.840852
Pedro J. Sanz (M’98) received the B.Sc. degree in physics from the University of Valencia, Valencia, Spain, in 1985, the M.Sc. degree in engineering [computer-aided design/computer-aided manufacturing (CAD)/(CAM)] from the Technical University of Valencia, Valencia, Spain, in 1989, and the Ph.D. degree in computer engineering from the Jaume I University, Castellón, Spain, in 1996.

Currently, he is Associate Professor of computer science and artificial intelligence, a Researcher with the Robotic Intelligence Lab, and Head of the Multimedia Research Group at Jaume I University, Castellón, Spain. He has been active in R&D within several projects on Advanced Robotics and Multimedia Interfaces since 1990. He is author or co-author of a broad range of research publications, collaborating meanwhile with different scientific societies such as IEEE R&A, IAPR, and ECCAI. His research interests include service robotics, particularly autonomous manipulation, telerobotics and human-robot interaction. He has been appointed Visiting Scientist at the Institute für Real-Time Computer Systems (Technische Universität München, Germany) periods in 2000 and 2001, and at Le Laboratoire des Sciences et Matériaux pour l’Electronique et d’Automatique, (LASMEA) with the University Blaise Pascal, France, in 2002.


Raúl Marín received the B.Sc. degree in computer science engineering and the Ph.D. degree in engineering from the Jaume I University, Castellon, Castellon, Spain, in 1996 and 2002, respectively.

Currently, he is a Researcher in the Department of Computer Science and is a Lecturer on computer networking and telematics at Jaume I University. In 1996, he was a Software Developer with the Multimedia Department of BYG Systems Ltd., Nottingham, U.K. In 1997, he was a Researcher, Software Developer, and Software Architect with Lucent Technologies (Bell Labs Innovations) and was with the Switching and Access Division, Madrid, Spain. His research interests include object recognition, Internet telerobotics, multimedia, three-dimensional (3-D) virtual environments, and education tutorials. He is author or co-author of multiple research publications on these subjects. He has been appointed Visiting Scientist at the Laboratory “Le LAboratoire des Sciences et Matériaux pour l’Electronique et d’Automatique” (LASMEA), Univ. Blaise Pascal, France, in 2002.

Dr. Marín was a member of the 11th International Conference on Industrial and Engineering Applications of Artificial Intelligence and Expert Systems (IEA-AIE’98). He was Chairman of the EURON 2003 Symposium on Internet and Online Robots for Telemanipulation, and Guest Editor of the Special Issue on Telemanipulation within the International Journal of Robotic Systems. He has served as a reviewer of several international journals, such as the Journal of Autonomous Robots, Special Issue on Internet and Online Robots. Moreover, he has acted as Reviewer in several international conferences, such as the 2002 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) and the IASTED International Conference on Robotics and Applications (RA 2003).
José Salvador Sánchez was born in Tarragona, Spain. He received the B.Sc. degree in computer science from the Technical University of Valencia, Valencia, Spain, in 1990 and the Ph.D. degree in computer science engineering from Jaume I University, Castellon, Castellon, Spain, in 1998.

Currently, he is an Associate Professor in the Department of Programming Languages and Information Systems of Jaume I University, and is the Head of the Pattern Recognition Section in the Computer Vision Lab. He is author or co-author of many scientific publications and co-editor of two books. He has served as guest editor for the special issue on Advances in Pattern Recognition and Image Analysis of the *International Journal of Pattern Recognition and Artificial Intelligence*, and for the special issue on Pattern Recognition and Image Analysis in Cybernetic Applications in *Cybernetics and Systems*. His research interests include the pattern recognition domain, including classification, feature and prototype selection, ensembles of classifiers, fuzzy systems, and decision tree induction, along with pattern recognition applications to robotics.

Dr. Sánchez was a member of the organizing committee of the 8th Spanish Conference on Computational Geometry and Co-Chair of the 9th Spanish Symposium on Pattern Recognition and Image Analysis. He has served as reviewer of the international journals *Pattern Recognition Letters, Information Fusion*, and *Pattern Analysis and Applications*, as well as of several international conferences, including the World Multiconference on Systemics, Cybernetics and Informatics, and the International Conference in Central Europe on Computer Graphics and Visualization. He was the winner of the 1997 Best Predoctoral Work Award of the Spanish Association for Artificial Intelligence. He is a member of IEEE Signal Processing Society, IEEE Computational Intelligence Society, IEEE Information Theory Society, the International Association for Pattern Recognition (IAPR), Spanish Association of Pattern Recognition and Image Analysis (AERFAI), the European Coordinating Committee for Artificial Intelligence (ECCAI), and the Spanish Association for Artificial Intelligence (AEPIA).