

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 focus 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. Chinellato, 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.

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