Robotica (2007) volume 25, pp. 129–130. © 2007 Cambridge University Press
doi:10.1017/S0263574707003499 Printed in the United Kingdom

Editorial

The idea underlying this Special Issue arises from previous successfully international events organized in this robotics context. Thus, during 2005 IEEE/RSJ International Conference on Intelligent Robots and Systems, hosted in Edmonton, Canada, a Workshop, with the same title was successfully organized by this guest editor. Moreover, this editor was involved in this research area, as co-Chair of the "Manipulation and Grasping Interest Group", within the European Robotics Research Network (i.e. EURON), from 2001, organizing also a couple of International Summer Schools, supported by EURON, on these topics (Spain, 2001 and 2004). On the other hand, as time goes by, more and more robotics applications are oriented towards working in all kind of service domains, such as hospitals, museums, etc. Hence, the interest on those robotic systems, integrating manipulation and navigation capabilities, namely mobile manipulators, is drastically increasing around the entire world. Therefore, this special issue is trying to face this new scenario providing a comprehensive overview of some key topics, foundations and applications within the Mobile Manipulators context, including human-robot interaction aspects and critical issues related with navigation and manipulation performance, among others. It is noticeable that the ten contributions here presented were selected after a peer reviewing process, where three independent and reputed international referees submitted their evaluations. And, from sixteen initially submitted papers, only the best qualified ten manuscripts were selected for this issue. In the following the original contributions addressed in this special issue are highlighted. The first paper, presented by A. De Luca *et al*., proposes the task-oriented modelling of the differential kinematics of nonholonomic mobile manipulators. Among other contributions, they introduce a novel technique, namely Task Sequencing, aimed at improving performance. The proposed methods are applied then to the specific case of image-based visual servoing, and comparative numerical results are presented for two case studies. The second one, presented by G.D. White and co-workers, is focalised in dynamic aspects of a wheeled mobile manipulator system. The dynamic-level redundancy-resolution scheme, introduced here, decomposes the system dynamics into decoupled task space and a dynamically-consistent null-space component. Different aspects of the ensuing novel capabilities are illustrated using simulation results. The third contribution, by V. Padois *et al*., presents a unified modelling framework for the reactive control of wheeled mobile manipulators, including both kinematics and dynamics. This framework has been successfully implemented in simulation and on a real robot. The fourth one, by S. Ekvall *et al*., demonstrate one of the possible strategies for the integration of spatial and semantic knowledge in a service robot scenario where a simultaneous localization and mapping (SLAM) and object detection/recognition system work in synergy to provide a richer representation of the environment than it would be possible with either of the methods alone. Results of map building and an extensive evaluation of the object detection algorithm performed in an indoor setting are presented. The fifth work, by S. Garrido and co-workers, introduces a method combining map-based and sensor-based planning operations to provide a smooth and reliable motion plan. The method uses a Fast Marching technique to determine a motion plan on a Voronoi Extended Transform extracted from the environment model. In addition to this real-time response ability, the method produces smooth and safe robot trajectories. The sixth paper, presented by S. Wang *et al*., introduces a sensor-based motion planning method for a robot arm manipulator operating among unknown obstacles of arbitrary shape. It can be applied to on-line collision avoidance with no prior knowledge of the obstacles. Infrared sensors are used to build a description of the robot's surroundings. This approach is based on the configuration space but the construction of the C-obstacle surface is avoided. The effectiveness of the proposed method is verified by a series of experiments. The seventh work, by P. Nebot *et al*., presents a software architecture which seamlessly integrates robot arms, mobile bases, vision systems and sensing devices, in a distributed, homogeneous agent framework. Preliminary results are shown, which pave the way towards the development of network-ready applications involving mobile and manipulating artefacts. The eighth contribution, by W. Becker *et al*., introduces the control system for a six degree-of-freedom heavy-lift mobile manipulator for lifting and inserting payloads on the deck of a ship. The control architecture is validated in simulation and on a laboratory manipulator. The ninth paper, by O. Prenzel *et al*., presents a new architecture, denominated MASSiVE, which is used for the control of the rehabilitation robot FRIEND II. The seamless integration of user interactions into this task-knowledge, in combination with MASSiVE's user-adapted human-machine interface layer, enables the system to deliberately interact with the user during run time. And, finally, the tenth contribution, by M. Prats and co-workers, presents a modular control architecture that enables a mobile manipulator to compliantly perform manipulation tasks in everyday human environments. An impedance velocity/force controller that allows the execution of a great variety of tasks under the Task Frame Formalism (TFF) is implemented. Different daily tasks like opening a door or manipulating a book are implemented in the UJI Service Robot as experimental validation. Although it is impossible to entirely cover this very complex field, it is sure that these papers will be helpful for researchers and engineers working within this very active domain.

I would like to thank all of the authors who submitted their papers to this special issue, without their effort, interest and valuable collaboration, this issue would not have been possible. This editor is also very grateful to the Reviewers for their advice, expertise and very kind assistance during all the process.

Finally, as guest editor of this special issue, I would specially like to express my gratitude to the Editor-in-Chief Prof. Gregory S. Chirikjian, for giving the authors the opportunity to present their work to the appreciated readership of the international journal Robotica. I would also like to extend my thanks to the Production Editor, Phil Jones, for his invaluable support.

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https://doi.org/10.1017/S0263574707003499 Published online by Cambridge University Press