Proposal for a Special Session at IEEE RO-MAN 2023

Visual and Haptic Cues for Physical Human-Robot Interaction and Co-Manipulation

Aim and Scope of the Special Session

Nowadays, autonomous robots are capable of very precise motion. However, when physical interaction with humans and environment is also involved, the complexity of the addressed problems increases, requiring dedicated interaction strategies and appropriate perceived information. Specifically, in human-robot co-manipulation, combining high strength and repeatability of manipulators, with the cognitive ability and flexibility of human operators, is a decisive factor in multiple domains (e.g., human-robot object handover or collaborative transportation in industrial and service applications), involving active simultaneous handling of objects between the robot and the human partner.
In these scenarios, effective exploitation of visual and haptic sensing is essential on both sides (robot and human). On one hand, haptic stimuli, both natural and artificial, enable one to feel forces applied to a co-manipulated object, so as to retrieve the co-worker's motion intentions and react accordingly. On the other hand, visual feedback provides complementary information about objects, partner configuration, and state of the environment, thus being of paramount importance for safety, task precision, and planning.

The scope of this special session is to attract state-of-the-art articles on innovative approaches to the use of haptic and visual cues for human-robot interaction and co-manipulation, highlighting the importance of sensory feedback on human and robot sides. The effective exploitation of visuo-tactile cues, also in a multimodal fashion, is essential not only in a number of physical/proximate human-robot co-manipulation tasks (such as human-robot object handover and collaborative object transportation) but also in scenarios demanding high levels of safety and player awareness in remote environments (such as teleoperated robot-assisted medical procedures), using haptics and/or virtual/augmented/extended reality.
The scientific contributions presented in this special session are expected to impact the state-of-the-art with advances in the use of sensory feedback for human-robot interaction and co-manipulation. Novel solutions for visual-haptic feedback and user studies can provide safer human-robot interaction, so as to speed-up the deployment of safe and intuitive robotic systems into our homes, business, and services.

Organizers

Marco Costanzo, PhD, Research Fellow, Dipartimento di Ingegneria, Università degli Studi della Campania Luigi Vanvitelli, Italy
E-mail: marco.costanzo@unicampania.it, Phone: +39 – 0815010271
Short Bio: Marco Costanzo received the PhD in Industrial and Information Engineering in 2021 at the Università della Campania "Luigi Vanvitelli" where he currently holds a researcher position. In 2019, he was Visiting Research Student at the Institute for Artificial Intelligence at University of Bremen. His research interests range from robotic manipulation based on force/tactile sensing to multi-modal sensing for safe human-robot interaction. He serves as Associate Editor of the IEEE Robotics and Automation Letters.

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Mario Selvaggio, PhD, Research Fellow, Department of Electrical Engineering and Information Technology, University of Naples Federico II, Italy
E-mail: mario.selvaggio@unina.it
Short Bio: Mario Selvaggio received the PhD in Information Technology and Electrical Engineering in 2020 at the University of Naples Federico II where he currently works as a postdoctoral researcher. During the PhD, he was Visiting Research Student at the CNRS-IRISA in Rennes, France, in 2018 and at the University of California Santa Barbara, CA, USA in 2019. His research interests are shared control/autonomy, physical human-robot interaction, robot teleoperation, grasping and manipulation. He serves as Associate Editor of the IEEE Robotics and Automation Letters.

Claudio Pacchierotti, PhD, HDR, CNRS, Univ Rennes, IRISA, Inria
E-mail: claudio.pacchierotti@irisa.fr
Short Bio: Claudio Pacchierotti is a tenured researcher at CNRS-IRISA in Rennes, France, since 2016. He was previously a postdoctoral researcher at the Italian Institute of Technology, Genova, Italy. Pacchierotti earned his PhD at the University of Siena in 2014. He was Visiting Researcher in the Penn Haptics Group at University of Pennsylvania in 2014, the Dept. of Innovation in Mechanics and Management at University of Padua in 2013, the Institute for Biomedical Technology and Technical Medicine (MIRA) at University of Twente in 2014, and the Dept. Computer, Control and Management Engineering of the Sapienza University of Rome in 2022. Pacchierotti received the 2014 EuroHaptics Best PhD Thesis Award and the 2022 CNRS Bronze Medal. He is Senior Chair of the IEEE Technical Committee on Haptics and Secretary of the Eurohaptics Society.

Marco Ferro, PhD, Research Fellow, CNRS, Univ Rennes, IRISA, Inria
E-mail: marco.ferro@irisa.fr
Short Bio: Marco Ferro is a postdoc at CNRS-IRISA in Rennes, France, since 2022. He was previously postdoc at the Dept. of Computer, Control, and Management Engineering (DIAG) of Sapienza University of Rome, Italy, where he also got his Ph.D. in Automation in 2019. He visited the LIRMM in Montpellier in 2014 as an intern, and he was a visiting Ph.D student at CNRS-IRISA in Rennes in 2018. Throughout his research experience, he worked on control and estimation methods for humanoid and surgical robots, focusing later on scientific and technological problems in the medical robotics domain.

Tentative Speakers

1. *Admittance-type Haptic Interaction for a Stable Human-Robot Collaboration with an Industrial Robot*, S.-S. Park, H. T. Dinc, K.-H. Lee, J.-H. Ryu, KAIST, Korea.
2. *Assistive force control in collaborative human-robot transportation*, B. Cavalcante Lima, E. Ferrentino, P. Chiacchio, M. Vento, University of Salerno.
3. *How temperature influences haptic perception of objects' surface shape during human-robot interaction*, M. Pompilio, N. D'Aurizio, G. Salvietti, T. Lisini Baldi, D. Prattichizzo, Università di Siena.
4. *Active safety in human-robot collaboration by using the worker posture*, M. Sileo, G. Carriero, D.D. Bloisi, F. Pierri, F. Caccavale, Università degli Studi della Basilicata.
5. *Encounter-type haptic paradigm during human-robot shared control co-manipulation of objects*, E. Bouzbib, C. Pacchierotti, CNRS-IRISA.
6. *Asymmetric bimanual control of dual-arm robots physically interacting with humans*, M. Lippi, Università RomaTre, J. Palmieri, A. Marino, Università di Cassino e del Lazio Meridionale.