



Advancement on Human-Robot Interaction: Perception, Cognitive Architecture and Field Tests

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Published online: 10 January 2023

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During the last decade, increasing interest in research on Socially Assistive Robotics (SAR) aimed at realizing intelligent robotic solutions for healthcare and social assistance. Indeed, our society has experienced an evolution of social robot applications: they moved from the role of “con-cierge” and “helper” toward the role of “companion” and “therapist”.

There are ongoing efforts to develop and refine robotic platforms, both “intelligent” and robust, to meet people’s preferences and needs. In this context, Human-Robot Interaction (HRI) field has become crucial, and it is now compelling to better understand how humans perceive, interact with, or accept these machines in social contexts. The current trend of the two-ways HRI research field is to endow robotic platforms with social intelligence to create a more trustworthy and humanlike interaction, for example, by mimicking human behaviour. In other words, SARs should interact cognitively, physically, and effectively with humans so to simulate the human being’s modality to interact with each other. Up to now the development of robotic functionality is mainly devoted to transmitting the content of information without paying so much attention to “how” to say it like human beings usually do. In this sense, the robot should be able to process all the input data it gathered from the sensors but also the ones provided by the clinicians to profile the user and provide the appropriate behaviours.

Current literature demonstrates that a substantial part of research work in this area are addressing fundamental scientific problems in cognitive human-robot interaction, and the research can be divided into four main pillars. The first pillar includes all the studies related to the study of psychology, ethnography, social cognition, and the cognitive models of

human-human interaction. The second pillars include the design and development of the multimodal system that will sense and percept the (re)actions of human beings like emotions, speech, and co-speech behaviours. The third pillar aims to the development of bioinspired models for robots that will control their actions in the environments and will continuously learn from humans. Finally, the fourth pillar will group all the studies on the ethical, social, and legal implications of the use of social robots in society.

While these research topics are potentially relevant with a high social and scientific impact, there are still gaps from a scientific perspective that need to be addressed. Indeed, studies should foster the relationship between cognitive, psychology, anthropology, sociology, robotics and AI domains. It is also required to have more extensive testing in the field, for improving robot capabilities and clinically validating solutions for healthcare applications highlighting barriers and limitations for the use in the real context. Additionally, it is also important to define a flexible architecture that could be adapted and can manage the unplanned event. It is also important to study the ethical and legal issues that can prevent the use of this robot in a real context. In this context, this special issue contains the proceedings of the 1st edition of the "Adaptive Behavioral models of robotic systems based on brain-inspired AI cognitive architecture (APHRODITE). The workshop was virtually held on August 31st, 2020 in Naples (Italy) during the 29th edition of the IEEE International Conference of Robot & Human Interactive Communication (RO-MAN2020 - <http://roman2020.unina.it/index.php>). It receives contributions from authors in different countries (e.g., Italy, France, Portugal, Austria, Norway) for a total of 10 accepted papers. The topics of the papers are examples of the pursued multidisciplinary and joint efforts of the four pillars above mentioned. Two invited speakers: Prof. Agnieszka Wykowska and Prof. Hiroaki Wagatsuma enriched the program and foster the discussion among the 60 attendees. I would like to thank the other workshop organizers and co-editors of this Special

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Issue Prof. Filippo Cavallo, Gabriella Cortellessa, Prof. Artur Serrano, Marek Budzel and Joao Quintas for supporting me in the workshop organization. I thank all the people who made this event possible: the authors of the papers and the reviewers.

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