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Editorial

Socially Acceptable Robot Behavior: Approaches for Learning, Adaptation and Evaluation

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Introduction

A key factor for the acceptance of robots as regular partners in human-centered environments is the appropriateness and predictability of their behavior. The behavior of human-human interactions is governed by social norms, which are customary rules that define how people should behave in different situations, thereby governing their expectations. Socially compliant behavior is usually rewarded by group acceptance, while non-compliant behavior can have consequences including isolation from a social group. Making robots able to understand human social norms allows for improving the naturalness and effectiveness of human-robot interaction and collaboration (Fong, Nourbakhsh, & Dautenhahn, 2003; Scheutz, Schermerhorn, Kramer, & Anderson, 2007; Walters, Dautenhahn, te Boekhorst, Koay, & Woods, 2007). Furthermore, it also increases their acceptance as partners' to human users because robots that follow social norms are seen as more caring, friendly, and trustworthy (Brave, Nass, & Hutchinson, 2005; Cramer, Goddijn, Wielinga, & Evers, 2010; Groom, Chen, Johnson, Kara, & Nass, 2010; Hamacher, Bianchi-Berthouze, Pipe, & Eder, 2016; Shiomi, Nakagawa, & Hagita, 2013). Since social norms can differ greatly between different cultures and social groups (Joosse, Poppe, Lohse, & Evers, 2014; Lee & Sabanovic, 2014; Li, Milani, Krishnamoorthy, Lewis, & Sycara, 2019), it is essential that robots are able to learn and adapt their behavior based on feedback and observations from the environment (Shiarlis, Messias, & Whiteson, September). Learning must be open-ended because social norms can change over time requiring continuous adaptation. Another challenge is that not all human social norms are applicable for human-robot interactions, while there might also be norms that only exist for human-robot interactions. What is considered socially acceptable behavior can greatly differ depending on the appearance and purpose of a particular

robot (Hwang, Park, & Hwang, 2013) as well as the specific scenario or environment the interaction takes place.

This special issue aims to discuss novel interdisciplinary approaches at the intersection of social and cognitive robotics, machine learning, and artificial intelligence that are aiming toward learning, creating, or evaluating socially acceptable robot behaviors. The following five papers were accepted after a rigorous and careful reviewing process.

Summary of the Special Issue

- The paper by Wullenkord, Bellon, Gransche, Nähr-Wagener, and Eyssel (2022) proposes the Five Factor Model of Social Appropriateness (FASA), which provides a multidisciplinary perspective on the notion of social appropriateness and its implementation into technical systems. The paper offers reflections on the applicability and ethics of the FASA Model, highlighting both strengths and limitations of the framework.
- The paper by Costantini, Formisano, and Pitoni (2022) addresses modeling of group dynamics of agents by proposing an epistemic logic, L-DINF-E, that allows to formalize the beliefs formed by a group of agents. L-DINF-E allows to model aspects of "Theory of Mind", understood as the set of social-cognitive skills involving the ability to attribute and reason about mental states, desires, beliefs, and knowledge of agents. The paper illustrates how L-DINF-E can be used to solve "false-belief tasks", i.e., tests in which an agent should understand that some other agent may develop, under some circumstances, false beliefs.
- The paper by Yildirim and Ugur (2022) presents a data-driven social navigation architecture that uses Conditional Neural Processes to learn global and local

controllers of a mobile robot from observations. Additionally, the proposed architecture uses a deep prediction mechanism to detect situations different from the trained ones, where reactive controllers step in to ensure safe navigation. The obtained results demonstrate that the proposed framework can successfully carry out social navigation tasks resulting in less personal-zone violations leading to less discomfort.

- The paper by Bassetti, Blanzieri, Borgo, and Marangon (2022) proposes a framework to make artificial agents socially-competent in varying multi-party social situations and beyond individual-based user personalization. The main idea is to provide artificial agents with the capability to handle different kinds of interactional disruptions, and associated recovery strategies, in microsociology. The result is obtained by classifying functional and social disruptions, and by investigating the requirements a robot's architecture should satisfy to exploit such knowledge.
- The paper by Roesler, Bagheri, and Aly (2022) presents an overview of how researchers in relevant research fields think the perception of robots and the corresponding interactions are influenced independently of a specific scenario if a robot's behavior conforms to social norms. Additionally, the presented study investigates what characteristics and metrics constitute a good general benchmark to objectively evaluate the behavior of social robots regarding its conformity to social norms according to researchers in relevant research communities. Finally, the paper summarizes how the obtained results can guide future research toward socially aware robot behavior.

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