cAESAR: The Fourth Workshop on Adapted intEraction with SociAl Robots

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ABSTRACT

Human Robot Interaction (HRI) is a field of study dedicated to understanding, designing, and evaluating robotic systems for use by, or with, humans [19]. In HRI there is a consensus about the design and implementation of robotic systems that should be able to adapt their behavior based on user actions and behavior. The robot should adapt to emotions, personalities, and it should also have a memory of past interactions with the user to become believable. This is of particular importance in the field of social robotics and social HRI. The aim of this Workshop is to bring together researchers and practitioners who are working on various aspects of social robotics and adaptive interaction. The expected result of the workshop is a multidisciplinary research agenda that will inform future research directions and hopefully, forge some research collaborations.

CCS CONCEPTS

• **Human-centered computing**; • **Computing methodologies** → **Cognitive robotics**;

KEYWORDS

Social Robots, Human Robot Interaction, Human Behavior Understanding, Assistive Robotics

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1 WORKSHOP DESCRIPTION AND MOTIVATION

Human-Robot Interaction (HRI) is a field of study dedicated to understanding, designing, and evaluating robotic systems for use by, or with, humans [19]. Often when speaking of robotics at public events or during interviews with the media, the question that is often raised is: “How must humankind adapt to the imminent process of technological change? What new skills do we need to understand robots?” However, these questions are being posed from the wrong point of view. It is not that robot users should be the ones who need to acquire new competencies. On the contrary, it is crucial to ask how robots can adjust to their human interaction partners in better ways. What do the robots have to learn to be considerate of people and, no less important, be perceived as considerate by people? Which skills do they need, and what do they have to learn to make cooperation with humans possible and comfortable? This approach underlines the necessity of mutual understanding between humans and machines, advocating new design paradigms in which collaborative machines not only must be able to anticipate their human partner’s goals but at the same time enable the human partner to anticipate their own goals as well [33]. In HRI there is a consensus about the design and implementation of robotic systems that should be able to adapt their behavior based on user actions and behavior. The robot should adapt to emotions, personalities, and it should also have memory of past interactions with the user to become believable. This consensus is also shared in the field of humanoid robotics, which is aimed at replicating some human features, such as physical abilities, cognitive processes, ability to respond to environmental stimuli, and adaptation to the context and the environment. Social robots are autonomous robots that interact with people by engaging in social-affective behaviors, skills, capacities, and rules attached to their collaborative role. They can recognize each other and engage in social interactions, they possess histories (perceive and interpret the world in terms of their own experience), and they explicitly communicate with and learn from each other. However, to be successful, interaction with a social robot must be believable and this means that the robot’s behavior should take into account several dimensions of the user in order to make the appropriate decisions, such as age, gender, emotions, personality, cognitive biases and inclinations, and past interactions [2]. This requires learning a model of human behavior and using this model in the robot's reasoning. Creating robotic systems capable of correctly modeling and recognizing human behavior and adapting their behavior to the user is a very critical task, especially in the domain of assistive robotics and when working with vulnerable user populations. The HCI community is recognizing more and more the relevance of the HRI field and the possible synergies with user modeling and adaptation techniques. On the one hand, HRI offers new scenarios and application fields to HCI research community, on the other hand, HCI researchers can bring their experience in modeling and adapting to the users, especially in the large field of social robotics.

2 WORKSHOP GOALS AND TOPICS

The aim of this Workshop is to bring together researchers and practitioners who are working on various aspects of social robotics and adaptive interaction. The expected result of the workshop is a multidisciplinary research agenda that will inform future research directions and hopefully, forge some research collaborations. Topics of interest reflect the main research trends in the field, as also demonstrated in the literature, and include (but are not limited to):

- Personalized HRI, e.g. [29], [32]
- User modeling and user profiling in HRI, e.g. [31], [7]
- Adaptation strategies for HRI, e.g. [31], [2]
- Affective interaction with robots, e.g. [21],
- Machine learning for social robots, e.g. [36], [20]
- Natural Language Interaction with social robots, e.g. [25], [17]
- Emotion detection in social HRI, e.g. [34]
- Social Assistive Robots, e.g. [24]
- Social Robots in Education, e.g. [4], e.g. [18]
- HRI and Cognitive Impairments, e.g. [28]
- Cognitive architecture for HRI, e.g. [37], [35]
- Social Robots as Conversational Recommender Systems, e.g. [13]
- Persuasion and Social Robots, e.g. [3]
- Social Robots in the real world, e.g. [26]
- Empirical Evaluation of Social Robots, e.g. [22]
- User-centered Design and co-design in social HRI, e.g. [6], [23], [11]
- Behavior Transparency for Social Robot, e.g. [16]

The current workshop follows three previous editions held in conjunction with IUI in 2020 [8], with UMAP in 2021[1] and 2022 [14], and a special session on Adaptation and Personalization in Human-Robot Interaction at the 2019 IEEE conference on Systems, Man, and Cybernetics[2].

3 CONTRIBUTIONS

Nine papers have been accepted for presentation at the workshop, which will be detailed in the following. Topics covered range from assistive robotics to telepresence robots, from cognitive robotics to behavior analysis, and from the study of facial expressions in HRI to human aggression against robots.

Catricalà et al. [10] present an approach in which a humanoid robot, by using various modalities, proposes the games in a way personalised to specific individuals' experiences using their personal memories associated with facts and events that occurred in older adults' life. This personalization can increase their interest and engagement, and thus potentially reduce the cognitive training drop-out.

Pigureddu and Gena [27] present the preliminary qualitative results of a therapeutic laboratory involving the Pepper robot, as a facilitator, to promote autonomy and functional acquisition in autistic children with low support needs (level 1 support). The lab, designed and led by a multidisciplinary team, involved 4 children, aged 11 to 13 years, and was organized in weekly meetings for the duration of four months. The paper presents the result of an in-depth qualitative evaluation of the interactions that took place between the children and the Pepper robot, with the aim of analyzing their effectiveness for the purpose of promoting the development of social and communication skills in the participants. The observations and analyses conducted during the interactions provided valuable insights into the dialogue and communication style employed and paved the way for possible strategies to make the robot more empathetic and engaging for autistic children.

In Eldardeer at al. [15] the authors discuss how activating shared perception on the robot's side can engage in the robot's learning and effective interaction with others in the environment. In this context, the robot will be actively perceiving the environment, and a mutual influence will occur between the robot and the human. Additionally, they identify five essential skills for the robot to enable human-robot shared perception: Common representation, Effective communication, Spatiotemporal coordination, Affective modulation mechanism, and Understanding the other. In this paper, they show the importance of the impact of these skill categories on the low-level perceptual activities for the robot to activate a mutual human-robot shared perception. Thus it improves the human-robot collaboration experience.

In De Carolis et al. [9], the authors present the development of a course on the English language for seniors using the Alpha Mini robot. In the near future, they will make an experiment in a daily center for seniors in order to test the effect and efficacy of the proposed approach as a cognitive stimulation therapy.

Bertel et al. [5] present a research aimed at analyzing and discovering, in a real context, behaviors, reactions and modes of interaction of social actors (people) with the humanoid robot Pepper. Indeed, they wanted to observe in a real, highly frequented context, the reactions and interactions of people with Pepper, placed in a shop window, through a systematic observation approach. The most interesting aspects of this research are illustrated, bearing in mind that this is a preliminary analysis, therefore, not yet definitively concluded.

The paper of Cucciniello and Rossi [12] reproduced and extended an existing approach that could discriminate the presence of stress by observing people's faces, which were obtained through a real-time acquisition device. The authors tested the method on a benchmark used, in previous work, to assess the impact of a robot's non-verbal behavior in eliciting emotions. Here, the results of a

[1]https://caesar2021.di.unito.it/

[2]http://smc2019.org/approved_special_sessions.html

pilot study are reported. Preliminary results highlighted the potential of the system to discriminate emotional stress from users' expressions and that the robot's non-verbal behavior may have an effect on this.

Abbate et al. [1] presented a research aimed at co-design, testing and evaluating with users new implementations for the physical and cognitive embodiment of the telepresence robot to improve its social acceptance, starting from contextual functions to those related to the edutainment dimension and personalisation. The work should demonstrate how specific procedures can be developed to support the framing of robots not as consumer objects but as objects to be co-created with other stakeholders.

Finally, Rezzani et al. [30] provides a literature analysis of HRI studies and methodological reflections that can be adopted for investigating human aggression against robots. A total of 19 studies have been analyzed as representative of the literature surrounding the concept of "robot abuse". They identified three main research approaches: observational studies that uncovered spontaneous instances of aggression with robots, evaluation studies that assessed mainly the emotional responses for aggression against robots, and experimental studies that aimed at understanding which robot design factors are linked with precursors to aggression. The paper discusses each category of studies and generally emphasizes the need for a solid methodological foundation. In this study, the authors introduce the adoption of the General Aggression Model, a psychological theory of aggression, to provide a theoretical framework that can be used to guide research in this field.

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