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Personalization in Long-Term Human-Robot Interaction

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***Abstract*—For practical reasons, most human-robot interaction (HRI) studies focus on short-term interactions between humans and robots. However, such studies do not capture the difficulty of sustaining engagement and interaction quality across long-term interactions. Many real-world robot applications will require repeated interactions and relationship-building over the long term, and personalization and adaptation to users will be necessary to maintain user engagement and to build rapport and trust between the user and the robot. This full-day workshop brings together perspectives from a variety of research areas, including companion robots, elderly care, and educational robots, in order to provide a forum for sharing and discussing innovations, experiences, works-in-progress, and best practices which address the challenges of personalization in long-term HRI.**

***Index Terms*—Personalization; Long-Term Interaction; Human-Robot Interaction; Adaptation; Long-Term Memory; User Modeling; User Recognition**

I. Introduction

Long-term human-robot interaction (HRI) is essential in areas such as companion robots [1], rehabilitation, and education. However, interactions based on fixed collections of behaviors can become repetitive over time, causing user engagement to decrease after the novelty effect wears off. Personalization can help improve user engagement in long-term interactions, by adapting to the user's personality, preferences, needs [2], or by recalling shared memories with the user [3]. Moreover, personalizing the interaction can facilitate establishing rapport and trust between the user and the robot. However, long-term HRI studies require substantial resources, may not always be technically feasible especially if the robots are deployed "in the wild", and often do not provide generalizable results due to the variability of subject needs, making it challenging for researchers to publish results.

This workshop focuses on studies on adaptivity to users, context, environment, and tasks in long-term interactions in a variety of fields (e.g. companion robots, collaborative tasks, education, rehabilitation, elderly care). We intend to create a medium for researchers to share their work in progress, to introduce their preliminary results, and to share and discuss with other researchers about the problems they have encountered during their studies and their respective solutions.

II. Background

Recent advances on the automatic perception of user actions and affective states [4], [5] are extending the possibilities for adaptation and personalization in HRI [6]. There has been an increasing interest in studying robots that can adapt to the affective states [7], [8] or engagement level [9] of users, as well as to other user preferences like proxemics [10].

Adaptive and personalized interactions are particularly relevant when robots are expected to interact with the same user for extended periods, as is the case of service robots [11] in domains like assisted living [12] and collaborative manufacturing.

III. Target Audience and Topics

We encourage researchers and students from HRI, robotics, cognitive science, rehabilitation, and educational backgrounds to contribute. We invite short papers of 2-4 pages, including works-in-progress containing preliminary results, technical reports, case studies, surveys, and state-of-the-art research of personal robots and long-term studies in any of these fields. The accepted papers will be published on the workshop website as well as in arXiv.

The workshop welcomes contributions across a wide range of topics including, but not limited to:

- Personalization in HRI for companion robots, collaborative tasks, education, rehabilitation, elderly care
- Adaptation algorithms for long-term interactions
- User modeling
- Long-term memory (episodic, semantic, associative)
- User recognition
- Long-term HRI studies
- Conversational agents in long-term interactions
- Engagement in long-term HRI
- Evaluation in long-term HRI
- Challenges/Guidelines for field studies in long-term HRI

- Design and methodologies for repeated HRI
- Autonomy in long-term interaction

IV. Workshop Overview

The aim of this full-day workshop is to provide a forum for researchers to share ideas and discuss recent research methodologies for personalization in long-term HRI. The workshop will consist of:

- **Keynotes:** Invited researchers Takayuki Kanda (Kyoto University, Japan), Hae Won Park (MIT Media Lab, USA) and Ognjen Rudovic (MIT Media Lab, USA) will present their experiences and perspectives on the topic.
- **Full talks:** The authors of the accepted full-length (3-4 page) research papers will give 12-minute presentations followed by 3-minute question sessions.
- **Short talks:** The authors of the accepted short length (2 pages) research papers will give 2-3 minute introductions to their papers followed by 3-minute question sessions.
- **Interactive activities (brainstorming):** In groups, workshop attendees will brainstorm to identify problems that can arise in long-term HRI and come up with solutions using available technologies. Brainstorming sessions will consist of two parts:
  1) *Identify problems:* Groups will come up with the main issues that can arise in long-term interaction.
  2) *Find a solution:* The problems will be grouped by topic, and 3 topics will be chosen. Each group will be asked to find a solution to an assigned topic using a commercially-available robot and currently-available technology. At the end of the session, each group will give a 1-minute pitch of their solution.

V. Organizers

Bahar Irfan is an Early-Stage Researcher and a PhD candidate at the Centre for Robotics and Neural Systems, University of Plymouth and AI Lab, SoftBank Robotics Europe, France, in the joint Marie Skłodowska-Curie ITN project APRIL. Her work focuses on multi-modal person recognition and personalization in long-term HRI for conversational agents. She is also working in a joint project on socially assistive robotics with Colombian School of Engineering Julio Garavito jointly funded by the Royal Academy of Engineering.

Aditi Ramachandran is a sixth year PhD candidate in the Social Robotics Lab at Yale University. Her research focuses on personalized social robots in education.

Samuel Spaulding is a PhD student in the Personal Robots Group at the MIT Media Lab. His thesis research is focusing on building robots that can learn personalized cognitive and affective models of users over repeated interactions across different tasks.

Dylan F. Glas is a Senior Robotics Software Architect at Futurewei Technologies. His research interests include interaction design frameworks, autonomous social behavior, and learning by imitation for social robots.

Iolanda Leite is an Assistant Professor at the School of Computer Science and Electrical Engineering at KTH. Her research interests are in the areas of HRI and Artificial Intelligence. She aims to develop autonomous socially intelligent robots that can assist people over long periods of time.

Kheng Lee Koay joined the University of Hertfordshire as a Senior Research Fellow with the Adaptive Systems Research Group in 2003, and has been a Senior Lecturer since 2016. His research expertise includes Mobile Robotics, Robotic Home Companions, HRI and Human-Robot Proxemics. In particular, his research focuses on human centred socially acceptable human-robot interactions, and experimental design and evaluation methodologies.

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