HRI Workshop on Human-Robot Teaming

Bradley Hayes[1]
bradley.h.hayes@yale.edu

Matthew C. Gombolay[2]
gombolay@mit.edu

Malte F. Jung[3]
mfj28@cornell.edu

Koen Hindriks[4]
k.v.hindriks@tudelft.nl

Joachim de Greeff[4]
j.degreeff@tudelft.nl

Catholijn Jonker[4]
c.m.jonker@tudelft.nl

Mark Neerincx[4]
mark.neerincx@tno.nl

Jeffrey M. Bradshaw[5]
jbradshaw@ihmc.us

Matthew Johnson[5]
mjohnson@ihmc.us

Ivana Kruijff-Korbayova[6]
ivana.kruijff@dfki.de

Maarten Sierhuis[7]
maarten.sierhuis@nissan-usa.com

Julie A. Shah[2]
julie_a_shah@csail.mit.edu

Brian Scassellati[1]
scaz@cs.yale.edu

[1]Yale University, [2]MIT, [3]Cornell University, [4]Delft University of Technology, [5]IHMC, [6]DFKI, [7]Nissan Research

ABSTRACT

Developing collaborative robots that can productively and safely operate out of isolation in uninstrumented, human-populated environments is an important goal for the field of robotics. The development of such agents, those that handle the dynamics of human environments and the complexities of interpreting human interaction, is a strong focus within Human-Robot Interaction and involves underlying research questions deeply relevant to the broader robotics community.

"Human-Robot Teaming" is a full-day workshop bringing together peer-reviewed technical and position paper contributions spanning a multitude of topics within the domain of human-robot teaming. This workshop seeks to bring together researchers from a wide array of human-robot interaction research topics with the focus of enabling humans and robots to better work together towards common goals. The morning session is devoted to gaining insight from invited speakers and contributed papers, while the afternoon session heavily emphasizes participant interaction via poster presentations, breakout sessions, and an expert panel discussion.

Categories and Subject Descriptors

I.2.9 [**Artificial Intelligence**]: Robotics
; H.1.2 [**Information Systems**]: User/Machine Systems—*Human factors*

General Terms

Algorithms; Human Factors; Experimentation

Keywords

Robotics; Collaboration; Teamwork; HRI; HART

1. WEBSITE

http://www.bradhayes.info/hri15/

2. INTRODUCTION

Creating collaborative, communicative robot agents that can provide assistance when useful, remove non-value added or undesirable responsibilities when possible, and provide instruction or guidance when necessary is a long-term goal of Human-Robot Interaction research. Achieving this capability requires addressing a multitude of deep and challenging research areas, including intention recognition, interpreting and generating social behaviors, capability inference, multi-agent planning, planning under uncertainty, task modeling and comprehension, and building actionable user preference models. These topics all play a substantial role in advancing the field of HRI and are areas where much needed collaboration between researchers is necessary.

3. WORKSHOP GOAL AND TOPICS

Human-robot teaming is an extremely promising and relevant domain of study for the HRI community, as recent years have seen an increase in contributed papers with potential applications in enabling and facilitating collaborative interactions. This is strongly indicative of a community interest and desire for research that is supportive of human-robot teams working jointly towards a common goal. This workshop seeks to explore and discuss algorithms, computational models, systems, empirical evaluations, and interdisciplinary research related to bringing robots out of isolation and into safe, autonomous interaction and collaboration within a human populated, unstructured world.

Our call for papers solicits both position papers and technical contributions related to human-robot teaming and collaboration, including (but not restricted to) the following research topics:

- Task planning under uncertainty
- Empirical methods for evaluating human-robot teaming
- Motion planning in multi-agent or dynamic environments
- Collaborator action and preference modeling
- Interpreting social signals for intention recognition, including verbal and non-verbal communication
- Sliding autonomy for collaborative robots
- Leveraging human-robot interaction to request assistance or to recover from failure modes
- Understanding, modeling, and shaping team dynamics in mixed human-robot teams
- Ethical concerns and decision making

4. CONTENT AND STRUCTURE

"Human-Robot Teaming" is a full-day workshop including peer-reviewed contributions and invited talks that span a multitude of topics within the domain of human-robot teaming. Accepted full papers are to be showcased via oral presentations with time reserved for discussion and audience interaction, while accepted short papers will be presented in a lightning talk format as well as during a poster session. The afternoon session focuses more heavily on participant interaction through breakout activities and panel discussion, where small groups of participants will craft position responses to a variety of exploratory challenge prompts regarding the future of the field. These exercises will follow directly into a panel discussion with human-robot teaming experts, facilitating audience participation and discussion.

These challenge prompts and discussion topics are selected to maximize interdisciplinary conversation, encouraging interaction between traditionally disparate research fields to identify promising areas of future work and to share insights gained from our own diverse experiences. It is our intent to leverage the discussion and panel session at the end of the workshop as a springboard for researchers to network and find new research ideas to collaborate within.

4.1 Contributed Paper Themes and Sessions

The contributed position papers, technical papers, and short papers are divided into three sessions along three complimentary themes, each preceded by a relevant invited talk to frame discussion. An extended poster session follows Session III, allowing participants to further engage the day's presenters.

Session I: Algorithms for Human-Robot Teaming
Invited Speaker: Ross Knepper
Assistant Professor of Computer Science
Cornell University

Session II: Empirical Methods and Evaluations for Human-Robot Teaming
Invited Speaker: Elizabeth Croft
Professor of Mechanical Engineering and Associate Dean of Educational and Professional Development
University of British Columbia

Session III: Social Aspects of Teamwork in HRI
Invited Speaker: Bilge Mutlu
Assistant Professor of Computer Science, Psychology, and

Industrial Engineering
University of Wisconsin-Madison

4.2 Interactive Sessions

The workshop concludes with an interactive session with invited speakers from industry, a breakout session to define and discuss the big challenges in the field, and finally a panel discussion led by experts in the field.

4.2.1 Interactive Session: Industry Perspectives

We aim to provide exchange of ideas between researchers and industry practicioners to understand the core challenges in realizing the potential of human-robot teaming, as well as to identify key areas of advancement in the state-of-the-art in robotic technology. We have invited representatives from major robotics manufacturers and have solicited participation from other industry practicioners.

4.2.2 Breakout Session

The breakout session involves small multi-disciplinary group discussion and presentation of responses to a variety of challenge questions. These challenge questions are designed to drive research teams to identify key challenges, interesting problems, important problem domains, and gaps in our understanding.

4.2.3 Panel Session

The expert panel serves to conclude the day with important perspectives and ideas to consider during the main conference, encouraging participants to interact well past the workshop's conclusion. The primary topics for the panel will include discussing the "big challenges" in human-robot teaming from technical, safety, study design, evaluation, and media perspectives. Example questions within this session include "How much responsibility for conveying intent relies on human teammates vs. robotic teammates?", "How do we evaluate the value of robotic teammates?", and "How do we introduce robotic collaborators to humans unfamiliar with robots?".

5. TARGET AUDIENCE

This workshop aims to provide an interdisciplinary forum for bringing together researchers passionate about enabling human-robot collaboration. Thus, in addition to soliciting contributions within the HRI and broader academic robotics communities, we actively seek and invite participation from the artificial intelligence, sociology, and psychology research communities. Further, we solicit participation from industry and robot manufacturers to bring their real-world insights and experiences into the discussion. With this compelling intersection of research areas, it is our goal to explicitly attract researchers that may not have traditionally looked to HRI as a venue for collaborative robotics work, supplementing the contributions of HRI researchers already working within this domain.

6. DOCUMENTATION

All accepted papers, posters, video contributions, and presentations will be digitally collected, making them publicly available as an online archive on the workshop website. Notes from discussion sessions will be compiled alongside submitted papers as post-workshop proceedings.