What Actors can Teach Robots

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Abstract

In an age when machines are increasingly entering our daily lives, social robotics focuses on how robots can successfully share spaces, interface, and collaborate with people. Machines that fail to interact appropriately run the risk of becoming irritating and unwelcome; however, when personality and charm are added, functional machines can not only add value to their environment, but also engage, elicit trust, and foster bonds with their human partners. The central idea of this workshop is that even very simple robots, in terms of both sensing and degrees-of-freedom, are capable of charismatic interaction.

Acting training can inform the development of such charismatic robots, but it is challenging to operationalize actor knowledge into computational systems. For example, people parse non-verbal communications intuitively, even from machines that do not look like people, and acting training contains explicit methodology for exploring the space of motion-based expression. Robotics researchers can gain insight on how to create interfaces that adapt the knowledge of human charisma experts – such as actors and performers – into robotics, developing robot social behaviors with humans in the loop.

This workshop will be a forum for discussing minimal social robots and prototyping new ones. The program includes

presentations exploring the social role of simple sensors and behaviors, a hands-on activity, and motivating talks from experts in the field. Accepted applicants will be invited to share their perspectives on minimal social robots during highlight talks, discussions, and a poster session. During the workshop, participants will work in small groups to craft an illustrative interaction for a minimalist robot whose communications they have designed. There will also be ample opportunities for early researchers to connect with experts in this field. A public website will provide an archive of accepted submissions and minimal social robot interaction videos in order to share the output of the workshop with the larger community.

Author Keywords
Robots, Interaction Design, Design Methods, Embodied Interaction

ACM Classification Keywords
I.2.9 [Robotics]: Sensors, Mechanisms, Design; H.5 [Information interfaces and presentation (e.g., HCI)]: Miscellaneous

Website
More information about the workshop is available at https://hri.stanford.edu/minimal/

Background
As digital technology allows the uncoupling of a device's physical interfaces from its underlying capabilities, engineers face greater opportunities for expressiveness, as well as confusion, when designing user interactions. This workshop encourages designers to discuss and create effective robots with more minimalist approaches while keeping acting principles in mind. Such design strategies may yield systems that require less maintenance, need less computing power, and are more accessible and affordable to everyday people. Moreover, the strategies are highly relevant to the robots and 'Internet of Things' artifacts that are currently entering human environments in large numbers [5].

Sociability, though challenging to operationalize technologically, is an incredibly efficient channel for communicating with people. People automatically anthropomorphize even the actions of very simple robots [7, 8, 4]. Doing so is inherently human [1]. While much previous work in social robotics has explored complex platforms, the premise of this workshop is to take a simple concept and push it as far as one can go, as in the examples of [2, 3]. Not only does this approach have the potential to identify underlying rules of social behavior, but it also makes the technology accessible and widely applicable.

This workshop intends to share knowledge between researchers who use minimalist design strategies in their own design work, interaction designers who are curious about how sociability can play a role in technological interfaces, and anyone in related areas who wants to try their hand at designing expressive minimalist robots.

By examining how people automatically infer and communicate information with a simple robot, this workshop will reveal the complex bi-directional communications that a minimalist robot can evoke [10, 9, 6, 11]. While the workshop activity will center on robotic technology, we encourage submissions examining any computational system that seeks to interpret or interface with people, as such research could provide useful perspectives in understanding the complex communications of simple sensors and actions.

Pre-Workshop Plans
- Organizers will advertise the workshop on the website, via listservs, and at relevant conferences.

- Applicants will prepare extended abstracts about minimal social robots (3 pages max).
- Applicants will also have the option to video-prototype an interaction sequence with one or more cardboard boxes, in which no text, speech, or explicit facial expressions are present (1 minute max).

Workshop Structure

8:30-9:00 Introduction/Framing

During this introduction, organizers will explain the workshop theme, give an overview of the planned workshop activities laid out in this schedule, and motivate the day's program with examples of minimal social robots from their own work. The organizers will particularly emphasize the afternoon team design activity and encourage attendees to think about who they would like to work with as they listen to the following talk segments.

9:00-9:30 Participant Highlight Talks

Workshop attendees who have submitted accepted abstracts will have the opportunity to present slides pertaining to their work throughout a 5-minute talk that encourages others to visit their poster during the afternoon poster session. The highlight talks will also serve the purpose of introducing attendees to one another's work and design thinking, which they can use to select ideal teammates for the afternoon design activity.

9:30-10:30 Motivating Talks

Three leaders from the research area of minimal social robots will deliver motivating talks on their own work, including design principles and project examples. These experts will remain throughout the rest of the day's proceedings as well and enhance the experience of participants with their insights and expertise.

10:30-11:00 Coffee

This morning coffee break will help to keep participants engaged and also provide an ample opportunity for team formation. The organizers will encourage attendees to find teammates by the end of the coffee break, and they will assist with team formation as needed.

11:00-11:30 Human-Sensing Discussion

Workshop organizer Naomi Fitter will introduce several basic sensors and discuss how she uses them in her design work. The concept is to start with something simple, but create complexity via the social relevance of what that sensor can detect or the interaction it can enable. Attendees will participate in some introductory social robot design exercises, improvising the interaction potential of minimal sensors in preparation for the afternoon design challenge.

11:30-12:00 Robot Action/Behavior Discussion

Workshop organizer Heather Knight will lead a crash course in acting motion training, in which participants use chairs on rollers to 'prototype' behavioral interactions between abstract objects, and/or between abstract objects and people. The goal here is to leverage attendee creativity to think about actions and behaviors that convey complex meaning from minimal robot forms. Next, attendees will remote-control a Neato vacuuming robot, the design platform that attendees will be able to use in the later design challenge.

12:00-1:00 Lunch with Teams

The workshop organizers will dismiss everyone for lunch and encourage the teams formed during an earlier coffee

break to eat lunch together and get a head start on discussing their designs for the afternoon.

1:00-1:30 Participant Poster Session

Authors of accepted abstracts will present posters to other workshop attendees during this poster session.

1:30- 2:30 Design Session I: Exploration

After a brief activity introduction from the organizers, teams of workshop participants will prototype their own minimal social robot interaction sequence, using the accessible design materials (sensors and platforms) introduced previously. The concept is that they will explore how to create character in simple technological systems via timelines of sensing and action. Part of this process includes video-prototyping, in which participants 'act out' a simulated interaction sequence that they capture on video. This sequence should be technologically possible given sufficient technological knowledge and implementation time; however, this method will serve to simulate the final social sequence. It also enables teams to document their process.

2:30-3:00 Coffee

Participants will take an afternoon coffee break to step back briefly from the design activity. This break will also be an opportunity for organizers to offer guidance to design teams that may require extra assistance or critique to teams that are far ahead of schedule.

3:00-4:00 Design Session II: Rehearsal

The second design session will give teams a chance to finish their minimal social robot prototyping and stage a final video or video series that summarizes the group's insights about a particular aspect of the minimal social robot design process, and/or the utility of a particular acting technique in evoking social behaviors between robots and people.

4:00-5:00 Illustrative Interactions

Each design team will introduce and present their illustrative interaction concept and final video to the rest of the group with a small amount of time for discussion. At the close of the workshop, the organizers will summarize insights developed over the course of the robot design and brainstorm post-workshop information-sharing plans and followup.

Post-Workshop Plans

- Workshop organizers will create a website archive of accepted papers and videos.
- Organizers will provide documentation of the workshop activities and illustrative interaction prototyping on the website.
- Organizers will disseminate part files, component part numbers, etc. from the design activity, such that the experience could be replicated elsewhere.
- Organizers will investigate the possibility of a special issue or book on Minimal Social Robots with Elsevier, to which the authors of accepted papers would be invited to submit expanded papers.

Call for Participation

This workshop will be a forum for discussing minimal social robots and prototyping new ones, also building on methodology from acting training. The program includes invited and accepted participant presentations, improvisational and video-prototyping exercises, and a design challenge that will take place during the workshop. Sociability, though

challenging to operationalize technologically, is an incredibly efficient channel for communicating with people. While much previous work in social robotics has explored complex platforms, the premise of this workshop is to take a simple concept and push it as far as one can go.

The intent of this workshop is to share knowledge between researchers who use minimalist design strategies in their own work and anyone in related areas who is curious about how sociability can play a role in technological interfaces. While the workshop activity will center on robotic technology, we encourage submissions examining any computational system that seeks to interpret or interface with people, as such research could provide useful perspective in understanding the complex communications of simple sensors and actions.

Prospective participants should prepare either (1) a 1-page extended abstract and a brief video or (2) a 3-page extended abstract. The extended abstract should present research related to minimal social robots, and will be scored based on its relevance to the workshop theme, novelty, insightfulness, and writing quality. The video, if included in the submission, should consist of a 30-60 second interaction sequence between one or more cardboard boxes. Storytelling should occur, for example, via illustrative sequences of motion; however, speech, text, and indications of facial expression are banned from inclusion. Videos will be rated for relevance to workshop theme and entertainment value, and may be informal and playful.

Accepted authors will be expected to present a 5-minute spotlight talk during the morning of the workshop, participate in a poster session in the afternoon, and prototype a minimal robot interaction during the course of the workshop. At least one author of each accepted paper must attend the workshop and at least one day of the conference.

The paper submission page and additional information can be found on the workshop website:
https://hri.stanford.edu/minimal/

Organizing Committee

Naomi T. Fitter is a PhD candidate in Mechanical Engineering and Applied Mechanics in the University of Pennsylvania Haptics Group, part of the GRASP Laboratory. She uses **minimal robot sensing and rapid prototyping** in her work, and also organizes Maker-style outreach events to help K-12 students and undergraduates in the Philadelphia area learn about basic circuitry and actuation. Her pastimes of **performing music and comedy** enhance her interest in expressive robots. In the past, she has worked with the Medical Devices Group at Microsoft Research and the Oral Care Division at P&G. She previously received BS and BA degrees in Mechanical Engineering and Spanish from the University of Cincinnati in 2012 and an MSE degree in Robotics from the University of Pennsylvania in 2015.

Heather Knight is a post-doc at Stanford University and adjunct Computer Science professor at Oregon State University. She also runs **Marilyn Monrobot, a robot theater company** featuring comedy performances by Data the Robot and an annual Robot Film Festival. Her research interests include **human-robot interaction, non-verbal machine communications and non-anthropomorphic social robots**. She completed her PhD in Robotics at Carnegie Mellon University, was named to the 2011 Forbes List for 30 under 30 in Scienc, and is featured on TED.com for her **Robot Comedy performances**. Additional past work includes: robotics and instrumentation at NASA's Jet Propulsion Laboratory, interactive installations with Syyn Labs (including the award winning "This too shall pass" Rube Goldberg Machine music video with OK GO), field applications and sensor design at Aldebaran Robotics, and

she is an alumnus from the Personal Robots Group at the MIT Media Lab.

Nik Martelaro is a PhD student in Mechanical Engineering at Stanford's Center for Design Research DesignX Group. He has been developing **the Interaction Engine platform** for use within his lab and is the lab expert for **mechatronic product development**. He has extensive background prototyping tangible, embedded interactive systems. Nik has also been a teaching assistant for courses on rapid prototyping and interactive device development. His current work focuses on how **computationally-aware physical products can elicit meaningful interactions** with users and how these products can relay those experiences back to designers.

David Sirkin is a Research Engineer in Mechanical Engineering at the Center for Design Research, and a Lecturer in Electrical Engineering, both at Stanford University. His research exploring **how people interact with expressive everyday (robotic) objects, and with autonomous vehicles** (both inside and out), has been covered by the Associated Press, the Economist, New Scientist and the Washington Post. His teaching includes courses in **interactive device design and user-centered design methods**. David frequently collaborates with, and consults for, local Silicon Valley and global technology companies including Microsoft Research, SAP, Siemens and Willow Garage. He received his PhD from Stanford in Mechanical Engineering (Design), and Masters degrees from MIT in Electrical Engineering & Computer Science and in Management.

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