Bartneck, C., & Forlizzi, J. (2004). Shaping Human-Robot Interaction - Understanding the Social Aspects of Intelligent Robotic Products. Proceedings of the CHI2004 Workshop, Vienna pp. 1731-1732. | DOI: 10.1145/985921.986205

Shaping Human-Robot Interaction: Understanding the Social Aspects of Intelligent Robotic Products

Christoph Bartneck
Technical University of Eindhoven
Den Dolech 2, 5600 MB Eindhoven
The Netherlands
christoph@bartneck.de

Jodi Forlizzi
HCII and School of Design
Carnegie Mellon University
5000 Forbes Ave., Pittsburgh, PA 15221
forlizzi@cs.cmu.edu

Categories and Subject Descriptors
H.5.m [Information Interfaces And Presentation]: Miscellaneous

Keywords
Robotics; Social Interaction; Product; Human-Robot

SOCIAL ROBOTS

The field of robotics is changing at an unprecedented pace. Robotic technologies that integrate information technology with physical embodiment are now robust enough to be deployed in industrial, institutional, and domestic settings. They have the potential to be greatly beneficial to humankind. However, how these products should behave and interact with humans — *act socially* — remains largely unclear. When designing these products, we will need to make judgments about what technologies to pursue, what systems to make, and how to consider context when designing artifacts and services. Researchers and designers have only just begun to understand these critical issues.

For example, Figure 1 shows an early prototype of an emotionally expressive car. Such a product prompts many questions, including:

Figure 1: Toyota Pod

CHI 2004, April 24–29, 2004, Vienna, Austria.
ACM 1-58113-703-6/04/0004.

Should the car express emotions? Will it be appropriate for the car to express *schadenfreude* when passing by a broken-down car on the highway? Will the user feel comfortable with any of these interactions?

A related issue is the impact of autonomy on the social role of an intelligent robotic product. Autonomous actions will be perceived as intentional behavior which is usually only ascribed to living beings. The artifact becomes a social actor and has to fit into our society, including its norms, rules and regulations. But will an intelligent robotic product receive the same social status as a creature? Will they become pets? The degree and type of autonomy these products can exhibit will greatly shape their interactions with people. The interactions can range, for example, from:

• people doing all the work (for example, interacting with a toy like Furby [Furby, 1998]

• people teaming with robotic products to accomplish tasks (for example, robots designed to help elders remain independent in their homes [Montemerlo et al, 2002]

• products providing simple social response to human interaction, for example, Kismet, a socially aware research prototype (Breazeal, 2003)

• a fully reciprocally social robot.

We need to examine issues related to the design and development of social robots that act autonomously — that is, on behalf of humans without continuous input from humans. A forum for researchers in a variety of disciplines is needed to discuss issues related to the interactions between humans and social robots.

OVERVIEW

Robotics is a broad discipline. The United Nations (UN), in a recent robotics survey, groups robotics into three major categories: industrial robotics, professional service robotics, and personal service robotics [UN, 2002]. Industrial robots represent the vast majority of robotic development, with many deployed in the automotive industry, where the ratio of human workers to robots is about ten to one [UN, 2002]. Professional service robots are a much less practiced field, but it is quickly growing. These robots work in domains inaccessible to people, such as navigating abandoned mines

Bartneck, C., & Forlizzi, J. (2004). Shaping Human-Robot Interaction - Understanding the Social Aspects of Intelligent Robotic Products. Proceedings of the CHI2004 Workshop, Vienna pp. 1731-1732. | DOI: 10.1145/985921.986205

and cleaning up nuclear waste. Personal service robots have the highest expected growth rate. They are estimated to grow from 176,500 in 2001 to 2,021,000 in 2005 — an alarming growth rate! [UN, 2002] Personal service robots assist people directly in domestic and institutional settings. Many robots interact with people who have no special skills or training to operate the robot. The design and interaction of these robots will be critical, and raises a number of research and design challenges.

GOALS OF THE WORKSHOP

This workshop seeks to examine issues related to the design and development of social robots that act on behalf of humans without continuous input from humans.

Our goal is to provide a forum for technologists, human scientists, and designers to discuss issues related to the interactions between humans and social robots: technology, product form, function and behavior, and most importantly, human behavior, expectations, and ethical issues related to these products. We hope to identify key research issues in this field, and provide a roadmap for future research in human-robot interaction. Topics to be covered include:

Technology. Human-robot interaction cannot be studied without consideration of a robot's autonomy. The degree and type of autonomy that a robot exhibits greatly shapes its interactions with people. The interactions can range from the human doing all the work (for example, interacting with Furby [Furby, 1998], to the human and robot working as a team (for example, in care of elders [Montemerlo et al, 2002] to the human and robot ultimately partaking in a reciprocally social relationship. We hope to determine what technologies are not the most robust, but the most feasible, for human-robot interactions.

Product form, function, and behavior. The appearance and function of a product, whether it is an appliance or a humanoid robot, affects the way that people perceive it, interact with it, and build long-term relationships with it. We define form as the total expression of the product. Form includes a product's physical shape, materials, and behavioral qualities. [DiSalvo, 2003]. We hope to determine initial design guidelines for the design and development of appropriate social robots.

Human behavior and expectations. Researchers have found that whenever artifacts show intentional behavior, people tend to perceive them as characters or even as creatures, depending on their level of anthropomorphism [Nass & Reeves, 1996)]. The appearance of the robot has also been shown to strongly influence people's expectations about how it behaves [Diederiks, 2003)]. These issues will need to be carefully studied when creating intelligent robotic products. For example, if a product has a certain amount of lifelike or anthropomorphic qualities, it will need a vocabulary of expressions to rely on for human-robot interaction. This vocabulary could include emotional expressions, conversational cues, and speech. We hope to gain more insight into what influence the robot's appearance has on the interaction with it, what appropriate appearances are given a certain context, and what social communication skills a robot needs to socially interact with humans.

We plan to cover a range of topics, including concepts, theories or guidelines for design of intelligent robotic products, implementation methods, and ways to study and quantify the social effects of robotic behavior.

REFERENCES

1. Breazeal, C. (2003). Designing Sociable Robots. Cambridge: MIT Press.
2. Toyota. (2002). POD, from http://www.toyota.co.uk/infront/products/pod.htm
3. DiSalvo, C., Gemperle, F., Forlizzi, J., and Montgomery, E. (2003). "The Hug: An Exploration of Robotic Form for Communication." Paper to be presented at the 2003 Ro-Man Conference, San Francisco, CA.
4. Furby (1998). Furby, from http://www.furby.com
5. Montemerlo, M., Pineau, J., Roy, S., Thrun, S., and Verma, V. (2002). Experiences with a Mobile Robotic Guide for the Elderly. Paper presented at the AAAI.
6. UN (2002). United Nations and the International Federation of Robotics. World Robotics 2002. UN, New York.