The Help Group HelpLetter

EMERGING TRENDS IN AUTISM, LEARNING DISABILITIES AND ADHD

Can Social Robots Help Autism?
Exploring Socially Assistive Robotics For ASD Intervention

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A lack of social skills for interpersonal interaction is among the most debilitating deficits associated with autism spectrum disorders (ASD). Children with ASD have problems with joint attention, turn-taking, play behavior, and communication abilities. Over the last decade, researchers have observed that children with ASD respond socially to robots. In fact, in some contexts, children with ASD can respond better socially to computers and robots than to humans. Given this unique social paradigm, there is great potential for the use of appropriately designed and personalized robotic technologies as prospective therapeutic tools for children with ASD.

Researchers in labs around the world are investigating various aspects of how robots can interact with children with ASD. These investigations are exploring the use of robots in how they may aid in diagnosing ASD, improving social interaction with peers, and acting as social mediators between a child with ASD and other social partners. Research robots are being studied in a variety of contexts, including general social interaction, education tasks (e.g., word games), unstructured and structured play, and making music (e.g., collaborative drumming). Researchers are using social robots both to investigate potential therapeutic uses of robots for ASD, and to better understand ASD itself.

The Interaction Lab at the University of Southern California (USC) Viterbi School of Engineering is working to design and study interactive, intelligent robots that can assist individuals and improve human performance in daily and task-related activities. We focus in particular on populations with special needs, including those with developmental or other social, cognitive, or physical disabilities, as well as individuals who are recovering from trauma, rehabilitating from cognitive and/or physical injury, aging in place or are in managed care.. Many of these populations are growing rapidly in the US and world-wide. As a direct result robotics has the potential to both serve as a tool for principled, analytical study of human behavior and to provide unique assistive technologies to improve the quality of life for individuals with a wide range of needs.

We are currently pursuing the science and technology involved in enabling robots to play important helpful roles in hospitals, schools, therapy and managed care centers, and eventually homes. Our specific research focus is on **socially assistive robots (SAR)**, which are systems that provide individualized monitoring, encouragement, coaching, training, and teaching through embodied social interaction, not through physical contact with the user.

To enable robots to perform socially assistive roles, we must address complex research challenges in assistive human-robot interaction (HRI). These include enabling the

robot to understand the user's behavior, activity, and intentions as they unfold; methods for natural human-robot interaction involving both verbal and non-verbal communication; means of establishing and sustaining social engagement between the robot and the user; customized, adaptive, and personalized assistive interaction; and achieving measurable assistive outcomes.

In the context of autism, we are currently developing a child-sized robot with a humanoid upper body on a wheeled platform designed for interaction with high- and low-functioning children with ASD. This robot interacts socially through vocalization, gestures, bubble-blowing, and, when appropriate, speech. The robot is designed for both structured and free-play tasks with a child or with multiple users, such as the child and a parent or peer. We use the robot to study how the robot's appearance and behavior affect the way in which children interact with it relative to their challenges. For example, we are exploring whether socially interactive robots encourage a social response in children with ASD, and whether they can be used to encourage and train social behaviors, including joint attention, pointing, eye-contact, turn-taking, and initiating play. This and other research into robotics for potential ASD therapies is very much in its early stages, so it is premature to present any definitive results. However, we have collected a wealth of feedback about how socially assistive robots can be used with children with ASD, what types of robot forms/appearances various children may prefer, what types of social/playful interactions are more appealing than others, and how we may involve parents, siblings, and eventually peers in the interaction with the view of future therapeutic benefits.

While there is a great deal of potential for socially assistive robots as therapeutic tools, there is still a significant distance between the current state of the art in robotics and ready deployment of such robots in clinics and homes. One of the important conclusions of research to date is the need for individualizing such robot systems to the needs of each child. The ability to further customize robots is a challenging area of research, but one that holds a great deal of promise for the future of SAR. The good news is that robotics research today is making remarkable strides in its understanding of how children interact with robots, how such interactions could be beneficial to treatment, how robot-aided treatment could be integrated into current treatment, and perhaps most importantly, how any robot system can be moved out of the lab, and into the clinic, classroom, and home settings.

For more information about our work, please go to: http://robotics.usc.edu/interaction/assistive