

Program Type: Treatment Research: Special Interventions in Autism Spectrum Disorders

Grant Title: “Robotics and speech processing technology for the facilitation of social communication training in children with autism”

Grant Amount: \$200,000

Duration of Grant: July 1, 2008 to June 30, 2010

Principal Investigator: Shrikanth Narayanan

Children diagnosed with autism spectrum disorder (ASD) have varying degrees of impairments related to social interaction and communication skills. Methods for addressing these impairments often attempt to engage children with ASD in stimulating social activities that facilitate developing basic social behavior such as the tendency to share interests with others, aiming to identify the parameters that motivate or reward the improved development of self-initiation of social behaviors, joint attention, and experience-sharing. It has often proved difficult, however, to identify activities that are interesting and engaging for the diverse spectrum of children with ASD.

Children with ASD have been shown to respond socially to simple robots and computers. While interest in and engagement with machines has been reliably observed, it remains to be validated whether such interactions can lead toward improvements in the child's communication and social skill training. The goal of this study is to test and validate the possibility of transference of communication and social skills between robots and children with autism toward family, peers, and others.

The proposed pilot study brings together experts in ASD, social behavior, human communication technologies and socially assistive robotics. Their combined expertise and resources will be brought to bear, in a principled hypothesis-testing approach, not to develop new technology, but to study ways in which existing technology can be applied for effective therapeutic use. The approach to achieving these goals combines empirical and technological elements, leveraging our existing engineering capabilities in robot and computer interface design with an experimental design based on a sound theoretical framework related to shared social experiences involving children with autism. Another key aspect of the proposed work is in the use of technology to facilitate quantitative analysis of the rich interaction data. The study proposes to first examine the factors that influence the extent to which robot or computer simulations can be made to be engaging to children with autism. Then studies will be conducted to examine how robot/computer simulations may be used to facilitate communication and shared experience interactions with family and peers. A set of hypothesis-testing experiments will be performed involving intelligent robots that will model social and communicative behavior such as joint attention, imitation, and turn-taking, and aim to train and encourage such behavior in the user. The experiments will collect voice, behavior, biometric, and movement data for quantitative analysis. The data will be used to examine the social behavior patterns of the child before and following the robot assisted intervention. By establishing an engaging and socially rewarding character, we hypothesize that the robot can become a focus for shared attention and interaction with a teacher or parent.

The proposed study is expected to produce results that will enable future in-depth intervention studies of robot and computer-assisted therapies using accessible technology for communication and social skills for children with autism. The team represents an interdisciplinary partnership that brings together established engineering researchers, with broad experience in human-centered technologies but new to the field of autism research, with experts in basic and translational autism research and clinicians at the USC University Center for Excellence in Developmental Disabilities (UCEDD) at Childrens Hospital, LA where the proposed study will be conducted. This unique combination of background expertise, existing laboratory resources, and advisory collaboration with, and access to the relevant experimental participant pool from, the Autism Genetic Resource Exchange (AGRE) will enable significant strides toward understanding the potential role of technology-assisted ASD assessment and intervention.