On behavioral complexity of therapeutic robots for autism spectrum disorders

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Abstract

We discuss behavioral design of communication robots for autism therapy. Autistic people, in general, have difficulties in understanding and communicating with others; while, they often show better performance in understanding and manipulating physical objects. Through our longitudinal observation of autists-robot interaction at therapeutic institutes for autistic children, we found that autistic children liked interactions with the robot and performed socially meaningful interactions with it. Also some of the social behavior to the robot transferred to their interpersonal interaction in later. The robot is able to exhibit its attention and emotions in simple and comprehensible ways; the autistic children understood the social meaning of the robot's actions without becoming overwhelmed, which may usually happens in interaction with real persons. Here we look into why they successfully engaged in socially meaningful interactions with the robot, and search for measurable characteristics of the robot's behavior that actually made them engage in. For such measurements, we especially investigate predictability of objects' microscopic and macroscopic behavior. Microscopic predictablity is that for fine-grained (or high dimensional in spatio-temporal domains) behavior of the robot; while, macroscopic predictablity is that for coarse-grained (or low-pass filtered) behavior. We believe that autistic people are good at predicting microscopic behavior of objects, and not well at predicting macroscopic one. This may be caused by their spatio-temporal preference in attention control; this would result in their unbalanced development in social interactions and physical manipulations. Based on this prediction-based model of autists preference, we would like to discuss further on behavioral design of therapeutic robots for autism spectrum disorders.