Self-Introduction

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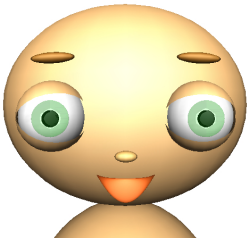
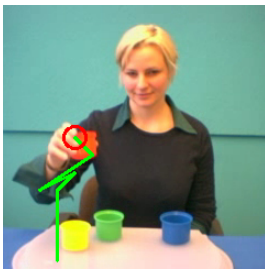
Research Summary

Learning by Interaction: A Developmental Methodology for Robot Action Learning





I discuss a new approach to robot action learning, called “learning by interaction.” Although “learning from demonstration” has been widely accepted in the field of robot imitation, the role of the teacher has attracted only minor attention. In contrast, developmental studies have suggested that parents play an important role in their infants' learning. When teaching actions to infants, for example, parents assist infants in detecting meaningful structures of the action by making pauses between movements. Learning by interaction emphasizes the importance of the way of teaching as well as the interaction.

I present our two approaches: analysis of parent-infant interaction and modeling of human-robot interaction. An open question for the first part was how parental action can properly guide infants' attention, and also robots', in spite of their little context knowledge. A difficulty for learners is the decision on where to attend and what to imitate. Our analysis using a bottom-up attention model revealed that parental action modification has the effect of highlighting the important aspects of the action [1]. The second part concerns human-robot interaction experiment investigating the way of action teaching of human partners. Our hypothesis was that a robot equipped with the bottom-up attention model gives an impression of an infant-like agent and thus induces parent-like teaching of partners. Our analysis on partner's responses found out the similar modifications in their actions to those observed in parental action [2]. I suggest from these results that the bottom-up attention is a key for robots to shape the interaction and take advantage of human scaffolding.

Representative Publications

1. Y. Nagai, C. Muhl, and K. J. Rohlfing. "Toward Designing a Robot that Learns Actions from Parental Demonstrations." In Proceedings of the 2008 IEEE International Conference on Robotics and Automation, pp. 3545-3550, May 2008.
2. C. Muhl and Y. Nagai. "Does Disturbance Discourage People from Communicating with a Robot?" In Proceedings of the 16th IEEE International Symposium on Robot and Human Interactive Communication, pp. 1137-1142, August 2007.