A Developmental Approach to Robot Action Learning

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An open question in robot action learning is how robots can detect relevant features of demonstrated actions. Robots which have no knowledge about the action nor the environment encounter the problem of not knowing what to detect and where to attend. Inspired by human parent-infant interaction, we suggest that parental action to infants can assist robots as well as infants detecting important aspects of the action. Parents are known to significantly alter their infant-directed action versus adult-directed one. They, for example, exaggerate their body movement and make more pauses between movements. Our hypothesis is that parental action modification such as suppression and addition of their body movement physically highlights the important aspects of the action, so that they can be detected by bottom-up attention.

The talk first presents our analytical experiment focusing on parent-infant interaction [1]. We found that parental action emphasized the initial and final states of a task, significant events in it, and the properties of objects used in it, which were extracted by a bottom-up attention model based on saliency. The talk then presents our human-robot interaction experiment using a robot simulation equipped with the saliency model [2]. The robot's attention was controlled so as to gaze at the most salient location in the interaction. Our qualitative analysis on people's reaction revealed that the saliency model enabled our robot to be accepted as an infant-like agent and therefore induce parent-like proper teaching of the partners. The talk will conclude with our suggestion that the bottom-up attention is a key for robots to shape the interaction and take advantage of human scaffolding for action learning [3].

References

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[3] Yukie Nagai, Claudia Muhl, and Katharina J. Rohlfing. Toward designing a robot that learns actions from parental demonstrations. In *Proceedings of the 2008 IEEE International Conference on Robotics and Automation*, pages 3545–3550, 2008.