

Cognitive Developmental Modeling of Joint Attention

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Joint attention is a cornerstone for the development of social and cognitive capabilities. Over many years, researchers in cognitive science and developmental psychology have investigated the ability and revealed the developmental process of joint attention in human infants. Their efforts motivated robotics researchers to build robots that develop the ability like infants. Based on the findings from infant studies, two kinds of cognitive developmental models of joint attention are presented. In terms of interaction with a caregiver, a learning model by which a robot learns joint attention based on task evaluation from a caregiver is reported first. A caregiver provides evaluation commensurate with the robot's performance of joint attention. At the same time, the robot develops its visual perceptual capability as learning proceeds. The refining enables the robot to efficiently acquire the well organized ability of joint attention. Next, a model focusing on the robot's self learning is presented. A robot is equipped with the ability to selectively gaze at salient visual stimuli, such as a human face and a bright colored object, and the ability to learn the sensorimotor coordination based on its own evaluation. Based on these capabilities, a robot acquires the joint attention ability by finding the contingency between the human gaze and a salient object that the human is looking at. Experimental results show that the two models enable a robot to reproduce a similar developmental process to that of infants. It means that the models could be a help for understanding the cognitive developmental mechanisms in infants.