
Cross-Task Learning by a Developmental Robot

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Abstract

Cross-task learning capability is essential for an artificial agent to explore in the real world. With this capability, an agent can learn multiple tasks and switch between different tasks based on its goal. In this paper, we propose a developmental cognitive learning architecture, which enables an agent to develop this learning capability by interacting with the environment. Mathematical formulation is derived to prove that the architecture can tackle the following three challenges in cross-task learning. 1) No task is defined in advance. The trainer teaches the agent to learn different tasks interactively and continuously through verbal commands. 2) Space and time complexities are reduced for the agent to learn new tasks with acquired knowledge from former tasks. 3) An attention mechanism is implemented for the agent to take right actions when facing ambiguous stimuli. We tested the architecture on a developmental agent for visual-auditory based navigation. The results verify the task nonspecific learning capability of the autonomous mental development (AMD) paradigm.