A Constructivist Approach and Tool for Autonomous Agent Bottom-up Sequential Learning

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Abstract : During the initial phase of cognitive development, infants exhibit amazing abilities to generate novel behaviors in unfamiliar situations, and explore actively to learn the best while lacking extrinsic rewards from the environment. These abilities set them apart from even the most advanced autonomous robots. This work seeks to contribute to understand and replicate some of these abilities. We propose the Bottom-up hiErarchical sequential Learning algorithm with Constructivist pAradigm (BEL-CA) to design agents capable of learning autonomously and continuously through interactions. The algorithm implements no assumption about the semantics of input and output data. It does not rely upon a model of the world given a priori in the form of a set of states and transitions as well. Besides, we propose a toolkit to analyze the learning process at run time called GAIT (Generating and Analyzing Interaction Traces). We use GAIT to report and explain the detailed learning process and the structured behaviors that the agent has learned on each decision making. We report an experiment in which the agent learned to successfully interact with its environment and to avoid unfavorable interactions using regularities discovered through interaction.

Keywords : cognitive development, constructivist learning, hierarchical sequential learning, self-adaptation
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