

Title: Evolution and Learning of Virtual Robots

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Abstract: Evolutionary robotics uses evolutionary algorithms to automatically design both body and controller of a robot. We describe two contributions to automated design of virtual robotic creatures. First, we introduce a nature-inspired method that allows virtual robots to modify their morphology through lifetime learning. We show that such morphological plasticity makes it possible to evolve robots that can dynamically adjust their morphology to the environment they are placed into. We also show that by reshaping the fitness landscape, learning reduces computation cost required to evolve a robot with a given target fitness even in a single environment. In the second contribution, we show that for certain problems in evolutionary robotics, premature convergence to local optima can be avoided by ignoring the original objective and searching for any novel behaviors instead (a technique known as Novelty Search).

Keywords: Evolution of Virtual Creatures, Body-brain Coevolution, Morphological Plasticity, Neural Networks, Learning