Generalizing Demonstrated Actions in Manipulation Tasks

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Abstract

Programming-by-demonstration promises to significantly reduce the burden of coding robots to perform new tasks. However, service robots will be presented with a variety of different situations that were not specifically demonstrated to it. In such cases, the robot must autonomously generalize its learned motions to these new situations. We propose a system that can generalize movements to new target locations and even new objects. The former is achieved by using a task-specific coordinate system together with dynamical systems motor primitives. Generalizing actions to new objects is a more complex problem, which we solve by treating it as a continuum-armed bandits problem. Using the bandits framework, we can efficiently optimize the learned action for a specific object. The proposed method was implemented on a real robot and succesfully adapted the grasping action to three different objects. Although we focus on grasping as an example of a task, the proposed methods are much more widely applicable to robot manipulation tasks.