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# Learning Approaches for Grasping

Grasping an object is a generically difficult task and, due to the lack of general analytical models,well-suited for learning. The system must decide both where and how to grasp the object. While selecting where to grasp requires learning about the object as a whole, the execution only needs to reactively adapt to the context close to the grasp's location. We propose a hierarchical solution that reflects the structure of these two sub-problems, and attempts to learn solutions that work for both. A hybrid architecture is employed by the controller to make use of various machine learning methods that can cope with the large amount of uncertainty inherent to the task. The controller's upper level selects where to grasp the object using a reinforcement learner, while the lower level comprises an imitation learner and a vision-based reactive controller to determine appropriate grasping motions. The resulting system is able to quickly learn good grasps of a novel object in an unstructured environment, by executing smooth reaching motions and pre-shaping the hand depending on the object's geometry. The system was evaluated both in simulation and on a real robot.