Object-Oriented Option Framework for Robotics Manipulation in Clutter

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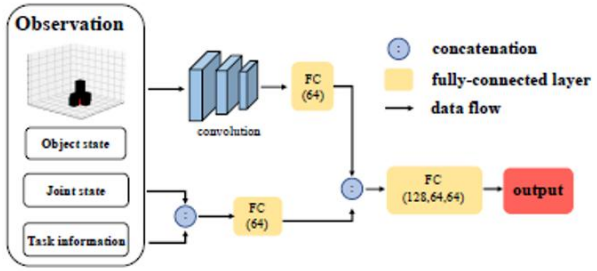
Method



Policy/value neural networks are constructed using convolutional layers followed by fully-connected layers to process object states, while fully-connected layers directly process joint states and task information.

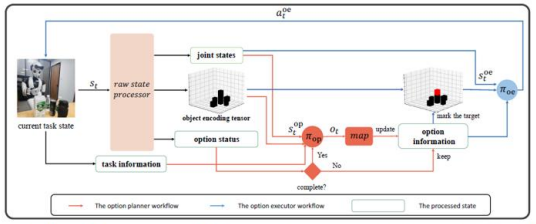
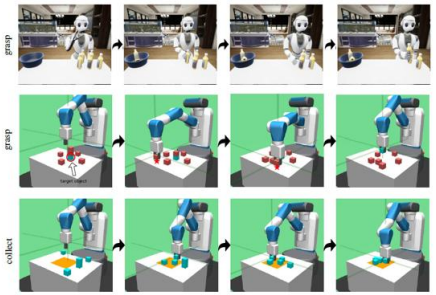


Illustration of the structure and the deployment workflow of O3F. The framework comprises two modules: the option planner π_{op} that determines the option for object movement, and the option executor π_{oe} manipulates the objects to accomplish the option task.

Experiment

(a) Grasp (Ginger XR1) (b) Grasp (c) Collect

An visualization of tasks in our experiments.
(a): Graspthe blocked orange juice with Ginger XR1.
(b): Grasp the blockedobject (cyan block) with robot arm.
(c): Collect all objects together.



Deployment examples of the policy learned by O3F on various MoC tasks.
Row 1: On a Ginger XR1 robot, O3F learns to grasp the blocked orange juice.
Row 2: In a grasping task on a robot arm, the cyan block is the target. O3F learns to move obstacles to the designated space area first and then grasp the target object. The in the ⋆ figure represents the target location of the generated option.
Row 3: O3F learns to collect all objects and place them in the specified area.