Probabilistic Slide-support Manipulation Planning in Clutter

Shusei Nagato[1], Tomohiro Motoda[1,2]Takao Nishi[1], Petit Damien[1], Takuya Kiyokawa[1], Weiwei Wan[1], and Kensuke Harada[1,2]

1. Osaka Univ., 2. AIST

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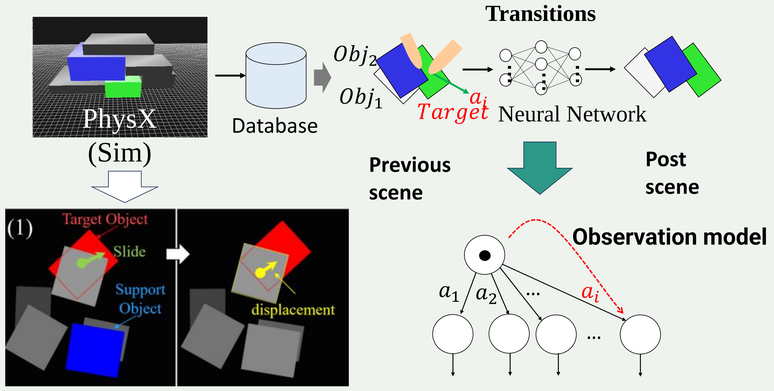
Introduction

Safely/efficiently pick items without any contact or risk of collapse?

- **Bimanual**: The robot slides the target while supporting a surrounding object
- **Efficiency**: Number of motion sequence is minimized

Collect Data/ Transitions

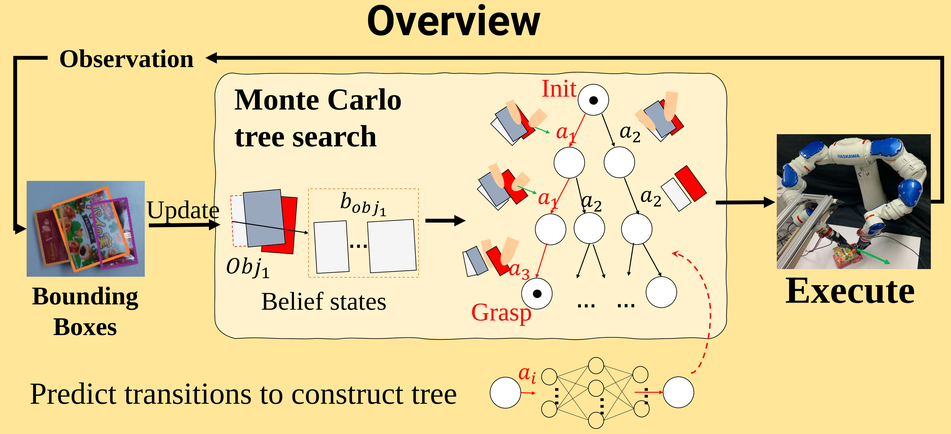
In this study, **neural networks** are used to predict the transitions. Using a simulator(PhysX, Nvidia), we will create stacked states and collect data.



"Slide-support" Manipulation

Safely and efficiently extract an object from clutter

Overview

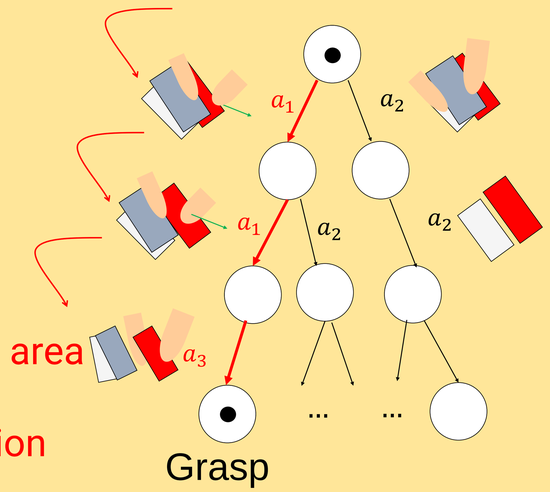


Action Planning

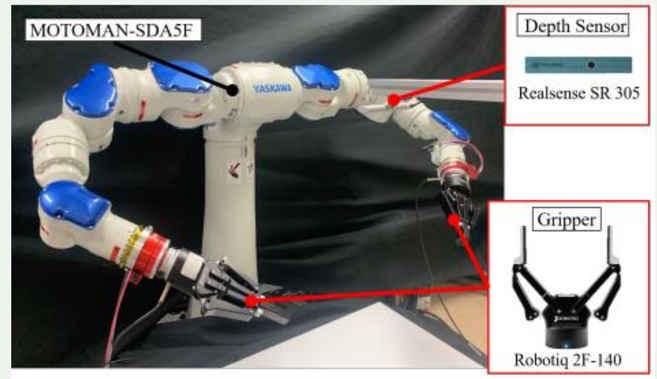
Actions:
- Support O_i
- Slide O_i
- Grasp O_i

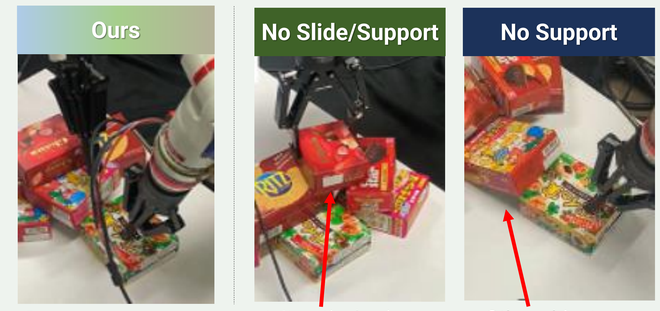
Rewards:
- Decrease in occlusion area

Penalties:
- Increase in the transition



Results





○ Avoid risk of object moving/cluttering

△ Iteratively pick up from top

× Other objects move

	Success rates	Moving amount (mm)	Action steps
Ours (w/o Slide, Support)	**8/10 (80%)**	-	3.1
Ours (w/o Support)	5/10 (50%)	129.7	-
Ours	7/10 (70%)	**65.6**	**2.7**

Summary

- Proposal of a method to extract objects from clutter using bimanual actions
- The feasibility of our **Slide-support**
- Minimize the number of operations