PSASI

(**P**hase-**S**pecific **A**gents with **S**tate **I**nterpolation) for ARNOLD Challenge

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Challenge Team: SSU Reality Lab

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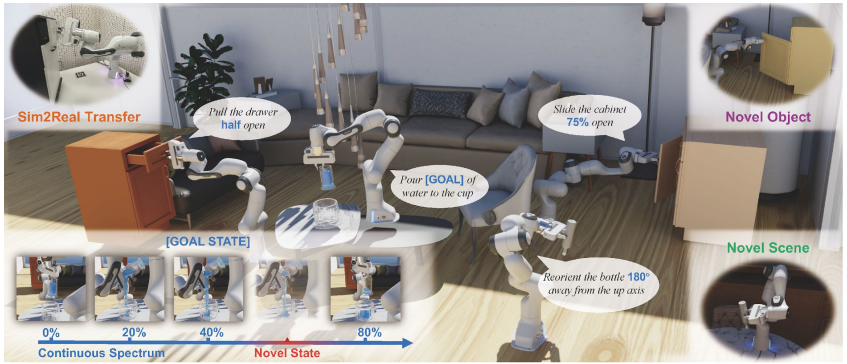
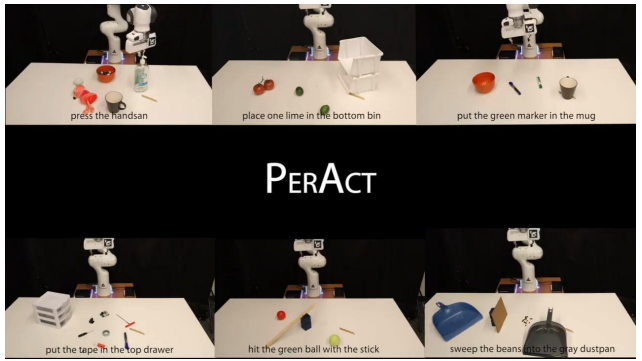
Introduction

The ARNOLD Challenge benchmarks language-grounded robotic manipulation with continuous states

Utilized the PerAct model as a baseline





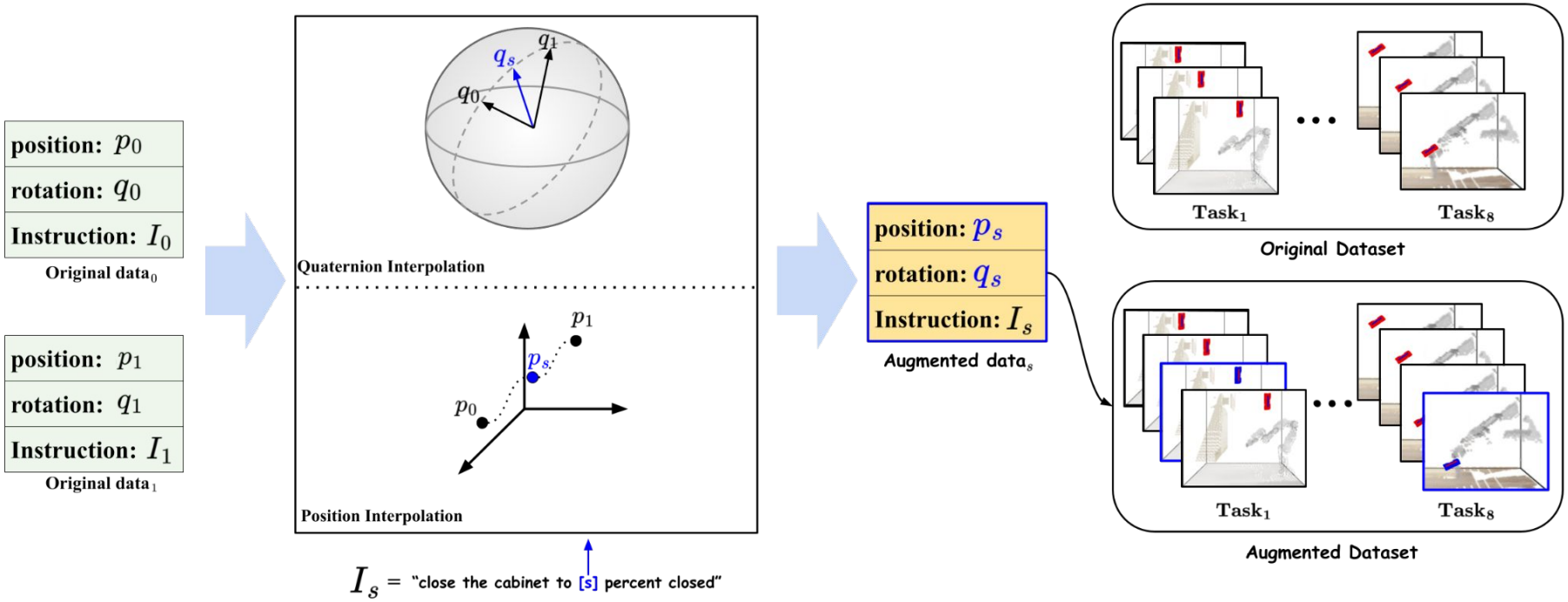
Key Approach

Phase-Specific Agents: Training agents specialized for each manipulation phase, grasping an object and manipulating it toward the goal state

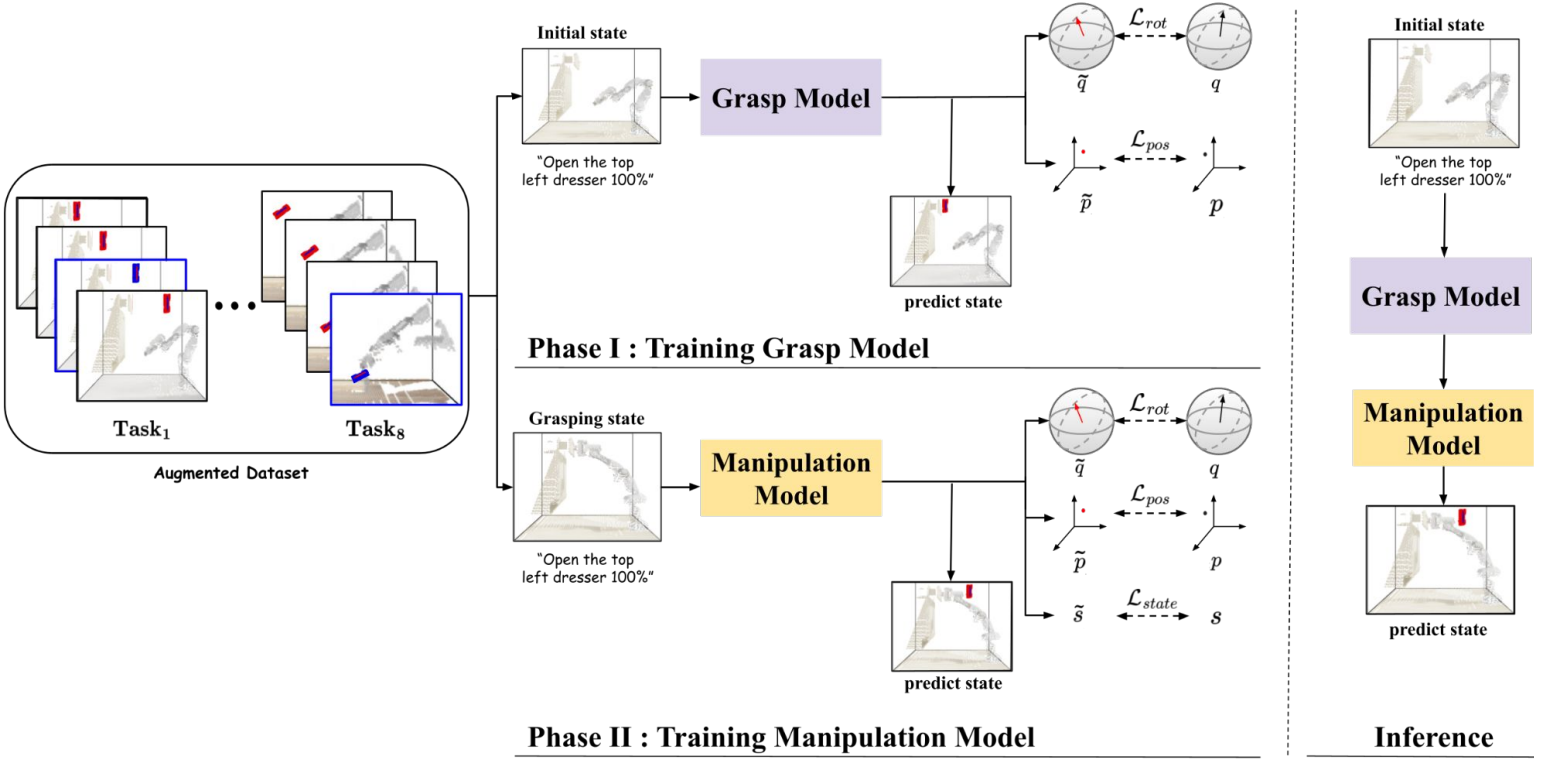
State Interpolation : Interpolating continuous goal states for data augmentation, enabling better generalization to novel states

Proposed Method : State Interpolation (SI)

Augment original state data with numbers through interpolation



Proposed Method : Phase-Specific Agents (PSA)



Results

Each component of PSASI improves the success rate of manipulation

		Method		
		PerAct†	PSA	**PSASI (Ours)**
Setting	Phase-Specific Agent (PSA)	✗	✓	✓
	State Interpolation (SI)	✗	✗	✓
Validation set	Grasp	0.46	**0.61**	**0.61**
	Manipulation	0.42	**0.58**	0.57
	Grasp + Manipulation	0.34	**0.45**	**0.45**
Test set	Grasp + Manipulation	0.22	0.28	**0.31**

† denotes baseline.

Result on Arnold Challenge

3rd Rank

Rank	Participant team	SR (↑)
1	EBDAI	0.45
2	Fun Guy (Fusion(SD&PC))	0.39
3	Reality Lab (combine_all)	0.31
4	Windboy (DT1)	0.25
5	MilkyWay	0.25
6	MCC-EAI	0.25
	Baseline B	0.22

Secured **3rd place**, showcasing a remarkable improvement over the other teams, highlighting our model's advanced capabilities and its competitive performance in the challenge.

Conclusion

Phase-Specific Agents and State Interpolation significantly enhanced our performance

- Phase-Specific Agents : Enabled **better understanding** of the **characteristics of each phase** (grasp and manipulate) and facilitated appropriate training for each phase
- State Interpolation : Augmented training data to **ensure robust performance across various states**, not just constrained ones

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Thank you

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