ViTac-Tracing: Visual-Tactile Imitation Learning of Deformable Object Tracing

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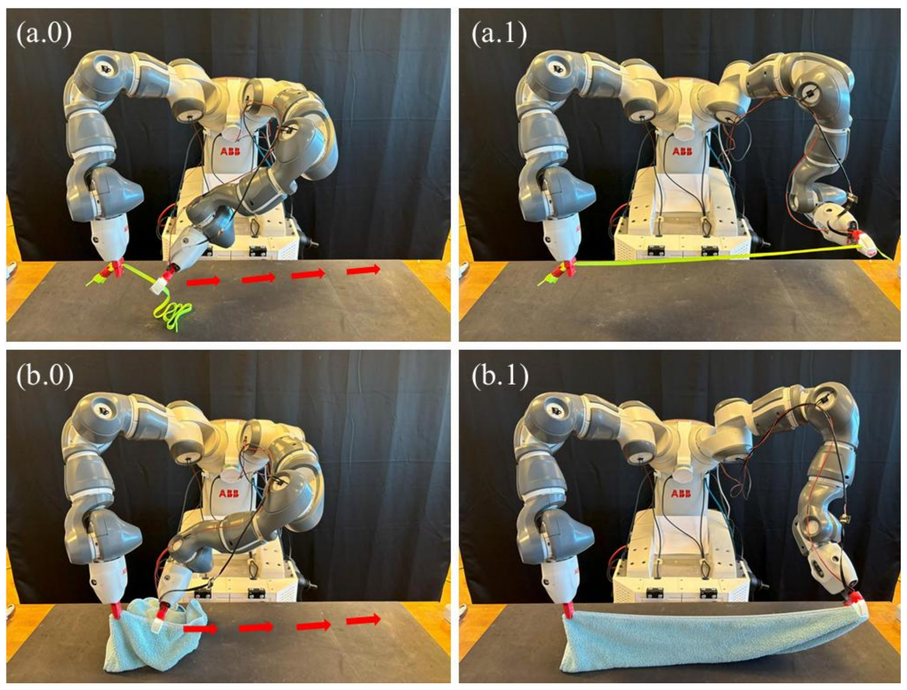
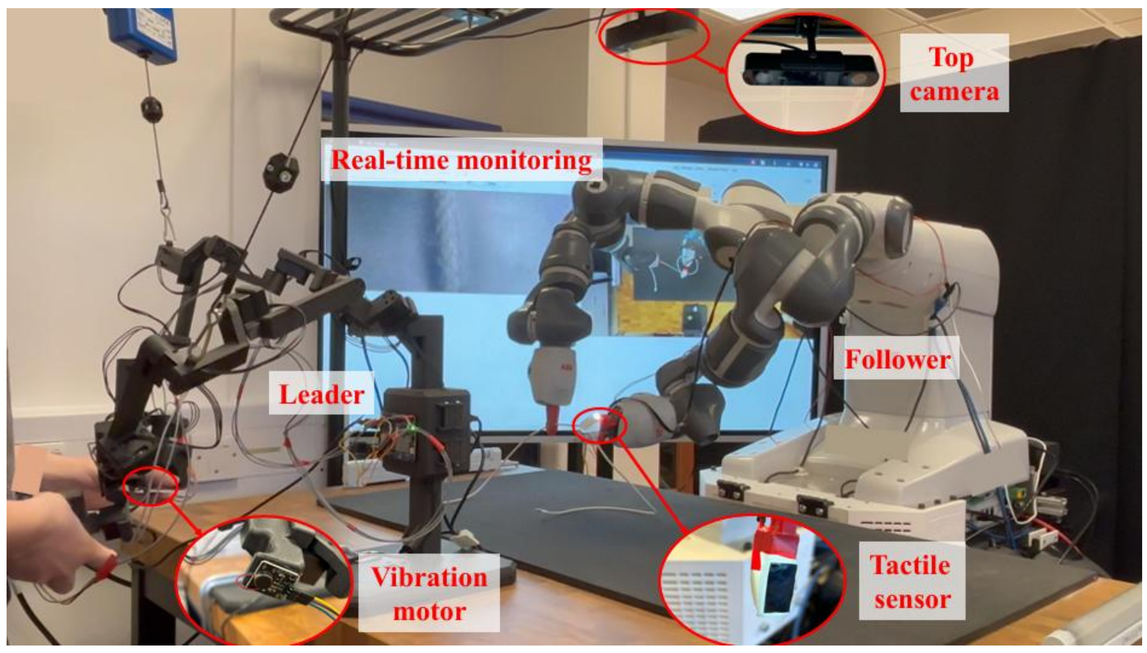
Problem Statement



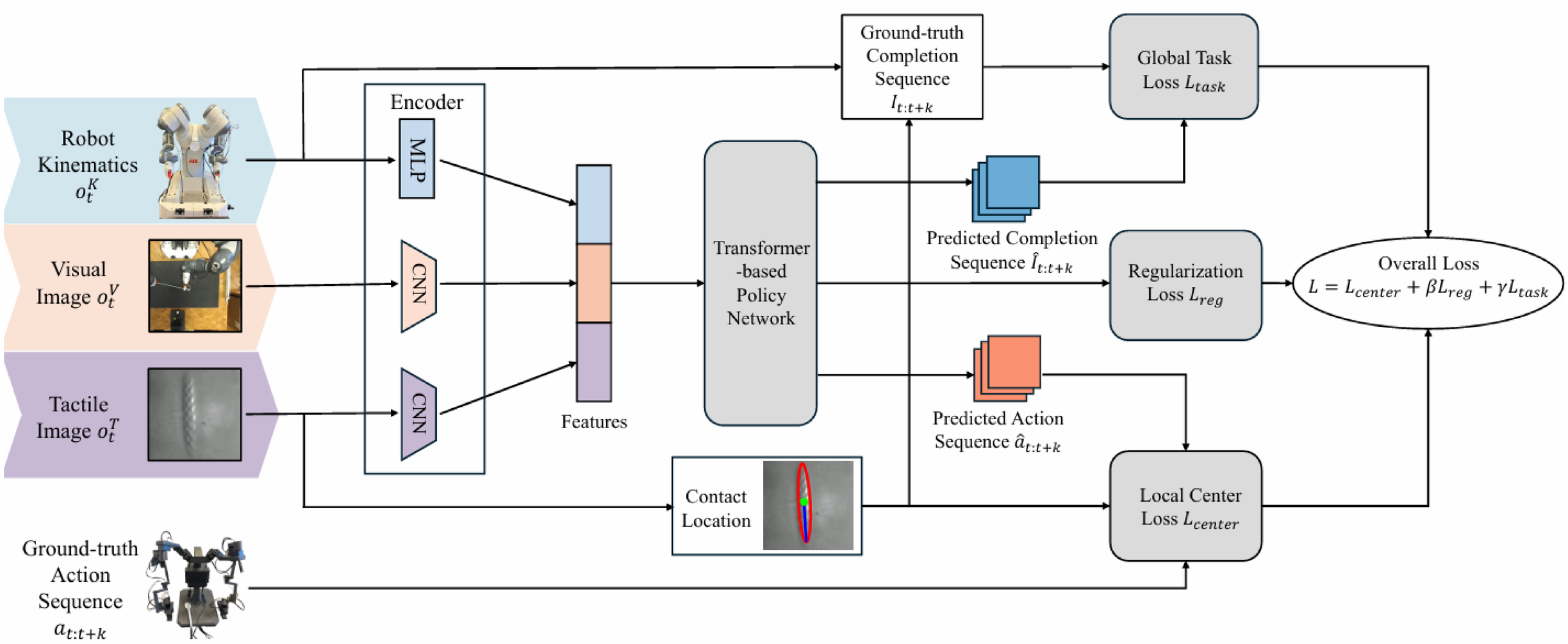
1D Deformable Object Tracing

2D Deformable Object Tracing

Visual-Tactile Teleoperation System



1D and 2D Deformable Object Tracing Policy Learning Framework



Experimental Results

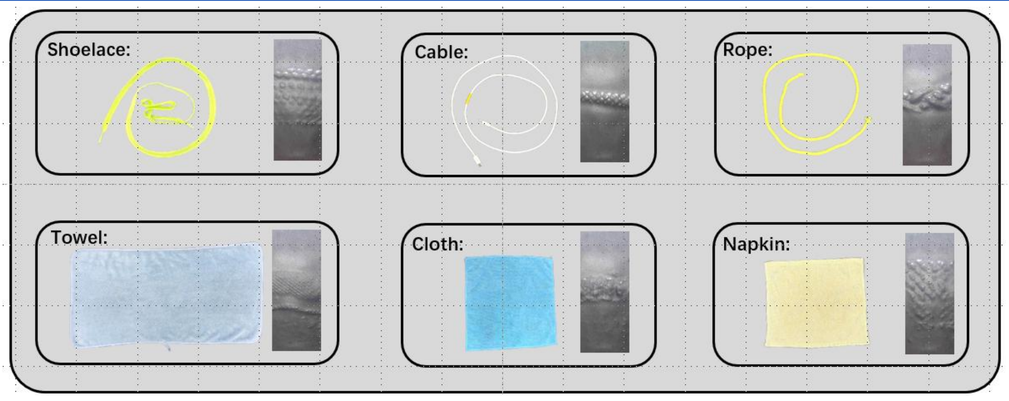
Methods	Success rate	Robot collision	Early stopping	Over-tracing	Object dropping
Joint Space	70.00%	2.50%	10.00%	5.00%	12.50%
w/o Vision	65.00%	10.0%	5.00%	20.0%	0.00%
w/o Tactile	60.00%	5.00%	12.50%	2.50%	20.00%
w/o Center Loss	65.00%	10.00%	2.5%	0.00%	22.50%
w/o Task Loss	67.50%	7.50%	7.50%	17.50%	0.00%
Ours	**80.00%**	5.00%	5.00%	7.50%	2.50%

Tab.1. Ablation experimental results to validate the effectiveness of individual components.

Unseen objects	Success rate	Robot collision	Early stopping	Over-tracing	Object dropping
Rope	70.00%	0.00%	20.00%	0.00%	10.00%
Napkin	60.00%	10.00%	0.00%	20.00%	10.00%

Tab.2. Experimental results on unseen objects..

Deformable Objects and Their Tactile Textures



Contributions

- A novel visual-tactile imitation learning framework for 1D and 2D deformable object tracing through a unified policy;
- A budget-efficient visual–tactile teleoperation system with multi-modal feedback to enrich;
- Extensive experiments validate the effectiveness and generalizability of our method.