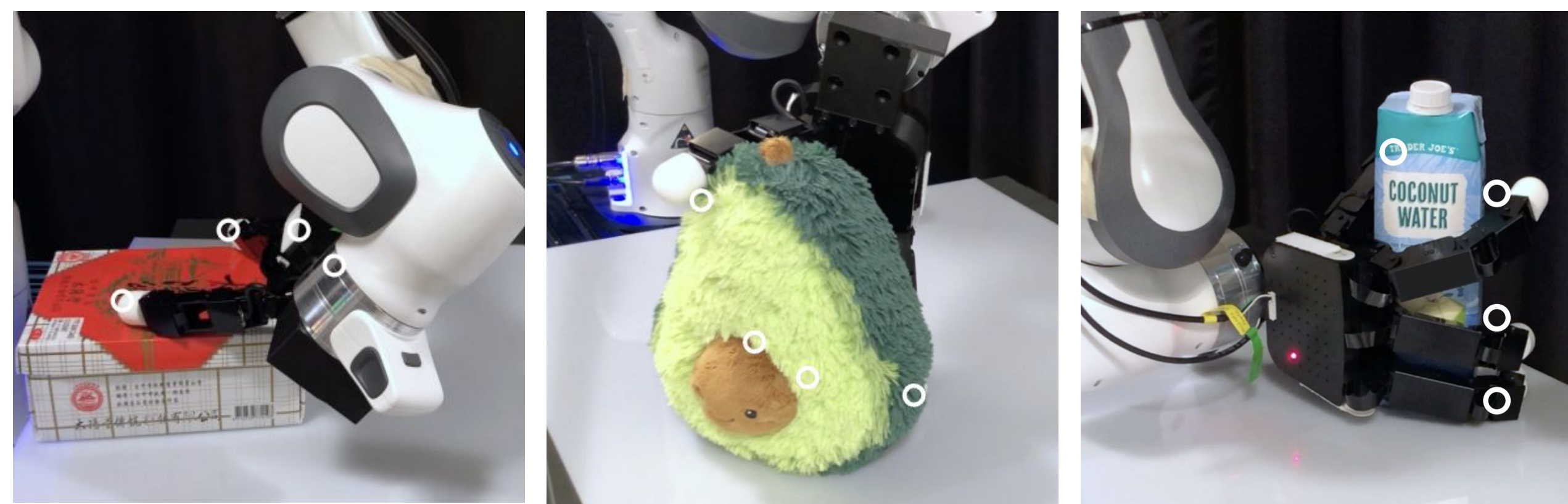
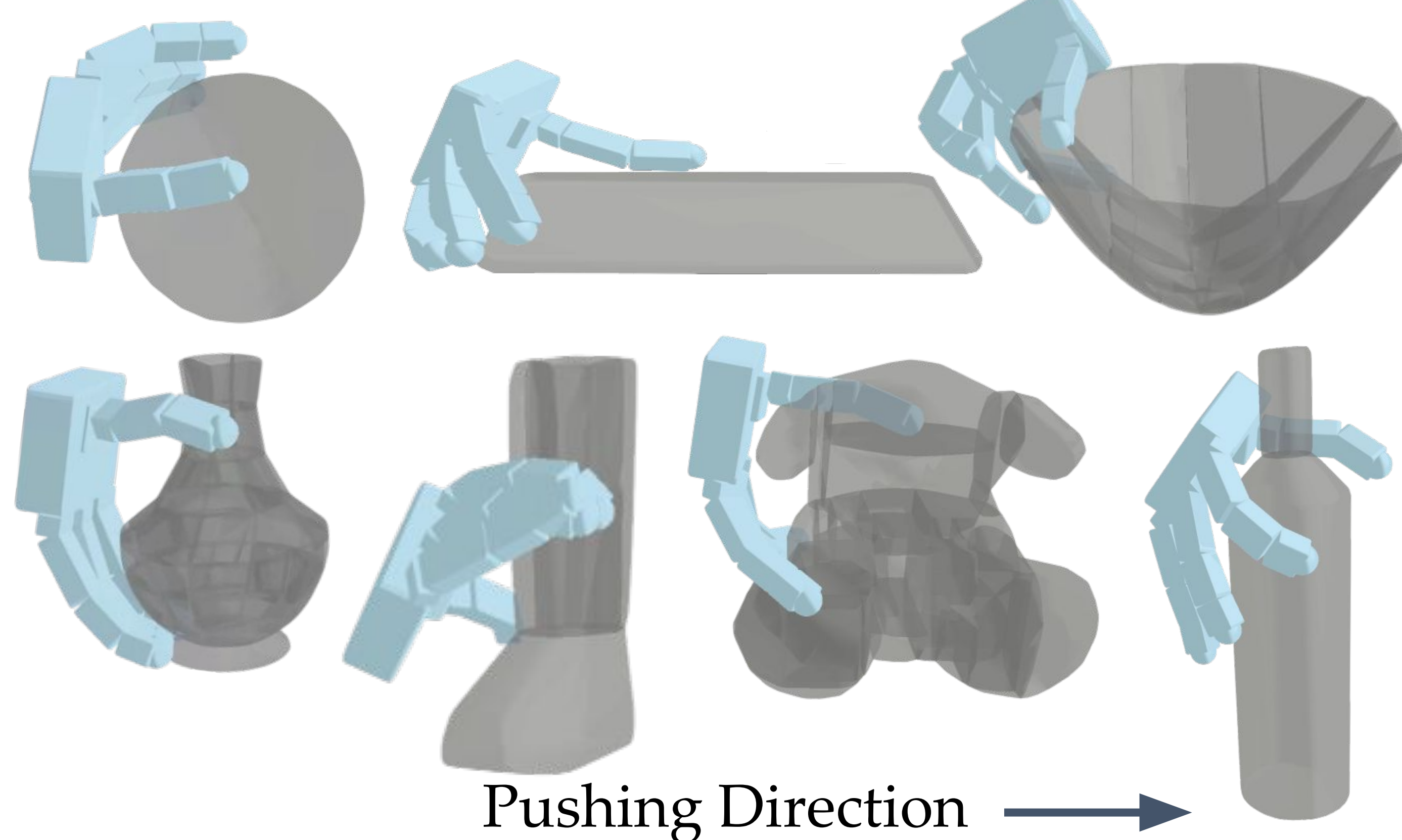


Motivation

- Non-prehensile tasks are common and useful for large and irregular shape objects.
- Dexterous hands with high degree of freedoms are compliant and useful for stabilizing objects.
- **High Dimensional Action Space compensates Complexity of Dynamics** of the system.

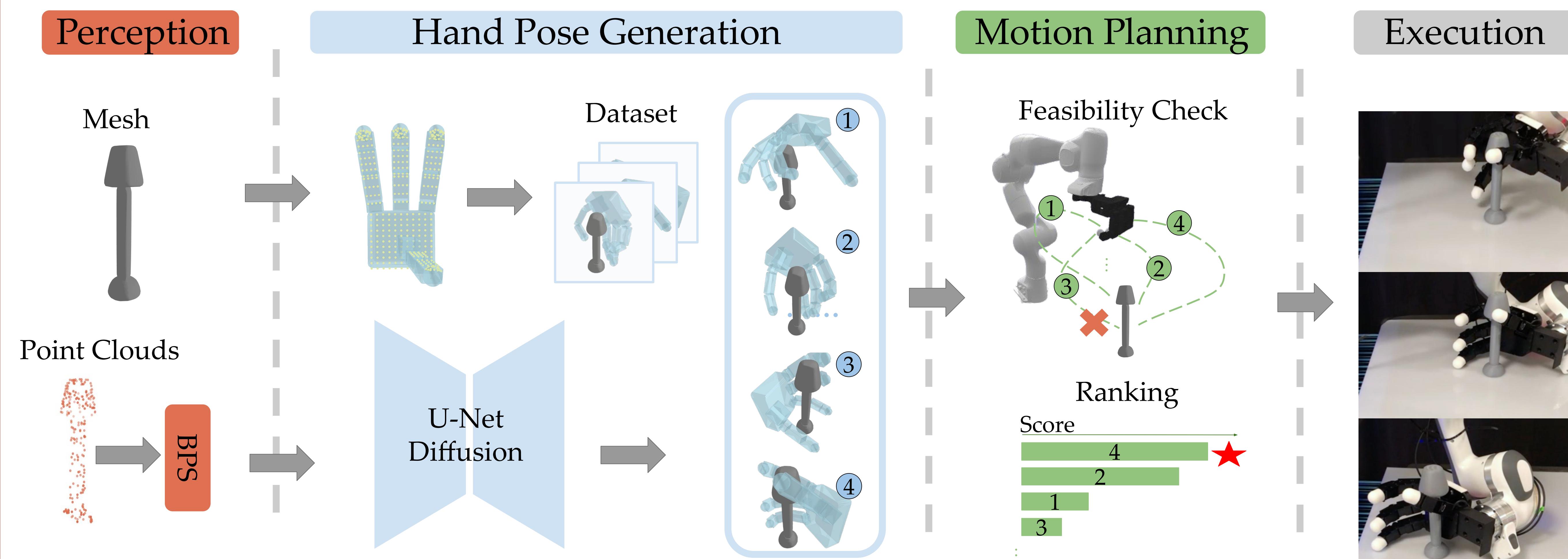


Dataset Visualization



Dataset of 1.3 M hand poses over 2.3k objects.

Method Overview



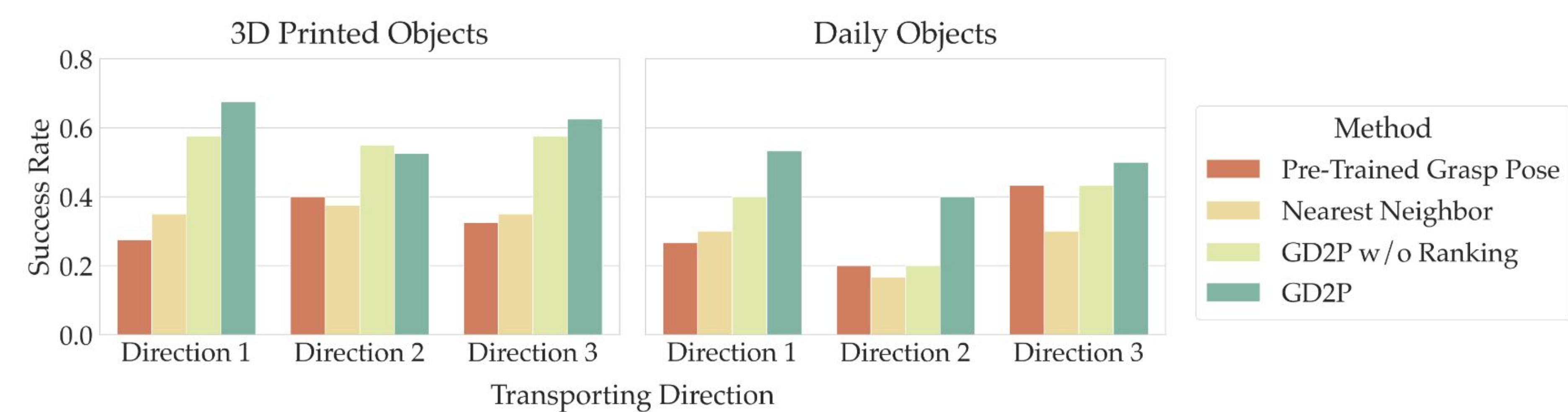
We propose **Geometry-aware Dexterous Pushing and Pulling (GD2P)** for nonprehensile manipulation with dexterous robotic hands.

Experiments Results

Data Size	# of Objects
2%	41.67 ± 10.21
20%	102.67 ± 5.85
50%	110.33 ± 29.67
100%	169.33 ± 15.18

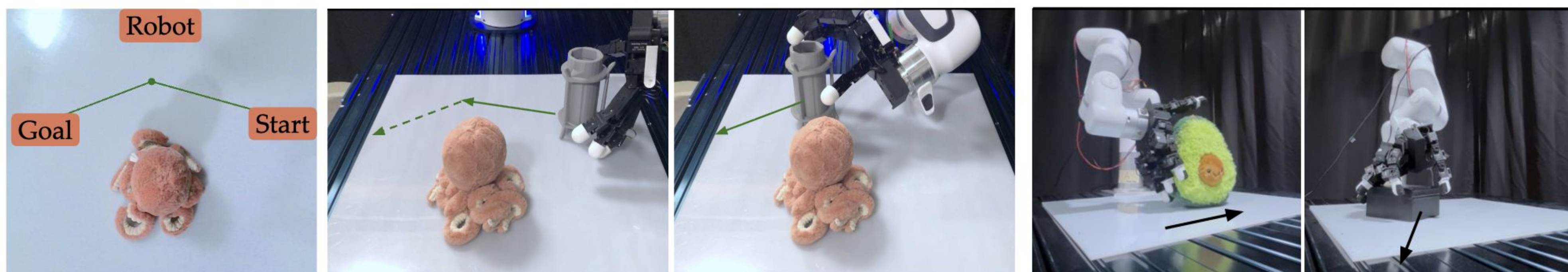
TABLE I: Number of objects with ≥ 1 feasible pushing hand pose out of 300.

Simulation



Real World Robot Experiments

Extended Evaluation



- **Long-horizon Composition:** multi-step pushes using GD2P, which avoids the central obstacle to achieve long-horizon push.
- **Embodiment Agnostic:** GD2P achieves consistent performance across various robotic hands.

Conclusion

- We propose GD2P, a dataset and method for nonprehensile object pushing and pulling using high-DOF robotic hands.
- We hope this inspires future work on dexterous nonprehensile manipulation.