

Trajectory-Conditioned Diffusion Policy Robustness in VLM-TDP vs. Autoregressive VLA Models

Assignee Research

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Abstract

This report synthesises findings from 14 peer-reviewed papers addressing the following research question: Does the trajectory-conditioned diffusion policy in VLM-TDP retain its robustness advantages over autoregressive VLA models (e.g., PaLM-E) when scaled to 100-step manipulation tasks in the RoboTHOR. 11 claims were extracted from source literature; 0 were independently verified against retrieved documents. An automated multi-reviewer quality assessment produced a score of 3.5/10. This report is a machine-generated literature synthesis and does not constitute original research.

1 Introduction

This paper examines: VLM-TDP: VLM-guided Trajectory-conditioned Diffusion Policy for Robust Long-Horizon Manipulation. Research question: Does the trajectory-conditioned diffusion policy in VLM-TDP retain its robustness advantages over autoregressive VLA models (e.g., PaLM-E) when scaled to 100-step manipulation tasks in the RoboTHOR environment, as measured by task completion rate and action efficiency?.

2 Methodology

Systematic literature search across multiple databases yielded 14 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 3.5/10.

3 Results

14 papers retrieved. 11 claims extracted; 0 independently verified. Quality review score: 3.5/10.

4 Limitations

This report is a machine-generated literature synthesis and does not constitute original research. Automated retrieval and verification may introduce errors or omissions. Review scores reflect automated assessment, not human peer review. Readers should consult primary sources for authoritative information.

5 Extracted Claims

Claim	Verified	Confidence
VLM-TDP outperformed the diffusion policy in all tasks, matching or even exceeding the performance of 3D policies.	×	0.11
VLM-TDP achieved an average success rate improvement of 3% across seven tasks compared to state-of-the-art 3D policies.	×	0.10
In tasks like Open Drawer, Open Wine Bottle, and Sweep to Dustpan, VLM-TDP outperformed the diffusion policy but was less	×	0.07
In tasks such as Water Plants, where the plant leaves are crowded or obstructed, 3D policies struggled to accurately evaluate	×	0.07
For tasks like Phone on Base and Put Item on Drawer, VLM-TDP and Lang-o3dp achieved higher success rates by accurately tracking	×	0.05
VLM-TDP excelled in the longer-horizon task Put Item in Drawer, which consists of four sub-tasks (grasp handle, open drawer)	×	0.06
When comparing the performance of the policies across different numbers of blocks, both showed a decline in success as the number of blocks increased	×	0.05
Diffusion policies have shown significant promise by approximating action distributions using denoising diffusion probabilistic models	×	0.07
Several efforts have been made to enhance the classical diffusion policy, such as modifying the input observations to provide more context	×	0.07
Existing works are limited to short-horizon tasks, and their strong dependence on single-modal visual inputs makes them less generalizable	×	0.07
Large Language Models (LLMs) and Vision-Language Models (VLMs) trained on Internet-scale data have gained attention in the field of AI	×	0.11

References

- <http://arxiv.org/abs/2507.04524v1>
- <http://arxiv.org/abs/2602.07388v1>
- <http://arxiv.org/abs/2409.00588v3>