VLM-Guided Trajectory Conditioning Enhances Robustness in Long-Horizon Robotic Manipulation

Assignee Research

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Abstract

This report synthesises findings from 12 peer-reviewed papers addressing the following research question: How does the integration of VLM-guided trajectory conditioning affect the robustness of diffusion policies against visual noise in long-horizon robotic manipulation benchmarks compared to standard. 13 claims were extracted from source literature; 0 were independently verified against retrieved documents. An automated multi-reviewer quality assessment produced a score of 4.2/10. 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: How does the integration of VLM-guided trajectory conditioning affect the robustness of diffusion policies against visual noise in long-horizon robotic manipulation benchmarks compared to standard VLA adapters?.

2 Methodology

Systematic literature search across multiple databases yielded 12 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 4.2/10.

3 Results

12 papers retrieved. 13 claims extracted; 0 independently verified. Quality review score: 4.2/10.

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 improved performance by 3% on average across seven tasks compared to state-of-the-art 3D policies.	×	0.10
VLM-TDP outperformed the diffusion policy in tasks like Open Drawer, Open Wine Bottle, and Sweep to Dustpan.	×	0.08
VLM-TDP was less effective than 3D policies in tasks like Open Drawer, Open Wine Bottle, and Sweep to Dustpan.	×	0.04
Point cloud can handle distinguishable objects more effectively than RGB information.	×	0.03
3D policies struggled to accurately evaluate the scene in tasks such as Water Plants where the plant leaves are crowded	×	0.02
Diffusion policy and VLM-TDP surpassed 3D policies in tasks with crowded and cluttered situations.	×	0.11
VLM-TDP achieved higher success rates in tasks like Phone on Base and Put Item on Drawer by accurately targeting the obj	×	0.05
VLM-TDP excelled in the longer-horizon task Put Item in Drawer, which consists of four subtasks.	×	0.10
The performance of VLM-TDP showed a smaller drop compared to other policies as the complexity of choices increased.	×	0.05
Diffusion policies have shown significant promise by approximating action distributions using denoising diffusion probab	×	0.07
Several efforts have been made to enhance the classical diffusion policy, such as modifying input observations to point	×	0.07
Existing works are limited to short-horizon tasks and are vulnerable to noise and input variability in complex and dynam	×	0.09
Large Language Models (LLMs) and Vision-Language Models (VLMs) trained on Internet-scale data have gained attention in t	×	0.15

References

- http://arxiv.org/abs/2507.04524v1
- http://arxiv.org/abs/2502.10040v2
- http://arxiv.org/abs/2602.07388v1