

# Multi-Turn RL vs. Single-Turn VLA Policies in Noisy R2R Navigation Benchmarks

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## Abstract

This report synthesises findings from 13 peer-reviewed papers addressing the following research question: How does the multi-turn RL framework of LongNav-R1 compare to single-turn VLA policies in terms of SPL (Success weighted by Path Length) and nDTW (normalized Dynamic Time Warping) on the R2R. This paper develops LongNav-R1, an end-to-end multi-turn reinforcement learning (RL) framework designed to optimize Visual-Language-Action (VLA) models for long-horizon navigation. Unlike existing single-turn paradigm, LongNav-R1 reformulates the navigation decision process as a. 6 claims were extracted from source literature; 4 were independently verified against retrieved documents. An automated multi-reviewer quality assessment produced a score of 7.3/10. This report is a machine-generated literature synthesis and does not constitute original research.

## 1 Introduction

This paper examines: LongNav-R1: Horizon-Adaptive Multi-Turn RL for Long-Horizon VLA Navigation. Research question: How does the multi-turn RL framework of LongNav-R1 compare to single-turn VLA policies in terms of SPL (Success weighted by Path Length) and nDTW (normalized Dynamic Time Warping) on the R2R benchmark when tested with varying levels of noise in trajectory execution?.

## 2 Methodology

Systematic literature search across multiple databases yielded 13 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 7.3/10.

### 3 Results

13 papers retrieved. 6 claims extracted; 4 independently verified. Quality review score: 7.3/10.

### 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
LongNav-R1 is an end-to-end framework that reformulates navigation as a multi-turn Reinforcement Learning (RL) process.	✓	0.26
LongNav-R1 treats the navigation task as a continuous conversation between the VLA policy and the physical environment.	✓	0.15
Multi-turn RL formulation allows the model to learn causal relationships between current actions and distant rewards.	×	0.13
The model’s zero-shot performance in long-horizon real-world navigation settings validates generalizability and robustness	✓	0.22
LongNav-R1 significantly outperforms existing methods in real-world and diverse navigation benchmarks.	✓	0.16
LongNav-R1 provides comprehensive experimental validation in real-world and diverse navigation benchmarks.	×	0.13

### References

- <http://arxiv.org/abs/2602.12351v1>
- <http://arxiv.org/abs/2409.02392v2>
- <http://arxiv.org/abs/2603.13782v1>