Diffusion Generative Flow Samplers: Improving Learning Signals Through Partial Trajectory Optimization

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Overview

Legged Locomotion Challenges

Emerging Topic in Legged Robotics

Terrain-aware locomotion has become an emerging topic in legged robotics. However, it is hard to generate diverse, challenging, and realistic unstructured terrains in simulation, which limits the way researchers evaluate their locomotion policies.

GFlowNet's Role in Addressing Terrain Benchmarking Challenges

Key Challenges for Terrain Benchmarking

To achieve reliable quantification of robustness, terrain samples should resemble real terrains in the wild. The generation process should be controllable to produce high-quality terrains that are challenging to a user-specified extent. Finally, the sampler must maintain terrain quality and diversity simultaneously.

- GFlowNet ensures high-quality terrains and diversity among those included in the final benchmark by providing probabilistic sampling from unnormalized distributions.
- It addresses realism through flow-based modeling of complex terrains.
- Controllability via reward-guided active learning for user-specified challenges.
- Quality-diversity balance through efficient exploration of terrain spaces.

Conclusion