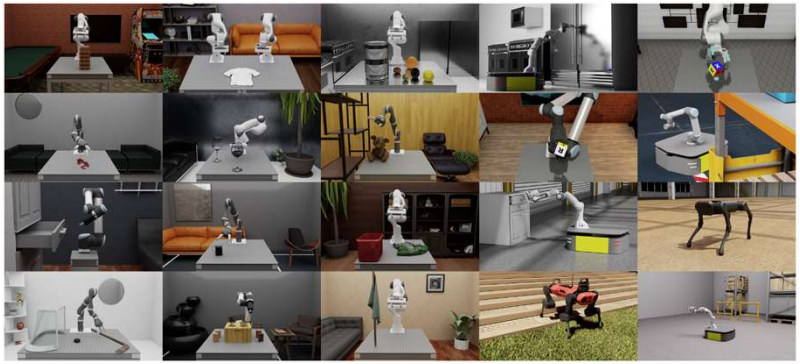
SA/BA/MA-Proposal: Development of GPU Accelerated Robotic Reinforcement Learning Benchmark

Introduction

Reinforcement learning (RL) has gained significant traction in the field of robotic manipulation, offering the potential to develop robust and adaptive robotic systems. Existing benchmarks, such as OpenAI Gym and Meta-World, have provided remarkable resources for the RL community by offering standardized environments for testing and evaluating algorithms. However, these platforms have limitations that can hinder progress in more complex and realistic robotic applications in terms of scalability, multi-agent scenarios, and real-to-sim transfer.

This thesis project proposes the development of a new benchmark for robotic manipulation tasks using recent NVIDIA's Isaac Sim simulator. Isaac Sim is a high-fidelity simulation environment that leverages GPU acceleration to enable scalable and realistic robotic simulations. This project aims to address the limitations of existing benchmarks by incorporating advanced features such as multi-agent interactions, real-to-sim reconstruction methods, and language embedding for task inferences.



Methodology

1. Environment Setup: Utilize Isaac Sim to create a diverse set of robotic manipulation tasks, including both single-agent and multi-agent scenarios.
2. Benchmark Development: Design a set of evaluation metrics and protocols to assess the performance of RL algorithms on the proposed benchmark.
3. Integration of Real-to-Sim Reconstruction: Implement methods for transferring real-world data into the simulation to improve the fidelity and relevance of the benchmark.
4. Language Embedding Integration: Incorporate natural language processing techniques to enable RL agents to interpret and execute tasks based on textual descriptions.
5. Evaluation: Test and compare various state-of-the-art RL algorithms on the developed benchmark, analyzing their performance and adaptability.

Requirements

1. Semester/Bachelor/Master thesis with at least six months full time.
2. Solid Python coding skills, fluent English and/or Chinese speaking.
3. Desktop PC/laptop has minimum computation resources with ≥6GB Nvidia GPU (e.g., RTX 2070 and more advanced version)
4. Knowledge reserve in reinforcement learning will be a plus.
5. Outstanding/competitive transcripts score (≤2.3) will be a plus.

Contact

If you are interested in the topic, please send your resume and transcripts as well as a brief introduction of yourself to my email address.

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