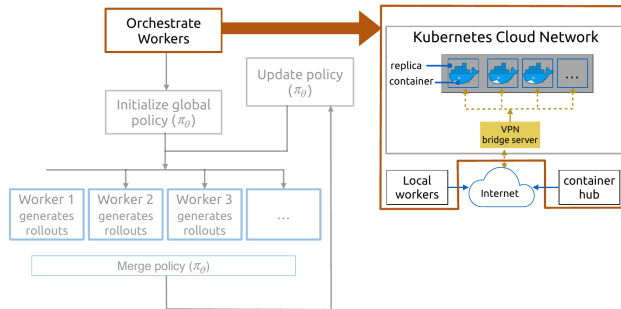
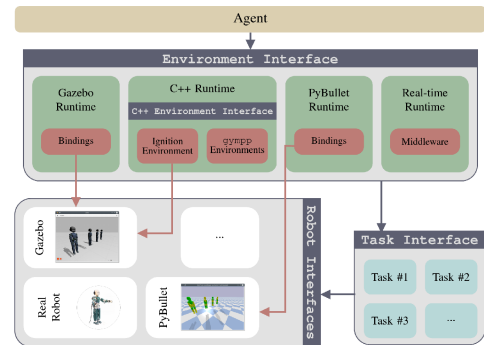


Master Thesis: Parallelized Robot Simulation with Domain Randomization in the Cloud

ROBOT_GYM: workflow



1



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Reinforcement Learning methods allow to master complex tasks like rotating a cube in a robotic hand trained in simulation only². To scale such a learning process it needs to be highly parallelized. Two existing frameworks for this are *gym-gazebo*, presented at ROSCon 2018¹ and *gym-ignition*³. While they offer a good starting point with preexisting simple environments, there are important features missing: (1) rollout and synchronization of multiple instances using Kubernetes container orchestration and (2) the application of domain randomization (change degrees of freedom that are not known or could vary during execution) to create more robust policies that transfer better to reality.

Your Tasks

At first you search and discuss related work on parallelized robot simulation. Based on that you set up a simulation software to scale in a cloud cluster. This will be enhanced by domain randomization of configurable parameters that is automatically applied and rolled out to simulation workers. Your results are compared to available information about parallel simulation with domain randomization and demonstrated on a reinforcement learning problem.

Requirements

- Profound knowledge in Python
- A course that covered Reinforcement Learning (e.g. EDAN95)
- Independent, diligent and structured way of working
- (Optional) Experience with Linux

Start Date

- Immediately or later

Key Words

- Cloud, Docker, Kubernetes
- Robotics, Simulation
- Reinforcement Learning

SARS-CoV-2

Due to the newly discovered coronavirus, the university performs remote education. This project will be conducted remotely on cloud infrastructure and supervision can happen with video calls.

¹ ROSCon 2018 Madrid: Accelerated robot training through simulation with ROS and Gazebo <https://vimeo.com/293299416>

² "Learning Dexterity" <https://openai.com/blog/learning-dexterity/>

³ "Gym-Ignition: Reproducible Robotic Simulations for Reinforcement Learning" <https://github.com/robotology/gym-ignition>