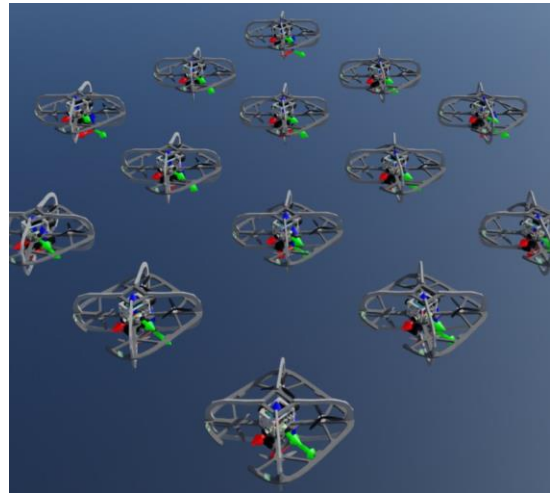


## High-Level Flight Stack Integration with PX4 in Isaac Lab

This project, developed in close collaboration with the NVIDIA Isaac Lab team, enables closed-loop simulation between Isaac Lab and PX4, one of the most widely used open-source autopilot stacks for autonomous aerial vehicles. A dedicated plugin will run the PX4 flight controller alongside the Isaac Lab physics engine, exchanging control commands and state estimates bidirectionally so that PX4 operates as it would on real hardware, but entirely within simulation. This enables reinforcement learning policies to be trained directly in the loop with a realistic, production-grade flight controller, interacting with the full PX4 stack including its state estimator, mode logic, and actuator mixing, making learned policies significantly more transferable to real platforms.



### Tasks:

- Develop an Isaac Lab plugin with real-time bidirectional communication between Isaac Lab and PX4
- Handle protocol translation and timing synchronization to preserve PX4's internal control loops
- Validate closed-loop simulation against known flight behaviors and reference trajectories
- Demonstrate RL policy training in the loop with the full PX4 flight stack

### Literature:

- [1] Mittal, Mayank, et al. "Isaac Lab: A GPU-Accelerated Simulation Framework for Multi-Modal Robot Learning." *arXiv preprint arXiv:2511.04831* (2025).
- [2] Meier, Lorenz, et al. "PX4: A node-based multithreaded open source robotics framework for deeply embedded platforms." *ICRA* (2015).
- [3] Panerati, Jacopo, et al. "Learning to Fly - a Gym Environment with PyBullet Physics for Reinforcement Learning of Multi-agent Quadcopter Control." *IROS* (2021).

**Relevant Projects:** Norwegian Centre for Embodied AI, SPEAR, ORIGAMI

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