Multicopter System Identification Tool for Isaac Lab Using Newton

This project, developed in close collaboration with the NVIDIA Isaac Lab team, bridges the sim-to-real gap for multirotor platforms by building a differentiable multicopter model in Newton and integrating it with Isaac Lab as a system identification tool. A dedicated plugin ingests real-world flight logs as ground truth and differentiates through the simulator to iteratively update trainable model parameters, such as motor time constants, thrust and torque coefficients, inertia tensor components, and drag terms - until simulated behavior closely matches the real vehicle. The result is a practical digital twin pipeline requiring no manual parameter tuning beyond standard flight log data, lowering the barrier to high-fidelity multirotor simulation and laying the groundwork for broader differentiable simulation workflows across other robotic platforms.

Tasks:

- Implement a high-fidelity multirotor simulation in Isaac Lab
- Implement a pipeline to match parameters according to real flight data in
- Investigate methods to identify flight regimes that are not covered by the flight data provided to collect data specifically for these regimes

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] Shi, Guanya, et al. "Neural Lander: Stable Drone Landing Control Using Learned Dynamics." *ICRA* (2019).
[3] Jonas Eschmann, et al. "Data-Driven System Identification of Quadrotors Subject to Motor Delays", IROS (2024)

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

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