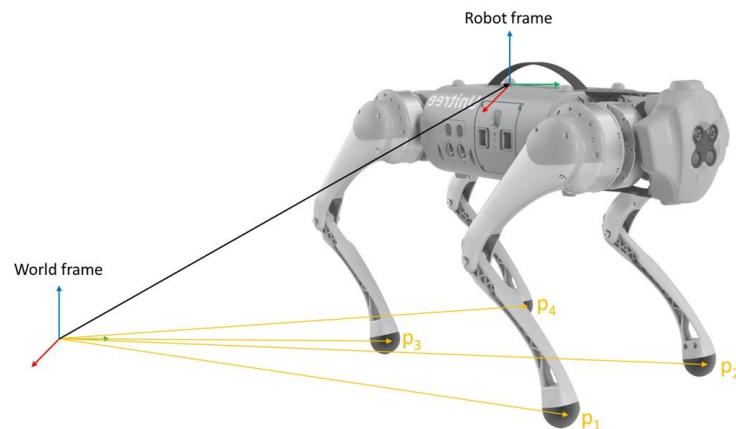# Thesis Topic: Proprioceptive state estimation for quadruped robots

What's this about?

Develop and implement a real-time state estimator for a 12 DoF quadruped robot that fuses proprioceptive sensors (IMU, joint encoders, and foot pressure sensors) to estimate robot pose and velocity in the world frame. Pure inertial estimation suffers from drift, so the estimator will utilize foot-ground contacts and kinematics to bound errors. The estimator will be evaluated in simulation on flat terrain using a 12 DoF quadruped model.

What will you learn?

- Probabilistic filtering for robotics.
- Contact detection and slip rejection strategies
- Basics of legged locomotion

Why is this important?

Reliable pose estimation is essential for stability, navigation and motion generation. Exteroceptive sensors (camera, LiDAR) provide a more accurate estimation but are computationally expensive and require more complex integration. In contrast, proprioceptive estimation is faster and always available, making it a practical baseline for the development of quadruped robot controllers.

Keywords: State estimation, sensor fusion, quadruped robot, contact detection, drift reduction.

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