

# Master Thesis – Reduction of Footstep Noise through Touchdown Velocity Control in Quadruped Robots

Legged robots are increasingly deployed in human-centered environments, where acoustic noise becomes an important factor for acceptance and usability. In quadruped robots, foot-ground impacts during locomotion are a significant source of noise, with the velocity of the foot at touchdown playing an important role in the resulting impact. This thesis investigates how controlling the foot velocity shortly before touchdown can be used to reduce locomotion-induced noise.

## Research Area and Background

This thesis focuses on the development of control approaches for regulating the velocity of quadruped robot feet during the final phase of the swing motion. The work combines robot control with acoustic analysis to investigate the relationship between **foot touchdown velocity and resulting sound emissions**. The research contributes to the development of quieter locomotion strategies for quadruped robots operating in human-centered environments.



## Your Tasks and Research Challenges

- **Characterize the relationship between foot touchdown velocity and acoustic emissions** through systematic experiments with different locomotion speeds and touchdown conditions
- **Develop a control strategy** that reduces foot velocity during the final phase of the swing motion while maintaining stable locomotion
- **Integrate the controller** with an existing quadruped locomotion policy and investigate its influence on the overall gait
- **Evaluate the approach** in simulation and, where possible, on a real quadruped robot, comparing the resulting sound emissions and locomotion behavior with a baseline controller

## What we offer at the Machine Intelligence and Robotics Lab!

- You'll get to learn a lot about our current research and gain some real hands-on experience
- We use the latest robotics hardware and newest ML libraries, as well tools like ISAAC Lab, ROS2, etc.
- We are a team of international, motivated robotics enthusiasts and would be happy to have you join us
- You will get encouraging support from your supervisor and honest feedback to improve your skills
- We offer flexible working hours and a great working environment in our Mairo Lab

**Type:** Master's thesis

**Date:** As soon as possible

**Supervisors:** Prof. Dr. Arne Rønnau, M. Sc. Katharina Kohl

## Do you want to work on cutting edge robotics research?

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We look forward to receiving your application (incl. current grade transcript)!

