

Bachelor Thesis – Analysis of Acoustic Emissions in Legged Robots

Legged robots are increasingly deployed in human-centered environments, where acoustic noise becomes a critical factor for acceptance and usability. The origins of noise in legged systems are still insufficiently understood. This work aims to enhance the understanding, and the gained insights can provide a foundation for the design of quieter legged robots.

Research Area and Background

This thesis is situated at the intersection of **robotics**, **acoustics**, and **signal processing**. It focuses on the analysis of noise generation mechanisms in legged robotic systems, combining experimental methods with data-driven signal analysis. The work contributes to the broader field of robot design for human-centered environments, where acoustic performance is an increasingly important factor.



Your Tasks and Research Challenges

- **Design** and set up an **experimental framework** for recording acoustic data on a legged robot
- **Perform systematic experiments** under varying locomotion conditions (e.g., speed, gait)
- Ensure **reproducible measurements** and proper synchronization with robot motion data
- **Analyze recorded signals** in time and frequency domains (e.g., impulse detection, FFT)
- **Identify** and distinguish **dominant noise** sources such as foot-ground impacts and actuator noise
- Correlate acoustic events with specific phases of the locomotion cycle
- **Quantify** the **relative contribution** of different noise sources to the overall sound emission

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: Bachelor's thesis

Date: As soon as possible

Supervisors: Prof. Dr. Arne Rönnau, M. Sc. Katharina Kohl

Do you want to work on cutting edge robotics research?

Contact: Katharina Kohl, katharina.kohl@kit.edu

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

