

Alexander Rief

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Summary

Mechatronics graduate (B.Sc., University of Innsbruck / UMIT Tirol) with a background in control system design, embedded implementation, and robotics simulation. Currently applying to M.Sc. Robotics, Cognition, Intelligence at TU Munich. Experience deploying controller code to STM32 hardware and validating system behaviour against simulation baselines.

Education

B.Sc. University of Innsbruck & UMIT Tirol, Mechatronics – Industrial Mechatronics Innsbruck, Austria
 • GPA 1.9 (Austrian scale: 1 = best); Hans-Riegel-Fachpreis in Mathematics Oct 2022 – Mar 2026
 • Thesis: Linear control of a general n-trailer system; implemented PID, pole placement, and LQR in C++ on STM32; validated on physical multi-trailer testbed against PyMoskito simulation results

Projects

N-Trailer LQR Control Oct 2025
 • Derived kinematic model for a general n-trailer chain; implemented gain-scheduled LQR via CARE and time-varying LQR by integrating the matrix Riccati ODE backward over the reference trajectory using `scipy solve_ivp`
 • Ported controller logic to STM32 in C++; built on existing motor driver layer to add closed-loop state feedback and onboard data logging
 • Validated on physical testbed; S-shaped and straight-line trajectories with up to three trailers; documented deviations between simulation and hardware behaviour – github.com/alexanderrief/n-trailer-lqr-control

Mobile Robot State Machine Mar 2026
 • Coursework project (Applied Robotics, WS 2024/25, grade: 1.0): state machine coordinating a mecanum-wheel platform and 6-DOF manipulator for pick-and-place (simulation framework provided by course staff)
 • Trapezoidal velocity profiles with axis synchronization (longest axis sets duration); P-controller with feedforward clamped to 110% max velocity corrects positional drift each timestep
 • Computed grasp targets via SE3 frame transforms (`spatialmath`); 0.8 m standoff geometry decouples approach direction from object position – github.com/alexanderrief/mobile-robot-state-machine

CSV Session Logger July 2025
 • Session-based CSV logger for robotics bench tests; enforces channel registration before logging to prevent untracked column accumulation mid-run; three NaN-fill strategies (none / ffill / mean) for asynchronous multi-rate sensor channels
 • CLI entry point (`csl`) for channel listing, duration inspection, and configurable matplotlib plots without opening a Python session; published on PyPI – github.com/alexanderrief/csv-session-logger

Skills

Programming: Python, C/C++, MATLAB, Git

Control & Robotics: LQR (gain-scheduled, time-varying), PID, Pole Placement, Luenberger Observer, State Feedback, Kinematic Modeling, Finite State Machines, Trajectory Generation

Simulation & Tools: PyMoskito, Exudyn, scipy, spatialmath

Embedded & Hardware: STM32 (C++), controller deployment, onboard data logging, physical testbed validation, Linux

Languages: German (native), English (C1 – TOEFL iBT 110/120)