

RUSTAMKHON OZODKHONZODA

Robotics and Mechatronics Engineering | State estimation and control for mobile robots

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PROFILE

Third-year Robotics and Mechatronics student at the University of Sheffield, on track for First Class Honours, focused on state estimation and control for mobile robots. Recently tested the claims of a published ROS 2 sensor-fusion system against its source code and a public dataset: two of three did not hold, and the work exposed a failure mode the paper had not described.

PROJECTS

FusionCore verification study ROS 2, C++, Python 2026
Independent study of a published 23-state UKF (arXiv:2605.25239) github.com/rustamoz/fusioncore-verification

- Reproduced the author's filter to within 2.6 m of his own output, then tested three of the paper's claims against its source code and the University of Michigan NCLT dataset.
- Showed the paper's proposed GPS velocity check cannot catch the failure it targets: its arithmetic is off by 1,000× (3.4 m/s, not 3,400), and it passes the one corrupted fix that reached the filter.
- Traced multi-minute GPS lockouts to a corrupted fix slipping through the chi-squared gate after a real signal loss; confirmed with RTK ground truth that the ~1,000 fixes rejected afterwards were almost all good.
- Added a C++ switch to freeze the paper's novel filter state; a controlled 2×2 ablation found no evidence that it improves accuracy, and traced the differences to GPS lockouts.
- Fixed four benchmark-harness defects (recordings were up to 95% duplicate timestamps); published an attributed fork (Apache 2.0) with unit tests, analysis scripts, a technical report and animations.

Autonomous Mobile Robot Embedded C, PIC microcontroller University of Sheffield

- Built a PIC-based robot: PWM motor control via an H-bridge, closed-loop navigation from IR sensors and wheel encoders, and beacon tracking with obstacle avoidance.
- Assembled and debugged the control board from a schematic, following a V-model from requirements to physical testing.

Mechatronics Robot Challenge Team project University of Sheffield

- Designed the mechanical structure and manipulator in Autodesk Fusion, 3D-printed custom parts, built the sensor and actuator circuitry, and refined design and control logic through arena testing.

SKILLS

Robotics software: ROS 2 (Jazzy), C++, Python, Embedded C, MATLAB, Linux (Ubuntu), Git and GitHub

Estimation and control: Unscented Kalman filtering, chi-squared outlier gating, trajectory evaluation (ATE, RPE), root locus, Bode and Nyquist analysis, lead/lag compensator design

Embedded and hardware: PIC microcontrollers (PWM, ADC, timers, interrupts, I²C), IR and encoder interfacing, circuit assembly and debugging, MPLAB X, Autodesk Fusion CAD, 3D printing

EDUCATION

University of Sheffield, B.Eng. Robotics and Mechatronics 09/2023 – 06/2027

On track for First Class Honours. Control, mechatronics, embedded systems and Kalman filtering.

EF Academy Oxford, International Baccalaureate Diploma 09/2021 – 05/2023

HL Physics, Mathematics AA, Business Management; academic excellence awards in four subjects.

EXPERIENCE

Coca-Cola CCI Revenue Growth Management Intern, Dushanbe 07/2024 – 09/2024

- Ran pricing, market-penetration and competitor analysis; identified a key sales issue whose resolution contributed to a record sales month (August 2024, +110%).
- Produced daily distributor stock and sales reports for the C-suite; presented to management on the 2025 plan.

Tcell Project Management Intern, Dushanbe 08/2023 – 09/2023

- Conceived and led 'Makon', a prototype booking super-app, from market analysis and forecasts to a pitch to the CEO.

Education First Market Research Intern, remote 07/2022

- Ran a data-driven competitive analysis of UK boarding schools in Excel; the findings fed into an advertising campaign in Oxford.

ADDITIONAL

Languages: English, Russian and Tajik, all fluent

Certifications: Alternative Investments (Harvard Business School), Bloomberg Market Concepts. **Award:** Harvard Student Agencies investment competition finalist