

Emrullah Celik

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Professional Summary

Controls & Firmware Engineer specializing in real-time, safety-critical MCU systems. Experienced in signal processing, state estimation, and model-based control for robust production deployment. Proven record shipping control stacks from architecture to mass production.

Skills

Controls & Robotics: PID, LQR, CLF/CBF, MPC, RLS, EKF/Kalman, FIR/IIR, Optimal Control

Software & Tools: Python, C/C++, Assembly, Verilog, Linux, PyTorch, ROS, Git, Docker, FreeRTOS, LTSpice

Hardware & Interfaces: SPI, I2C, UART, CAN, DMA, STM32, nRF52, Jetson Nano, Raspberry Pi

Professional Experience

Embedded Control Software Engineer, SharkNinja, Needham, MA Jun 2025 – Present

- Led embedded control features from concept through mass production for multiple STM32-based consumer products, defining system architecture, control algorithms, and validation workflows.
- Designed real-time fluid control for a high-pressure pump in a water filtration system using PID with adaptive feedforward, meeting strict settling and overshoot constraints in production
- Engineered thermal control for an espresso boiler using PID with Smith Predictor compensation to mitigate transport delay and maintain temperature stability under variable steam demand
- Designed cross-unit calibration from noisy potentiometer signals to normalize grind size across manufacturing variability and ensure consistent product performance
- Designed flowmeter ISR driver with high-pass noise filter and flow-rate-adaptive coefficient selection, correcting nonlinear sensor response and improving volumetric accuracy by 5x
- Developed a predictive dosing algorithm (Kalman filter + RLS) that eliminated grinding overshoot, adapted to bean and unit variability, improved accuracy by 10x, and reduced BOM cost by avoiding relay-based redesign
- Mentor incoming engineers and co-ops in control design, debugging, and documentation standards

Graduate Research Assistant, Boston University, Boston, MA Sep 2023 – May 2025

- Designed and implemented a differentiable QP-based CLF-CBF controller for a 5D vehicle model, enabling gradient-based tuning of safety and stability constraints via end-to-end optimization.
- Deployed the controller within a CARLA-based mixed-reality HIL framework integrating physical robots and digital twins over ROS for closed-loop validation.
- Developed deep-learning LiDAR/camera fusion for real-time state estimation in a safety-critical QP control loop.

Embedded Software Intern, Giner Labs, Waltham, MA May 2023 – Aug 2023

- Designed LTSpice-modeled drive circuits and Nordic MCU firmware for wearable electrochemical sensors.
- Integrated custom drive circuit with nRF52 and built Python-UART interface for real-time data visualization.
- Built Arduino firmware and drive circuitry for prosthetic knee gait analysis.

Software Developer, IKON R&D, Ankara, Turkiye Dec 2021 – Aug 2022

- Built Docker-based OpenVINS/VINS Fusion environments for custom IMU/camera hardware.
- Implemented EKF-based sensor fusion for visual-inertial navigation and optimized C++ code for image processing.

Education

Boston University, Boston, MA

M.S. Systems Engineering, GPA: 3.90/4.00

Middle East Technical University, Ankara, Turkiye

B.S. Electrical & Electronics Engineering, GPA: 3.72/4.00, High Honors

Publications

S. Ahmad, E. Sabouni, **E. Celik** *et al.*, “A Mixed-Reality Testbed for Autonomous Vehicles,” *IROS*, under review, 2026.

Selected Projects

MPC-Based Autonomous Overtaking Controller, Python 2025

- Formulated a receding-horizon MPC controller for autonomous overtaking in CARLA, with IMU-GPS EKF fusion for state estimation; benchmarked against LQR and PID baselines across speed and curvature scenarios.

Swarm UAV Surveillance & Obstacle Avoidance, Python 2020

- Designed distributed coverage and obstacle avoidance algorithms for a multi-UAV swarm in disaster scenarios, enabling autonomous coordination; achieved 3rd place in Teknofest Swarm UAV Competition.

Bare-Metal E-Ink Display Driver with SPI-DMA, C++ 2025

- Developed a bare-metal embedded driver for an e-ink display featuring SPI-DMA transfers, partial refresh scheduling, and joystick-based UI navigation; optimized refresh cycles for low-power continuous operation.

Real-Time Sound-Responsive Motor Controller, ARM Assembly 2022

- Implemented real-time frequency-domain sound classification directly in ARM Cortex-M4 assembly, driving closed-loop motor speed and RGB LED output with no OS or HAL overhead.

Embedded Home Security System with Face Recognition, Python 2022

- Deployed real-time face recognition on a Jetson Nano with automated Google Drive event logging and a SQLite-backed incident database; designed the full pipeline from camera capture to alert dispatch.

Multi-Cycle CPU & FPGA POS Terminal, Verilog HDL 2021

- Designed and verified a multi-cycle CPU in Verilog with ModelSim testbenches; extended the platform to a fully functional FPGA-based POS terminal with VGA display output.

Professional Development

Deep Learning Specialization, Coursera (DeepLearning.AI),

Machine Learning, Coursera (Stanford University)

Awards & Fellowships

Dean's Fellowship, Boston University,

2023–2024

Graduate Research Assistantship, Boston University,

2024–2025