

Michael Malachowski | Senior Embedded Software Engineer

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Purdue University | B.S. Electrical Engineering, May 2017 | Presidential Scholarship

Embedded software engineer with 8+ years of experience developing C/C++ control systems and engineering tools, taking unfamiliar problems from feasibility through requirements, design, implementation and verification.

EXPERIENCE

Elan Industries

Remote | Greenbrier, TN

Senior Software Engineer

Nov 2022 - Present

- **Architected and developed a distributed control system for walk-in coolers and freezers.**
Developed system and software specifications from basic customer requirements and implemented STM32 controller and touchscreen software in C/C++ with TouchGFX/FreeRTOS. Owned visual design and screen flows for temperature monitoring, alarms and operation, incorporating customer feedback. Used an alarm matrix and FMEA-style analysis to define fault messages and recovery steps.
- **Developed a configurable thermostat firmware platform supporting more than ten product variants.** Built a graphical utility for customers and product teams to edit temperature ranges and switching thresholds, then export configurations without routine engineering handoffs. Developed AC zero-cross switching software that reduced relay arcing and dramatically improved endurance in testing.
- **Reverse engineered undocumented appliance controls.** Recreated PIC16 firmware for battery-powered smart coffee-carafe lids from oscilloscope measurements. Implemented coffee-level sensing, freshness-timer displays and low-power sleep/wake, improving capacitive-touch reliability. For a separate heated carafe, reimplemented the brewer's AC-power-line protocol with edge detection and filtering, restoring reliable communication despite power-supply interference.
- **Modernized embedded build, diagnostic and release infrastructure** by migrating legacy GCC builds from nmake to CMake/Ninja and building Python tools for firmware flashing and live diagnostics. Added host-side C/Python tests, automated firmware and configuration checks, and versioned release packages with checksums, making builds repeatable and releases easier to verify.
- **Established AI-assisted development workflows** for coding, testing and documentation, and trained the software team. Built a platform coordinating 15+ persistent AI agents with distinct responsibilities, durable task ownership, event-driven scheduling and recovery. Automated work monitoring, time tracking and email organization to reduce administration and keep requirements and follow-ups visible.

TECHNICAL SKILLS

Languages and toolchains: C, C++, Python, CMake, Ninja, GCC, IAR Embedded Workbench

Embedded platforms and HMI: ARM Cortex-M, STM32/NXP, AVR/PIC, FreeRTOS, TouchGFX, emWin

Hardware and debugging: Board bring-up, schematic analysis, JTAG/SWD, oscilloscopes, logic analyzers, UART/SPI/I2C, RS-485

Test and verification: Host/target testing, Robot Framework, automated release checks, requirements traceability

CI/CD and release engineering: GitHub Actions, Docker, Git, PTC Integrity, Jira; configuration management, release automation

Wireless: Nordic nRF BLE, ESP32 Wi-Fi, ESP-IDF

AI development tools: Codex, Codex App Server, multi-agent orchestration, local LLMs, RAG, ComfyUI

EXPERIENCE CONTINUED

Electrolux

Senior Electronics Software Engineer

Software Development Engineer

Springfield, TN

Nov 2019 - Nov 2022

Jul 2018 - Nov 2019

- **Led oven-control-board software development as the subject-matter expert.** Developed NXP Kinetis hardware-abstraction layers and peripheral drivers in C, including appliance Class B safety functions and factory diagnostics. Brought up and integrated new control boards, coordinated releases, and provided day-to-day technical direction and mentoring to two junior engineers.
- **Modernized firmware release tooling and workflows.** Replaced fragile manual procedures and batch scripts with Python/PTC Integrity automation integrated with Jira, producing controlled, versioned firmware and configuration packages. Jira notified testers of new releases and, after test approval, prompted engineers to prepare production-release candidate packages for project management, reducing manual coordination across the release process.
- **Reengineered combined UI and oven-control firmware for a replacement MCU with half the memory.** Moved the application to an NXP KE17 during the semiconductor shortage, refactoring it to preserve existing features, compatibility and performance.
- **Diagnosed intermittent MCU lockups and firmware faults.** Combined target-state capture, schematic analysis and waveform measurements to investigate failures during EMC and reliability testing and isolate hardware/firmware interactions.

Lutron Electronics

Embedded Engineering Intern

Coopersburg, PA

Summers 2015 and 2016

- **Reduced embedded hardware test cycles from hours to minutes** by building reusable Python/Robot Framework libraries and microcontroller-based test fixtures.
- **Defined system requirements for wireless-device fault reporting** with engineering and product stakeholders, specifying how a commercial lighting-control system should detect, communicate and present device faults.

SELECTED PERSONAL PROJECTS

- **Miara - Nutrition and workout application.** Built a personal fitness application combining a searchable food library and barcode-based food logging with workout tracking and personalized, equipment-aware training plans. Implemented the Python/FastAPI/SQLite backend with recoverable background jobs, automated Docker releases through GitHub Actions, and tested backup restoration.
- **Persistent conversational AI bot.** Built a conversational bot for group and private chats with long-term recall, media understanding and collaboration with other AI agents. Implemented retrieval-augmented generation (RAG) in Python with SQLite FTS5 and semantic search, plus durable queues, deduplication and receipt-based delivery recovery.
- **Purdue IEEE Aerial Robotics - Captain / Electrical Lead (2015-2017).** Led a 30+ student team developing a custom UAV and an STM32/ARM Cortex-M4 flight controller. Implemented sensor and motor interface firmware and designed and laid out the controller PCB in Eagle CAD.