Rahul Raja

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Summary

Embedded Engineer with 1+ years of experience in real-time control and diagnostics across battery management and industrial systems. Specializes in C-based embedded development, safety-critical firmware design, and system-level validation. Proven success delivering robust fault handling, hardware interfacing, and energy system intelligence in cross-functional environments. Experienced in HIL frameworks, serial communication protocols, and FMEA-driven software reliability.

Skills

Programming & Scripting: C, Python, SQL, MATLAB, Scala, Chisel, LaTeX.
Embedded Systems: Embedded C, Micrium OS, DMA, real-time firmware development, control loop tuning, distributed system architecture.
Control Systems & Modeling: Simulink, PID/PD controllers, system modeling, feedback control design, error crc algorithms.
Battery & Energy Systems: BMS diagnostics, state machines, fault modeling, thermal runaway detection.
Protocols & Standards: Automotive Ethernet, UDS (basic knowledge), SDLC, FMEA.
Tools & QA: JMP, MiniTab, version control, Monte Carlo analysis, MATLAB toolchains.

Work Experience

Karh, Battery Managment System Intern, Ann Arbor, MI **May 2025 - Present**

- Designed BMS logic using Simulink and Embedded C, improving thermal fault detection response time by 22% while enabling real time loop tuning in distributed embedded environments.
- Simulated battery systems in LTspice, identifying drift during charge cycles and enabling 15% improvement in transient stability across custom RLC configurations.
- Implemented thermal runaway detection tests in Simulink and Python, reducing false positives by 28% and validating sensor response accuracy under rapid charge-discharge transitions in prototype battery modules.

University of Michigan, Research Assistant, Ann Arbor, MI **May 2024 - Aug 2024**

- Modeled PID feedback loops in Simulink, reducing steady-state error by 12% and enabling adaptive control strategies for autonomous lab-scale systems.
- Applied JMP and FMEA to identify failure patterns, reducing board-level error propagation by 22% across early-stage hardware runssetup.
- Documented hardware validation results in LaTeX, streamlining internal reviews and supporting publication of technical findings on analog circuit design and control analysis.

Hitachi, Embedded System - Intern, Chennai, India **May 2022 - Jul 2022**

- Developed Micrium OS firmware for automation controllers, improving timing accuracy by 19% and enabling real-time industrial actuation across variable input conditions.
- Optimized compute-intensive routines using loop unrolling and memory access alignment, reducing instruction cycles and boosting system throughput.
- Collaborated on schematic-level design and hardware peripheral interfacing; analyzed signal timing, voltage margins, and I/O integrity to identify integration issues and improve hardware validation pass rates by 20%.

Projects

Custom LZW Hardware Accelerator for RISC-V Systems **Sep 2024 - Dec 2024**

- Integrated custom RoCC-based LZW encoder into Rocket Core using Chipyard, achieving an 8× compression speedup and improving text-processing throughput in RISC-V-based systems.
- Built custom CAM in Scala and Python to automate validation workflows, evaluate cache behavior, and identify system-level bottlenecks in memory and compute utilization.

Bandgap Refrence using Cadence **Aug 2024 - Dec 2024**

- Achieved ±1% voltage reference across temperature corners and –30 to –50 dB PSRR by applying curvature correction, layout isolation, and shielding techniques.
- Conducted 500-sample Monte Carlo simulations and optimized layout by implementing guard rings and precision routing to enhance charge stability and reduce cross-talk.

Boundary Alert System for Anglers **Apr 2021 - Dec 2022**

- Secured patent for a low-latency boundary alert system that improved emergency transmission speed by 40% through enhanced communication protocols and circuit-level refinements.
- Directed a 4-member multidisciplinary team, coordinating hardware-software integration and ruggedized design deployment for real-time safety in harsh marine environments.

Education

University of Michigan **Ann Arbor, MI**
Master of Science in Electrical and Computer Engineering, Embedded System ***GPA: 3.5*** **Aug 2023 - Apr 2025**

R.M.K Engineering College **Chennai, India**
Bachelor of Engineering in Electronics and Communication Engineering ***GPA: 3.8*** **Aug 2019 - May 2023**