

Akilan S

Embedded Systems Engineer | Firmware Engineer | IoT Engineer

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PROFESSIONAL SUMMARY:

Firmware Engineer with 2+ years of experience in developing real-time software solutions for microcontroller-based products across Industrial IoT and automotive applications. Proficient in Embedded C, FreeRTOS, Device Driver Development, and firmware architecture for STM32, ESP32, ARM Cortex-M, and AVR platforms. Strong expertise in Hardware Bring-Up, Hardware-Software Integration, Firmware Debugging, and communication protocols including UART, SPI, I2C, CAN Bus, and MQTT. Experienced in Battery Management Systems (BMS), Automotive Electronics, and end-to-end product development from design through deployment. Skilled in optimizing system performance, improving reliability, and delivering scalable, production-ready solutions for connected and real-time applications.

PROJECTS:

AI-Powered EV Battery Monitoring & Predictive Maintenance System (Edge AI)

Client: Electric Mobility Solutions Provider

- Built an STM32/ESP32-based Battery Management System (BMS) for real-time monitoring of voltage, current, temperature, SOC, and SOH parameters.
- Integrated CAN Bus communication at 500 kbps to enable seamless connectivity between EV controllers and battery modules.
- Designed a **FreeRTOS-based architecture with 8+ concurrent tasks** for battery diagnostics, communication, and data processing.
- Developed an Edge AI/TinyML model that achieved 85% fault prediction accuracy for battery degradation, overheating, and cell imbalance detection.
- Integrated MQTT-based cloud connectivity and OTA firmware updates, reducing maintenance efforts by approximately **70%**.
- Improved memory utilization by **25%** and reduced communication latency by **30%**, improving overall system reliability and performance.

Technologies: STM32, ESP32, Embedded C, FreeRTOS, CAN Bus, MQTT, Edge AI, TinyML, OTA, BMS, UART, SPI, I2C

Engine ON/OFF Control System for Automotive Applications

Client: Lucas TVS

- Enhanced an ATtiny402/202-based Engine ON/OFF Control System for automotive applications in collaboration with Lucas TVS, improving system reliability and operational efficiency.
- Utilized interrupt-driven edge detection to monitor external switch inputs and ensure reliable engine state transitions.
- Utilized Arduino UNO as a UPDI programmer for firmware flashing, debugging, and validation, reducing development cost and setup complexity.
- Architected state-machine-based control logic with configurable activation thresholds, fault handling, and safety interlocks.

- Performed hardware validation using LED-based output simulation before integration with the actual engine control circuitry, improving debugging efficiency by **40%**.
- Streamlined firmware for low-power operation and faster response times, enabling deployment in compact automotive control modules.

Technologies: ATtiny402, ATtiny202, Embedded C, AVR Libc, UPDI Programming, Interrupts, GPIO, Timers, State Machine, Automotive Electronics, Hardware Debugging

TECHNICAL SKILLS:

- C, Embedded C, Python (Basic)
- STM32, ESP32, ARM Cortex-M, ATtiny402/202, AVR
- Device Drivers, GPIO, ADC, PWM, Timers, Interrupts, State Machines, Firmware Debugging
- FreeRTOS, Task Scheduling, Inter-Task Communication, Real-Time Systems
- UART, SPI, I2C, CAN Bus, MQTT
- Battery Management System (BMS), SOC/SOH Monitoring, CAN Communication, Engine Control Systems
- Edge AI, TinyML, Wi-Fi, Bluetooth, Cloud Connectivity
- STM32CubeIDE, ESP-IDF, Arduino IDE, Oscilloscope, Logic Analyzer

EXPERIENCE:

Spiro Prime Tech Pvt. Ltd. | Embedded Systems Engineer

02/2024 – Present

- Designed and optimized firmware for STM32, ESP32, ARM Cortex-M, and AVR platforms, supporting sensor interfacing, peripheral control, and system integration.
- Architected FreeRTOS-based multitasking applications with 8+ concurrent tasks, improving system responsiveness by 25%.
- Integrated UART, SPI, I2C, CAN, MQTT, and Wi-Fi communication interfaces for industrial and IoT solutions.
- Conducted hardware bring-up, firmware debugging, and validation using Oscilloscope and Logic Analyzer, reducing troubleshooting time by 40%.
- Streamlined memory management and power-saving mechanisms, reducing RAM utilization by 20% and improving firmware efficiency.
- Collaborated with cross-functional teams to deliver 3+ firmware projects from development through testing and deployment within project timelines.

EDUCATION:

B.Sc.–Computer Science

06/2019 – 05/2022

Dhanraj Baid Jain College

M.C.A.–Master of Computer Applications

08/2022 – 04/2024

New Prince Shri Bhavani College of Engineering & Technology