

UPPARA BHARATH KUMAR - Jr. Embedded Firmware Engineer

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PROFESSIONAL SUMMARY

A highly motivated, proactive and detail-oriented Embedded Firmware Engineer with 1+ year of experience in design, implementation, embedded software and systems. Backed by a strong technical foundation in building firmware for real-time applications, with excellent knowledge of real-time operating systems, wireless communication, and microcontroller programming. Demonstrates outstanding problem-solving and debugging skills with the ability to work independently or within a team environment.

EXPERIENCE

Jr. Embedded Firmware Engineer, R&D Department | Kali MedTech Pvt. Ltd. - Ahmedabad, Gujarat **April 2025 – Present**

- Engineered production-grade firmware for 12-lead resting and 7-channel wearable ECG medical devices using NXP RW612 and FreeRTOS, achieving clinical-level signal accuracy
- Deployed a Bluetooth Low Energy communication stack for real-time ECG data streaming to companion mobile applications.
- Reduced power consumption through low-power firmware optimization, extending battery life on wearable devices.
- Performed ECG signal validation, calibration, and noise-filtering in collaboration with hardware and quality assurance teams.
- Incorporated NAND Flash offline data logging with synchronization to maintain uninterrupted data recording.

SKILLS

Embedded Programming Languages: Advanced C, C++, Data Structures, Embedded C.

Embedded Hardware: Soldering, Circuit Debugging, Testing, Component Selection and Datasheet Analysis.

OS and RTOS: Linux Commands, Multithreading, IPC (Pipes, FIFO, Shared Memory), FreeRTOS.

Microcontrollers: NXP (RW612), Texas Instruments (CC2650), ESP32 (CAM, H2, S3, WROOM), Arduino (Nano, Mega, Nano 33 IoT), PIC (18F4580), Nordic (PPK-II).

Debug Probes: NXP Link Server, SEGGER J-Link (JTAG and SWD), CP2102 USB-to-TTL Converter.

Development Tools: MCUXpresso IDE (NXP), Code Composer Studio (TI), Arduino IDE, MPLAB, Vim editor, Git.

Communication Protocols: Bluetooth, Wi-Fi (Wireless), SPI, I2C, UART, CAN, TCP, UDP and IP, GPIO.

Embedded Modules: Memory: NAND Flash, EEPROM. ADC: ADS1298, ADS1293, AD8232, MCP4725, Max32664. Sensors: TMP117, Ultrasonic Distance, Motion, Gas. Displays: CLCD, 0.97-inch E-Paper, OLED 0.91. Timers, Interrupts, Digital Filtering, Logic Analyzer.

PROJECTS

12-Channel Resting ECG Device | Kali MedTech | **2026**

- Architected complete firmware on NXP RW612 for 12-lead ECG acquisition using ADS1298 over SPI. Configured register-level settings for sampling rate, programmable gain, and channel selection. Deployed a complete BLE stack with custom GATT definitions for real-time wireless streaming. Implemented digital filtering with notch filters, bandpass filters, and baseline wander correction to deliver artifact-free clinical waveforms across all 12 leads.
- Validated ADS1298 SPI signal acquisition and ADC configurations across all 12 lead channels. Collaborated with hardware and QA teams for electrode lead placement validation, ECG signal calibration, and clinical-grade waveform quality verification
- Components: NXP RW612, ADS1298, SPI, BLE, FreeRTOS, MCUXpresso IDE.

7-Channel Wearable ECG Device | Kali MedTech | **2025**

- Developed wearable firmware on NXP RW612 using ADS1293 for multi-channel ECG acquisition across chest vectors, enabling regional cardiac abnormality detection. executed an offline-first architecture where all acquired ECG data is continuously written into onboard NAND Flash memory in real time, ensuring zero data loss during BLE disconnection. Upon reconnection, stored data is automatically synchronized to the companion mobile application.
- Executed real-time calibration routines, multi-channel signal stability checks, and low-power firmware optimization in collaboration with hardware and QA teams to meet medical-grade accuracy and reliability standards.
- Components: NXP RW612, ADS1293, NAND Flash, BLE, FreeRTOS, MCUXpresso IDE.

Smart Vital Signs Card (ECG and SpO2) | Kali MedTech |

2025

- Programmed a compact card-form-factor vital monitoring system on ESP32-H2, integrating ADS1293 for ECG acquisition via silver-plated dry contact electrodes and Max32664 PPG sensor for simultaneous SpO2 and heart rate measurement. Established a FreeRTOS-driven multitasking architecture for concurrent real-time signal acquisition, digital filtering, and BLE transmission to a companion smartphone application.
- Optimized firmware for low-power continuous operation and validated ECG signal quality, SpO2 accuracy, and BLE data synchronization reliability through systematic hardware and QA testing.
- Components: ESP32-H2, ADS1293, Max32664, BLE, FreeRTOS, Arduino IDE.

Car Black Box Data Logger | Emertxe Institute |

2024

- Created a vehicle black box data logging system on PIC18F4580 to continuously capture and record real-time vehicle speed, engine status, and critical driving events. Enforced event detection logic for sudden braking, acceleration spikes, and engine faults with precise timestamping for post-incident forensic retrieval.
- Engineered EEPROM non-volatile storage management with circular buffer architecture and checksum-based data integrity verification, ensuring reliable data persistence under continuous write cycles and sudden power loss conditions.
- Components: PIC18F4580, EEPROM, UART, Timers, MPLAB IDE, Embedded C.

Mining Safety Helmet Monitoring System | Academic Project |

2023

- Enhanced a smart safety helmet system to monitor worker health and environmental conditions in mining areas. Integrated sensors to measure parameters such as temperature, gas levels, and motion for safety tracking. Enabled real-time data transmission to a monitoring station for continuous supervision. Planned system to alert in case of hazardous conditions or abnormal readings. Ensured reliable operation in harsh industrial environments.
- Managed acquisition of multiple sensor data with continuous monitoring and timely updates. Structured system to detect threshold violations and trigger alerts instantly. Maintained stable communication and consistent performance in challenging conditions.
- Components: ESP32, GPS, RFID, Gas Sensors, Wi-Fi, Bluetooth, Embedded C.

EDUCATION

Bachelor of Engineering in Electronics and Communication Engineering (ECE)

2019 - 2023

- Sri Krishnadevaraya University, Anantapur, Andhra Pradesh | 63 %

Board of Intermediate Education (Class - XII)

2017–2019

- Master Junior College of Arts & Science, Kurnool, Andhra Pradesh | 75%

Board of Secondary Education (Class - X)

2016–2017

- Z P High School, Ternekal | 77%

KEY ACHIEVEMENT

Successfully created and shipped multiple clinical-grade ECG and vital monitoring devices that are integral to real-time patient-monitoring systems.

CERTIFICATIONS

- Advanced Embedded Systems, Emertxe Information Technologies, Bengaluru.2024
- Internet of Things (IoT) Internship Certification, Skill Dzire, Online2022