

GOKUL ARUNACHALAM

Technical Lead - Embedded Software

C204, Onella nest phase-2,
Patil nagar, Sus gaon,
Pune - 411021.

Email: gokulraja.1212@gmail.com
Mobile: 8883262288
<https://github.com/binarymaker>

OBJECTIVE

Develop state-of-the-art embedded software for electric vehicles, leveraging advanced technology to enhance innovation and prioritize safety, contributing to the evolution of sustainable transportation.

SUMMARY

Versatile R&D professional with 10 years experience in conceptualization and development of microcontroller based products and solutions.

- Experienced in the development of 2W/3W electric vehicle traction motor controllers (DCU), battery management systems (BMS) and multifunction connectivity ECU (MFECU).
- Good knowledge in software development life cycle with V model from requirements gathering to system testing.
- Specialization in design and develop modular software architecture to achieve portable and reusable software across multiple platforms.
- Specialized skills in embedded C programming, object-oriented programming, SOLID principle, design pattern and data structure.
- Good understanding of state machine, multi-tasking, RTOS and thread-safe system.
- Good experience in AUTOSAR architecture and BSW integration and configuration - ComStack, DiagStack, MemStack, ComplexDriver and MCAL migration.
- Good experience in motor controller development - BLDC, PMSM and Induction motor. Algorithms - FOC, MTPA, flux weakening, regenerative braking, six step commutation.
- Good experience in battery management system development. Cell chemistry - NMC and LFP. Algorithms - state-of-charge (SOC) estimation, state-of-health (SOH) monitoring, cell balancing, thermal management, fault detection and distance to empty estimation.
- Good knowledge and software stack development experience in automotive communication protocols and diagnostic standards - CAN/FD, J1939, ISOTP (ISO 15765-2), UDS (ISO 14229-1, 2, 3, 7) and OBD-2.
- Knowledge in ASPICE and functional safety (ISO 26262).

- Extensive experience in non-AUTOSAR BSW software stack development.
- Expert skills in using version control system and code bug tracker.
- Good experience in software verification and test driven development - static testing (MISRA-2012), unit testing and automated system testing.
- Excellent experience in in-house GUI custom tool development for automation using python and Qt designer.
- Hands-on experience in deploying end-to-end automation pipelines for Embedded DevOps.
- Good experience in maintaining and improving legacy code, documenting code, adhering to clean code and refactoring techniques.
- Ability to work in start-up projects and good experience in developing low level device driver and board support package (BSP/HSI) with multiple microcontroller/environment/ecosystems.
- Proficient in leveraging AI tools within software development to enhance productivity and efficiency.
- Good experience in circuit design, hardware debugging and board bring-up.
- Experience with digital and analog oscilloscopes, logic analyzers, PC based simulating systems, etc.

EXPERIENCE

- Hella eMobionics Pvt Ltd, Pune.
Designation : Technical Lead | April 2022 - till.
- Elektrobit India Pvt Ltd, Bangalore.
Designation : Technical Specialist | July 2021 - April 2022.
- Lucas TVS Ltd, Chennai.
Designation : Software Development Engineer | April 2018 - Jun 2021.
- ELGI Ultra Industries Ltd, Coimbatore.
Designation : Engineer | September 2016 - March 2018.
- Crisp System India Pvt Ltd, Coimbatore.
Designation : FPGA and Embedded Programmer | June 2014 – August 2016.

TECHNICAL COMPETENCY

- Microcontrollers Known : ATMEL 89 Series | Renesas-RH850F1KM(Automotive) | Renesas-RL78(Automotive) | Microchip PIC 16F, 18F & dsPIC33EV(Automotive) | Infineon XMC1400 | STM32 Cortex-M0+, M3 & STM8(Automotive) | Xilinx FPGA Spartan 3E | ARM7 LPC2148 | Arduino Mega, Due | Raspberry pi.

- Programming Language : C/C++, Assembly, Embedded C, HDL, Python | QT GUI.
- Markup Language: Markdown, XML, YAML, JSON.
- Communication Protocols : UART, SPI, I2C | SMBus, Modbus, CAN, 1-Wire
- Compiler IDE : Keil, Eclipse, Renesas-CS+, MPLAB X, MikroC, Arduino, PyCharm, EB Tresos, HighTec GNU, Green Hill Compiler.
- Scripting language : Linux shell script, Makefile, Python, MATLAB.
- Simulation and Debug Tools : Labcenter Proteus, LT Spice, GDB, OpenOCD, Lauterbach TRACE32, iSystem winIDEA, Renesas E1/E20
- Testing Tools : MISRA static analysis, PC-lint, Helix QAC, Unity Unit test, Ceedling test framework, CMock and fake function framework stubs, Code coverage, Cyclomatic complexity, Static stack analysis, Profiling and robot framework(RPA).
- ALM Tools : Jira, PTC-Integrity, IBM DOORS, ClickUp, GitHub Issues.
- Version Control Tools : Git, SVN, PTC-Integrity SCM.
- Continuous Integration : Travis-CI, Codacy, Codecov, Gitlab-CICD Runner, Docker and doxygen code documentation.
- AI Tools: ChatGPT, Github Copilot, Codeium, Flux.io.
- Software Architectural : Plant UML, ANSYS SCADE
Structural : Class diagram, Object diagram, Component diagram, Package diagram.
Behavioral : Sequence diagram, Use case diagram, State diagram, Timing diagram.
- Modules: AC induction motor variable frequency driver, BLDC motor control, Bluetooth, Character Display, DC motor H-Bridge drive, EEPROM, External ADC, GPS, High Side Driver, BMS ASIC, SBC, External Watchdog, Inverter Smart Gate Driver, Hall position sensor, Graphical Display, GSM/GPRS, SD card interface, Servo motor drive, Stepper motor drive, Real time clock, Universal motor phase angle control, Zigbee.

PROJECTS

- **Platform project - BSW Middleware software stacks (Automotive).**

Common platform software development for all the 2W/3W products including motor controller, battery management system, connectivity ECU and Onboard charger.

- Established coding guidelines to ensure uniformity and code quality across projects.
- Designed and implemented a Header/Source file template generator tool for streamlined software development.
- Developed essential operating system (OS) components such as scheduler, hierarchical state machine framework, timers, circular queues, and stacks.
- Created a robust communication stack, including CAN TP Stack, CAN matrix and a tool to convert dbc files to configuration source files.

- Implemented a comprehensive diagnostic stack featuring UDS client and server, diagnostic trouble code (DTC) management, and fault code memory (FCM).
 - IO Abstraction layers for digital and analog with debounce, scaling and filtering.
 - CRC (Cyclic Redundancy Check) stacks for 8, 16, and 32-bit calculations.
 - Developed memory management solutions, including flash wrapper, EEPROM emulation and Non-volatile memory manager (NVM).
 - Safety modules March-c RAM test, CRC based ROM test and watchdog manager - alive supervision, deadline supervision and logical supervision.
 - NTC/PTC configurable thermistor drivers for accurate temperature sensing.
 - Designed and implemented 3 phase hall sensor drivers for position feedback.
 - Created a DSP library, featuring low-pass filters, moving average filters, median filters, IIR filters, hysteresis filters, and calculus operations.
 - Developed a robust fail-safe bootloader and bootloader updater for secure and reliable firmware updates.
 - Created a Python-based GUI tool for the UDS client tester, enabling bootloader reprogramming and DTC (Diagnostic Trouble Code) reading.
 - Implemented automated unit testing and static test reporting, establishing a robust quality gate for code quality assurance.
 - Organized project modules as Git sub-modules, streamlining integration and facilitating swift bug fix deployments.
- **Electric vehicle - Two wheeler traction motor control (Automotive L1 category).**
 - Technical requirement derived from system requirements.
 - Software architectural development.
 - Microcontroller peripheral driver development - ADC, PWM, SPI, CAN.
 - Develop FOC motor control algorithm using fixed point arithmetic - Clark Park Transforms, PID, filters.
 - Implement drive mode state machine and throttle map.
 - Perform static test and compliance document.
 - Derive and run unit test from functional requirements.
 - Position sensor calibration tool GUI development.
 - Maintain and refactor source code.
- **Electric vehicle - Two wheeler traction motor control (Automotive L2 category ASIL-C).**
 - Device driver for smart inverter gate driver - TI DRV32XX.
 - BSW Middleware software integration and validation.
 - Microcontroller built-in self test drivers - ADC, PWM, RAM, ROM.
- **Hybrid vehicle - Suspension air compressor motor control (Automotive ASIL-B).**
 - Software architectural development.
 - UDS based boot-loader development.
 - Worked with hardware teams on board bring-up and debugging.
 - Worked with ISO 26262 safety framework to achieve functional safety.
 - Peer review of design and code.
 - Perform static test and compliance document.
 - Derive and run unit test from functional requirements and standards.
 - Maintain and refactor source code.

- **IOT - Smart refrigerator system.**

Automatic defrost enable system based on Freezer temperature. Energy monitor, temperature control via smart phone and OTA firmware update & maintenance.

- Application software development.
- In Application programming - custom boot-loader development.
- Microcontroller peripheral driver development.
- Software requirement capture and SRS documentation.
- Bug fix and change log notes release.
- Code version control in git.

- **Research projects**

- Completed over 100 research prototype projects in diverse embedded domains.
- Develop the project evaluation board and board support packages.
- Work with MATLAB, Python, Raspberry Pi, OpenCV, Android and VLSI.
- Cost-effective agriculture and industrial projects.

EDUCATIONAL QUALIFICATION

- B.E : Electronics and Communication Engineering
Institution : Maharaja Engineering College, Avinashi | First class 72% | 2014.
- Diploma : Electronics and Communication Engineering
Institution : Ruthraveni Muthuswamy Polytechnic College | First class 89% | 2011.
- S.S.L.C : Government Higher Secondary School, Tirupur | First class 81% | 2008.

TECHNICAL TRAININGS AND COURSES

- C-DAC - Embedded system and design | 2 Months.
- TÜV SÜD - Functional safety ISO 26262 training | 2 weeks.
- pManifold EV Academy - Electric vehicle systems and modeling | 3 Month.
- NPTEL - Fundamentals of Electric vehicles: Technology & Economics.
- Texas Instruments Online - Teaching Old Motors New Tricks.
- Youtube - Understand Motors. [link](#)
- Udemy - Mastering Microcontroller and Embedded Driver Development.
- Udemy - Embedded System Design using UML State Machines.
- Udemy - STM32Fx Microcontroller Custom Bootloader Development.
- Udemy - Mastering RTOS: Hands on FreeRTOS and STM32Fx with Debugging.
- Udemy - Embedded Systems Object-Oriented Programming in C.
- Udemy - GitLab CI: A Complete Hands-On for CI/CD Pipelines & DevOps
- Udemy - Complete Battery Management System Course: Level 1 and Level 2
- Udemy - Clean Code

TECHNICAL BOOKS

- Reusable Firmware Development: A Practical Approach to APIs, HALs and Drivers.
- Test Driven Development for Embedded C: Building High Quality Embedded Software.

- Embedded Software Design: A Practical Approach to Architecture, Processes, and Coding Techniques.
- Patterns in the Machine: A Software Engineering Guide to Embedded Development.
- The Pragmatic Programmer.
- Working Effectively with Legacy Code.
- Clean Code: A Handbook of Agile Software Craftsmanship.
- Clean Architecture: A Craftsman's Guide to Software Structure and Design.
- Dive Into Refactoring.
- Head First Object-Oriented Analysis & Design: A Brain Friendly Guide to OOA&D.

TECHNICAL ARTICLES POSTED

- Balancing the Triad: The Importance of Diversifying Your Embedded Development Team. [link](#)
- From Skeptic to Advocate: My Journey with Unit Testing in Embedded Software Development. [link](#)
- Unit Testing: Developer's Friend for Refactoring Code. [link](#)
- PCB design and fabrication during academic (basic level). [link](#) [video link](#)
- My open source project portfolio. [link](#)

PERSONAL PROFILE

Date of birth	: 12.12.1992
Sex	: Male
Marital status	: Married
Nationality / Religion	: Indian / Hindu
Languages Known	: Tamil, English, Kannada (Speak)
Physical Condition	: Good Health

STRENGTHS

- Learn new things faster.
- Self-motivated and positive approach towards any problems.
- Analytical skills.

DECLARATION

I hereby declare that the above given information's are true to the best of my knowledge and belief.

(GOKUL.A)