

PRANAV SUBRAMANIAN

Embedded Firmware & Hardware Developer

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SUMMARY

Embedded Firmware & Hardware Developer with 5+ years of experience designing low-power IoT, GNSS and motor-control products from schematic to firmware to field deployment. Delivered a smartwatch-sized GPS tracker with 60%+ longer battery life and 30% lower board cost, and an ESP32 platform that saved \$70K. Skilled in Embedded C/C++, STM32, ESP32 and TI DSP, PCB design (Altium Designer, KiCAD), and communication protocols (UART, I2C, SPI, CAN, Modbus). Strong communicator and collaborative team player who also works independently and has led complete product development from concept to field deployment.

SKILLS

Programming: Embedded C, Embedded C++, Python

Microcontrollers & Processors: STM32 (ARM Cortex-M), ESP32, STSPIN32F0A, TI DSP (TMS320F28337), 8051, Arduino

Communication Protocols: UART (RS232, RS485), I2C, SPI, CAN, Modbus, Bluetooth, Wi-Fi, OTA Updates

IoT & Cloud Integration: MQTT Clients, Adafruit IO, Google Cloud, AWS

Cellular & GNSS: SIMCOM A7672S (LTE-M/NB-IoT), GNSS/AGPS, AT Commands, Low-Power Design

Motor Control: BLDC 6-step commutation, IFOC, Stepper Motor Control, PWM Design

PCB Design & Hardware: Altium Designer, KiCAD, Circuit Maker, Cadence Allegro, Multi-layer & High-speed PCB, Analog & Mixed-Signal Design

Manufacturing & CAD: Component Selection, BOM Management, DFM, Fusion 360, SolidWorks, FreeCAD, 3D Printing, Rapid Prototyping

Other: Leadership and Training, Field Deployment

WORK EXPERIENCE

EMBEDDED HARDWARE & FIRMWARE ENGINEER | Drishti Works | Mumbai, India

May 2026 – Present

Hardware and firmware developer for the LG Band, a battery-powered wearable GPS tracker with SOS alerts (ESP32, LTE-M, GNSS).

- Redesigned the emergency GPS tracker hardware for low power, size and cost: shrank the board from 40 × 49 mm to 34 × 34 mm (about 41% less area, in a smartwatch-sized 40 × 37 × 8 mm device) and cut the cost of each board by 30% through BOM optimization, while keeping every feature and adding new ones critical for an emergency tracker.
- Increased battery life from about 15 hours to more than 24 hours (60%+ gain) while using a battery half the size, through the hardware redesign combined with firmware power optimization.
- Deployed 40+ devices in the field with an 88%+ success rate, leading a small on-site embedded team for deployment and servicing.
- Designed GNSS antenna evaluation boards to benchmark multiple antennas and select the best fit for the device.
- Developed low-power Embedded C++ firmware (ESP32 deep sleep, modem sleep via DTR, 40 MHz CPU scaling when necessary, low-battery cut-off that prevents brownout reset loops) with AGPS-assisted multi-constellation GNSS (GPS, GLONASS, Galileo) and HDOP-weighted position averaging for faster, more accurate fixes.
- Built a loss-free, secure data and update pipeline: batched MQTT publishing with retry-until-confirmed delivery, dual-slot checksummed EEPROM (24LC256) backup for power-loss recovery, HTTPS OTA updates with SHA-256 verification and automatic rollback, a priority SOS alert path, and automatic recovery from modem reboots.

FREELANCE EMBEDDED HARDWARE & FIRMWARE DEVELOPER | Self-Employed | Mumbai, India

March 2025 – Present

Custom Home Amplifier

February 2026 – Present

Designed and built a custom four-channel Bluetooth home audio amplifier with a touchscreen interface, IR remote and multi-input audio control.

- Developed ESP32 firmware that streams Bluetooth A2DP audio over I2S to a DAC, with four selectable inputs and a TDA7439 audio processor (I2C) controlling volume, bass, mid, treble, gain and balance.
- Built the user interface: DWIN touchscreen (UART) with sliders and settings pages, IR remote, and a debounced touch power switch.
- Implemented per-input saved profiles (volume, tone, gain, balance) in non-volatile memory with default recovery, plus amplifier power sequencing with relay, mute, subwoofer and fan control.
- Designed the complete enclosure as 3D-printed parts, tuned to a target frequency to create a custom hardware audio profile.
- Added Bluetooth remote control in the latest update; now developing an 8-channel upgrade with frequency splitters ahead of the amplifier stage.

BLDC Motor Driver

November 2025 – February 2026

Developed a 48 V, 750 W BLDC motor driver for a client, built around the STSPIN32F0A motor controller.

- Prototyped on the STSPIN development board, then designed custom hardware to meet the client's requirements for a 48 V, 750 W power stage.
- Implemented 6-step commutation with 20 kHz PWM, above the audible range, for silent motor operation.
- Added Hall-sensor position tracking, variable acceleration profiles and controlled deceleration for smooth, repeatable motor control.
- Integrated RS485 communication with Modbus protocol support.

BLDC Motor Winding Machine

March 2025 – October 2025

Developed a fully automated hub winding system for BLDC motors using STM32F microcontroller with real-time 3-axis stepper motor control. The system sequences winding patterns via custom G-code parsing. [\[Video Demo Link\]](#)

- **Tools/Tech:** STM32F407, Stepper Motor Drivers, G-code Parser, Touch Interface and IoT support for remote monitoring.
- Designed and implemented real-time embedded motion control with quadrature encoder feedback, self-calibration for automatic hub slot detection, and smooth acceleration and deceleration profiles.
- Engineered a custom G-code interpreter for programmable winding sequences and calibration sequences across multiple motor hubs.
- Led complete mechanical design, hardware integration, and firmware development.

ELECTRONIC ENGINEER | Noze Inc | Montreal, QC, Canada

January 2023 – October 2024

Core electronics lead for sensor platforms and embedded systems, driving end-to-end development, cross-functional support and lab automation.

- Led hardware and firmware development for advanced chemiresistor VOC sensors, utilizing TI MSP chipsets, analog multiplexers, and ratiometric measurements for high-precision breath diagnostics.
- Designed ESP32-based motherboard with embedded C++ firmware supporting Wi-Fi cloud sync, multithreaded control, motor/sensor interfacing; project saved the company ~\$70K.
- Reduced sensor system noise by 80% via hardware filtering and optimized signal processing, significantly improving detection performance.
- Spearheaded development of a PID sensor platform and 24/7 automated data acquisition system, increasing lab efficiency and scalability.
- Managed production of medical-grade electronics, streamlined overseas/local manufacturing, reduced assembly time by 40%, and led intern mentorship in embedded hardware and firmware.

SMT LINE OPERATOR & SMT PROGRAMMER | Vexos | Markham, ON, Canada

September 2022 – January 2023

- Oversaw the full PCB assembly process, from screen printing to final assembly, to strict quality standards.
- Operated reflow machines and programmed pick-and-place machines, optimizing assembly time while maintaining quality control.

ELECTRONIC ENGINEER | CG Power & Industrial Solutions | Bhopal, India

July 2019 – September 2020

Developed and tested traction and auxiliary converter systems for Indian Railways: hardware design, firmware and customer training.

- Performed power-system harmonic analysis and built a simulation model that eliminated unwanted harmonics.
- Developed real-time, multi-core Embedded C firmware for TI DSP (TMS320F28337) traction converter control electronics.
- Independently resolved hardware and firmware issues on the 1600HP traction and auxiliary converters for the DEMU project.
- Sourced and developed complete hardware for the 2.2HP traction converter test bench.
- Developed and assembled control electronics and IGBT drivers for three level inverters.
- Implemented slip control and Indirect Field-Oriented Control (IFOC) for motor drive.

COLLEGE INTERNSHIP | KJ Somaiya College | Mumbai, India

May 2018 – May 2019

- Built 8051-based microcontroller trainee kits for college labs, handling full hardware sourcing, schematic/PCB design (Protel98), and documentation, teaching interfacing with LCD, seven-segment display, ADC, DAC, and MAX232.

EDUCATION

MASTER'S DEGREE Embedded System Development Conestoga College ON, Canada 3.9/4 GPA	2021 – 2022
BACHELOR'S DEGREE Electronic Engineering KJ Somaiya Institute of Engineering and IT Mumbai, India 6.8/8 CGPA	2015 – 2019
DIPLOMA DEGREE Electronic Engineering Shah & Anchor Kutchhi Polytechnic Mumbai, India 80%	2011 – 2015

AWARDS

CG Power PRARAMBH 2.0 Won first prize for developing 2.2 HP traction converter test bench in annual project competition.	2020
CG Power CG Superstar Won award for providing technical training to customers on our product.	2020
CG Power CG Superstar Won Best Performer Award (Q3) for quickly resolving a major field issue.	2019