André F. Pinheiro Aleixo

FPGA & Embedded Systems Engineer

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Professional Summary

Embedded systems engineer with 8+ years of experience in robotics, industrial automation, and FPGA design. Specialized in real-time control systems, vision processing (NIR/SWIR), and edge computing. Currently leading electronics development at INZU Group, focusing on robotic cells, custom PCB design, and high-speed data processing pipelines using FreeRTOS, Yocto Linux, and industrial protocols.

Education

Master's Degree in Automation, Electronics and Industrial Control

University of Deusto *2019 - 2020*

- Master's Degree in Automation, Electronics and Industrial Control

Skills: LabVIEW, Verilog, Siemens Tia Portal, Kuka Robots, TI DSPs, Device Drivers, C#, NI LabVIEW, Yocto Project, MATLAB

Bachelor's Degree in Electrical and Electronics Engineering

Universidade Federal de Pernambuco *2013 - 2018*

- Bachelor's Degree in Electrical and Electronics Engineering

Skills: Field-Programmable Gate Arrays (FPGA), Verilog, ChibiOS, FPGA, Electronics Design, Intel Quartus Prime, Bare-Metal Embedded, Proteus, C++, MATLAB, Real-Time Operating Systems (RTOS), C

Professional Experience

Ikergune - INZU Group - Electronics Department Lead

San Sebastián, Basque Country, Spain *January 2023 - Present*

- Development of vision systems using NIR and SWIR spectral cameras for process analysis, creating custom C# software for real-time image acquisition and processing with support for RTSP and HTTP streaming protocols
- Designed and implemented FPGA IP cores for convolutional kernel acceleration on Xilinx UltraScale+ devices, developing high-throughput data pipelines for real-time image processing
- Integrated FPGA acceleration into embedded edge computing platforms running Yocto Linux, developing C++ drivers and middleware to interface with FPGA and manage data flow

- Engineered industrial communication solutions integrating IO-Link and HTTP protocols with machine networks, implementing protocol stacks for robust data exchange and control
- Developed custom sensor systems using Infineon microcontrollers running FreeRTOS, including PID control loops and SPI peripheral communication, with PCB design handled via Altium Designer, for particulate matter measurement
- Designed and implemented stepper motor control systems using XMC microcontrollers integrated with FreeRTOS, developing trajectory control algorithms including acceleration and deceleration profiles in C/C++ for precise motion management

Skills: Yocto Project, Verilog, FPGA, C++, Embedded C, HDL Designer, FPGA prototyping, Bash, VHDL, Field-Programmable Gate Arrays (FPGA), C, CMake, Bare-Metal Embedded, Device Drivers, Data Acquisition, Embedded Linux, Embedded Systems, Hardware Description Language, Firmware, I2C, IO-Link, Kernel, Devicetree, U-Boot, BOOT, Bootloader, OpenCV, Computer Vision, Machine Learning

Ikergune - INZU Group - Software Engineer

San Sebastián, Basque Country, Spain *August 2022 - January 2023*

- Designed and implemented the full integration pipeline between a custom CAD/CAM system and a robotic simulation API, using C++ to automate simulation, path planning, and KUKA code generation
- Developed both the API interface and post-processor, handling the complete workflow from trajectory acquisition to robot-compatible output
- Adapted toolpaths from upstream CAM software to KUKA syntax, incorporating kinematic validation, axis limits, and machine-specific parameters
- Validated generated programs through simulation and deployment in the robotic cell, ensuring precise and collision-free execution

Skills: C++, CMake, Application Programming Interfaces (API), Automation, Industrial Robots, Robot Framework, CAD/CAM Software

Ikergune - INZU Group - Robotics Integration Engineer

San Sebastián, Basque Country, Spain *May 2021 - August 2022*

- Developed and configured the complete KUKA robot control system using WorkVisual, including programming of robot motion sequences and system diagnostics
- Engineered safety systems for the robotic cell, implementing both robot-integrated safety functions and safety zone monitoring using PROFIsafe, the safety protocol stack over PROFINET, ensuring compliance with industrial safety standards (e.g., SIL/PL)
- Performed precision and repeatability verification using laser tracker systems, developing custom C# scripts to automate measurement sequences, data acquisition, and error analysis

Skills: Robot Framework, Protocol Stacks, Profinet, PROFIsafe, IO-Link, EtherCAT, C++, C#

Ikergune - INZU Group - Automation & Software Developer

Elgóibar, Basque Country, Spain *September 2020 - May 2021*

- Developed Python scripts to automate and optimize internal industrial processes, improving efficiency and repeatability in manufacturing workflows
- Built C# applications to integrate user interfaces and machine controls, streamlining human-machine interaction and data flow
- Participated in computer vision projects, contributing to the development of inspection and monitoring systems using cameras and image processing techniques
- Contributed to the design and implementation of a patented industrial control system for automated powder feeding equipment, integrating motor control, pressure regulation, and sensor feedback loops
- Developed control logic using PLCs and integrated SCADA systems for real-time process monitoring, data acquisition, and system supervision

Skills: SCADA, PLC Siemens, PLC Programming, Programmable Logic Controller (PLC), SIMATIC STEP 7, PyTorch, Tkinter, Python (Programming Language), Python, Anaconda, Windows Presentation Foundation (WPF), WPF Development, C#

Aingura IIoT - INZU Group - System Engineer

Bilbao, Basque Country, Spain *February 2020 - September 2020*

- Developed embedded C code for a Texas Instruments DSP to acquire digital sensor signals and communicate with a C# application via SCI (Serial Communication Interface)
- Built a C# application to acquire data from an industrial KUKA robot over TCP/IP (via KUKAVARPROXY) and interface with the DSP for synchronized data handling and storage
- Created LabVIEW RT modules on CompactRIO for real-time acquisition of digital signals and robot position data via TCP/IP, including data management and logging
- Integrated external sensors to capture physical signals related to robot movement, ensuring signal consistency across different acquisition systems
- Performed system calibration, trajectory setup, and signal comparison to validate synchronization and analyze timing behavior across hardware and software layers

Skills: Embedded Systems, Signal Processing, Internet Protocol Suite (TCP/IP), C#, LabVIEW, Kuka Robot, Data Analysis, MATLAB, NI LabVIEW, TI DSPs, Kuka Robots, Industrial Robots, Embedded C, Object-Oriented Programming (OOP)

Asa Branca Rocket Design - Embedded Systems & Telemetry Engineer – Aerospace Subsystems

Recife, Pernambuco *March 2018 - July 2019*

- Helped develop the telemetry subsystem for rockets, drones, and cubesats, focusing on real-time sensor data acquisition, processing, and inter-subsystem communication
- Programmed firmware in C using ChibiOS/RT on STM32 boards, ensuring a scalable and deterministic embedded architecture for critical flight operations
- Integrated sensors via SPI, I^2C, and UART, optimizing driver-level communication and RTOS task management

Skills: Embedded Systems, Linux, Real-Time Operating Systems (RTOS), C (Programming Language), Task Management, Data Acquisition, Satellite Systems Engineering, ChibiOS, Universal Asynchronous Receiver/Transmitter (UART), STM32, SPI, I2C, Spacecraft Telemetry

Universidade Federal de Pernambuco - Researcher

Recife, Pernambuco *July 2016 - January 2019*

- Developed analog and embedded systems for biomedical therapy and monitoring applications
- Developed an electrical stimulator for gait improvement in Parkinson's patients, using MSP430 microcontroller and real-time inertial feedback (I^2C accelerometers/gyroscopes) for stimulation timing control
- Designed a power control and switching circuit for hyperhidrosis treatment, using CMOS transistor arrays, MSP430-based PWM modulation, LTspice simulations, and PCB prototyping in Proteus
- Contributed to experimental validation and interface control of FES systems for neuromuscular stimulation

Skills: System on a Chip (SoC), C (Programming Language), Biomedical Electronics, Electronics Design, Embedded Systems, MATLAB, Signal Processing, MSP430, Launchpad TI(Texas Instruments), Bare-Metal Embedded, Real-Time Operating Systems (RTOS), I2C

Universidade Federal de Pernambuco - Undergraduate Researcher – NFC Vital Sign Acquisition System

Recife, Pernambuco *July 2017 - July 2018*

- Developed a passive embedded system based on the NXP/Freescale FRDM-K64F microcontroller, powered via NFC and capable of acquiring vital signs such as heart rate and blood oxygen saturation without the need for an external power source
- Designed and integrated an NFC-based energy harvesting architecture using the NTAG I^2C Plus interface (Class 6), enabling biomedical signal acquisition (MAX30100) and seamless wireless communication with an Android application
- Project presented at CBEB (Brazilian Congress of Biomedical Engineering) — the largest biomedical engineering conference in Brazil — and awarded the Ricardo Ferreira Award to the Talented Young Scientist, recognized as the best undergraduate scientific research of the year (2018)

Skills: System on a Chip (SoC), Android Studio, Embedded Systems, NFC, NXP, Signal Processing, Radio-Frequency Identification (RFID), Bare-Metal Embedded, Biomedical Electronics, Freescale

CETENE - Internship in FPGA Engineer

Recife, Pernambuco *August 2015 - December 2015*

- Contributed to the initial development and simulation of a custom SDRAM controller IP for Altera FPGAs, using VHDL and ModelSim testbenches
- Contributed to the development and simulation of FPGA components for a low-power RFID reader project, aligned with the EPCglobal Class 1 Gen 2 protocol
- Assisted in the integration of Alien RFID Readers into a plant inspection application, supporting configuration, testing, and operational validation

Skills: Radio Frequency (RF), FPGA prototyping, VHDL, RFID Applications, Intel Quartus Prime, ModelSim, SystemVerilog

Publications

Functional Electrical Stimulator for Treatment of Patients with Foot Drop

Jamile T. D. Alves; Marco A. B. Rodrigues; André F. P. Aleixo *2019*

- *Book chapter* - DOI: 10.1007/978-981-13-2119-1_33

Virtual Reality Game Development Using Accelerometers for Post-stroke Rehabilitation

Gustavo R. P. Esteves; Bruno A. M. Miranda; André F. P. Aleixo; Malki-çedheq B. C. Silva; Marco A. B. Rodrigues *2019*

- *Book chapter* - DOI: 10.1007/978-981-13-2119-1_89

Wearable Device for Acquisition of SpO2 and Heart Rate

André F. P. Aleixo; Euller G. Lima; Érico C. Leite; Ana V. M. Inocêncio; Lucas T. Lins; Marco A. B. Rodrigues *2019*

- *Book chapter* - DOI: 10.1007/978-981-13-2119-1_90

Languages

- **English**: Professional working proficiency
- **Portuguese**: Native or bilingual proficiency
- **Spanish**: Full professional proficiency

Technical Certifications

- **Verilog for an FPGA Engineer with Xilinx Vivado Design Suite**
- **Embedded Linux Using Yocto**
- **Programación TPE, Nivel B - FANUC Europe**
- **Certified LabVIEW Associate Developer** (National Instruments)