André F. Pinheiro Aleixo

FPGA & Embedded Systems Engineer

andre.f.p.aleixo@gmail.com
linkedin.com/in/andaleixo
+34 657 216 127
github.com/andaleixo

San Sebastián, Basque Country, Spain
Available to relocate to the United Kingdom

Education

Master's Degree in Automation, Electronics and Industrial Control

University of Deusto *2019 - 2020*

- Master's Degree in Automation, Electronics and Industrial Control
- Specialized in industrial automation, embedded systems, and robotics
- *GPA: 7.6/10.0 (3.8/5.0 international scale)*

Bachelor's Degree in Electrical and Electronics Engineering

Universidade Federal de Pernambuco *2013 - 2018*

- Bachelor's Degree in Electrical and Electronics Engineering
- Focus on embedded systems, FPGA design, and biomedical electronics

Professional Summary

Experienced embedded systems engineer with extensive expertise in robotics, electronics, and industrial automation. Specialized in real-time control systems, sensor integration, vision systems (NIR/SWIR), and edge computing utilizing FPGAs and microcontrollers. At INZU Group (Ikergune), I lead the development of robotic cells, custom PCB design, motor control systems, and high-speed data processing pipelines. My work encompasses both hardware and software integration, leveraging platforms such as FreeRTOS, Yocto, and industrial protocols including IO-Link and PROFINET.

Career Objective

- Seeking opportunities in FPGA design, embedded systems development, and industrial automation
- Passionate about real-time systems, computer vision, and robotics integration
- Interested in leading-edge technologies including edge computing and AI acceleration

Professional Experience

Electronics Department Lead

INZU Group (Ikergune) *January 2023 - Present San Sebastián, Basque Country, Spain*

- Led development of advanced vision systems utilizing NIR and SWIR spectral cameras for industrial process analysis, implementing custom C# software for real-time image acquisition and processing with RTSP and HTTP streaming protocol support
- Designed and implemented FPGA IP cores for convolutional kernel acceleration on Xilinx UltraScale+ devices, creating high-throughput data pipelines for real-time image processing applications
- Integrated FPGA acceleration into embedded edge computing platforms running Yocto Linux, developing C++ drivers and middleware for FPGA interface and data flow management
- Engineered industrial communication solutions integrating IO-Link and HTTP protocols with machine networks, implementing robust protocol stacks for reliable data exchange and control
- Developed custom sensor systems using Infineon microcontrollers with FreeRTOS, incorporating PID control loops and SPI peripheral communication, with PCB design via Altium Designer, for particulate matter measurement applications
- Designed and implemented stepper motor control systems using XMC microcontrollers integrated with FreeRTOS, developing trajectory control algorithms with 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, CMake, Bare-Metal Embedded, Device Drivers, Data Acquisition, Embedded Linux, Embedded Systems, Hardware Description Language, Firmware, I2C, IO-Link, Kernel, Devicetree, U-Boot, Bootloader, OpenCV, Computer Vision, Machine Learning

Software Engineer

INZU Group (Ikergune) *August 2022 - January 2023 San Sebastián, Basque Country, Spain*

- Designed and implemented comprehensive integration pipeline between custom CAD/CAM system and robotic simulation API, utilizing C++ to automate simulation, path planning, and KUKA code generation
- Developed both API interface and post-processor components, managing complete workflow from trajectory acquisition to robot-compatible output generation
- 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 robotic cell environment, ensuring precise and collision-free execution

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

Robotics Integration Engineer

INZU Group (Ikergune) *May 2021 - August 2022 San Sebastián, Basque Country, Spain*

- Developed and configured complete KUKA robot control system using WorkVisual, including programming of robot motion sequences and comprehensive system diagnostics
- Engineered safety systems for robotic cell, implementing both robot-integrated safety functions and safety zone monitoring using PROFIsafe protocol stack over PROFINET, ensuring compliance with industrial safety standards (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#

Automation & Software Developer

INZU Group (Ikergune) *September 2020 - May 2021 Elgóibar, Basque Country, Spain*

- Developed Python scripts to automate and optimize internal industrial processes, enhancing efficiency and repeatability in manufacturing workflows
- Built C# applications to integrate user interfaces and machine controls, streamlining human-machine interaction and data flow management
- Participated in computer vision projects, contributing to development of inspection and monitoring systems using cameras and image processing techniques
- Contributed to design and implementation of 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, Anaconda, Windows Presentation Foundation (WPF), WPF Development, C#

System Engineer

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

- Developed embedded C code for Texas Instruments DSP to acquire digital sensor signals and communicate with C# application via SCI (Serial Communication Interface)
- Built C# application to acquire data from industrial KUKA robot over TCP/IP (via KUKAVARPROXY) and interface with 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)

Embedded Systems & Telemetry Engineer – Aerospace Subsystems

Asa Branca Rocket Design *March 2018 - July 2019 Recife, Pernambuco, Brazil*

- Developed 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 scalable and deterministic embedded architecture for critical flight operations
- Integrated sensors via SPI, I²C, and UART, optimizing driver-level communication and RTOS task management

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

Researcher

Universidade Federal de Pernambuco *July 2016 - January 2019 Recife, Pernambuco, Brazil*

- Developed analog and embedded systems for biomedical therapy and monitoring applications
- Developed electrical stimulator for gait improvement in Parkinson's patients, using MSP430 microcontroller and real-time inertial feedback (I²C accelerometers/gyroscopes) for stimulation timing control
- Designed 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, Biomedical Electronics, Electronics Design, Embedded Systems, MATLAB, Signal Processing, MSP430, Launchpad TI(Texas Instruments), Bare-Metal Embedded, Real-Time Operating Systems (RTOS), I2C

Undergraduate Researcher – NFC Vital Sign Acquisition System

Universidade Federal de Pernambuco *July 2017 - July 2018 Recife, Pernambuco, Brazil*

- Developed passive embedded system based on NXP/Freescale FRDM-K64F microcontroller, powered via NFC and capable of acquiring vital signs such as heart rate and blood oxygen saturation without external power source
- Designed and integrated NFC-based energy harvesting architecture using NTAG I²C Plus interface (Class 6), enabling biomedical signal acquisition (MAX30100) and seamless wireless communication with Android application
- Project presented at CBEB (Brazilian Congress of Biomedical Engineering) — largest biomedical engineering conference in Brazil — and awarded Ricardo Ferreira Award to Talented Young Scientist, recognized as 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

FPGA Engineer Intern

CETENE *August 2015 - December 2015 Recife, Pernambuco, Brazil*

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

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

Technical Skills

Programming Languages & Embedded Systems

- **C/C++**: Embedded systems development, Real-time programming, FreeRTOS, ChibiOS/RT, Bare-Metal Embedded
- **C#**: Industrial applications, Real-time image processing, GUI development, WPF Development
- **Python**: Industrial automation, Data processing, Scripting, PyTorch, Anaconda
- **VHDL/Verilog**: FPGA design, IP core development, Digital signal processing, FPGA prototyping

FPGA & Hardware Design

- **FPGA**: Xilinx UltraScale+, VHDL, IP cores, Real-time processing, Field-Programmable Gate Arrays
- **Microcontrollers**: STM32, MSP430, Infineon XMC, FreeRTOS, TI DSPs
- **PCB Design**: Altium Designer, Electronics Design, Bare-Metal Embedded

Development Tools & Platforms

- **Embedded Linux**: Yocto Project, Kernel, Devicetree, U-Boot, Bootloader, Device Drivers
- **Computer Vision**: OpenCV, Machine Learning, Data Analysis
- **Signal Processing**: MATLAB, Real-Time Operating Systems (RTOS)
- **Communication**: I2C, SPI, UART, TCP/IP, NFC, RFID Applications

Industrial Automation & Robotics

- **Industrial**: KUKA robots, PROFINET, IO-Link, PLC programming, Robot Framework
- **Protocols**: PROFIsafe, EtherCAT, Data Acquisition
- **SCADA**: PLC Siemens, SIMATIC STEP 7, Programmable Logic Controller (PLC)

Key Projects

- **NIR/SWIR Vision Systems**: Developed advanced spectral imaging systems for industrial process analysis using custom C# software and FPGA acceleration, achieving 90% cost reduction compared to initial project estimates
- **FPGA IP Core Development**: Designed and implemented convolutional kernel acceleration IP cores for Xilinx UltraScale+ devices, significantly reducing latency and hardware utilization
- **Robotic Cell Integration**: Engineered complete KUKA robot control systems with safety protocols and precision verification
- **Industrial Control Patent**: Co-authored engineering and industrial control patent integrated into a €100+ million project

Academic Mentorship

- **Mentor:** B. Michalewicz
  Development of a Frame Grabber Application on a Xilinx Zynq-Based Heterogeneous Platform
- **Mentor:** P. Matanzas
  Design and Implementation of an FPGA-based Acceleration System for Real-Time Image Processing
- **Mentor:** J. Barturen
  Vulnerability Analysis in Industrial Automation: Pentesting in Sinumerik ONE Architectures with Profinet and IO-Link Wireless Communications
- **Mentor:** P. Matanzas
  Design and Implementation of a Customized Linux Distribution for Real-Time Image Processing in Industrial Environments

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)**

Languages

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