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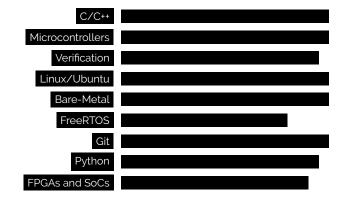
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alair-junior

Computer Engineer

WHO AM I?

Professional with 20+ years of experience, working in industry since 1999 and in academia since 2005. Data-driven with strong bias for action and a willingness to take ownership along all steps of the development process, from training to support. Solid knowledge of the entire computer system and passion for the hardware/software interface, embedded systems, and computer design and verification. Experience leading and collaborating with cross-functional teams in industry and academia and personally interested in mentoring young talents. Skillful in translating academic research into consumer products. Have worked and researched in several industry segments, including heavy industry, automotive, transformation industry, consumer electronics, health, among others.



SELECTED EXPERIENCE

2020 - present

MTS SOFTWARE DEVELOPMENT ENGINEER

Member of Platform security Processor (PSP) Team. Subject-matter expert in the AMD's Secure OS

Implementation, validation, and debugging of SoC features supported by AMD's PSP

The PSP offers services for several components of the system, like the graphics subsystem, BIOS, and others. I work in the PSP Operating System implementing, validating, and debugging features, specially memory interfaces with other components, for different SoCs. Additionally, I personally developed a tool to support the validation of PSP features from Pre-silicon to Bring-up.

C/C++ / Git / Python / Bare-Metal / Verification / SoC

Support for PSP related features during SoC Pre-silicon validation and bring-up

Being a member of PSP team, I was involved in the validation of key SoC security features during Pre-silicon validation (simulation and emulation) and during SoC Bring-up.

C/C++ / Git / Python / Bare-Metal / Verification / Simulation / Bring-up

2019 – 2020 SENIOR SOFTWARE ARCHITECT

Responsible for Low-level and Embedded Software development.

Interfacing Legacy Chassis Dynamometer to ABB Power Drives

In this project, we developed a gateway to interface a legacy Chassis Dynamometer at Fiat-Chrysler Automobiles (FCA) with a set of new ABB Power Drives. I was responsible for reverse engineering the original proprietary serial communication protocol, translating the messages to ABB Power Drive standards, and coding the software to control and monitor the drives using Modbus/TCP. I also used a HTTP server C library to implement a REST endpoint to feed information to an user interface developed in Angular. The gateway was built over an Advantech Industrial Computer running Linux. C/C++ / Git / Linux / device drivers / Serial Communication / TCP/IP / Modbus/TCP

Knife: minimalist framework for creating applications that use Linux processes

Knife is a minimalist framework for creating robust applications that use Linux processes. It abstracts the usage of fork and other OS functions to create and monitor processes. I was responsible for developing the entire framework. Knife is being used by TCS Industrial in commercial projects and it is released under MIT license. (See in GitHub) C / Git / Linux / POSIX processes / fork

Machine Management Integration System (MMI)

In this project, we developed a Hardware and Software Platform allowing the monitoring of equipment at the factory floor. The Industrial Internet of Things (IIOT) hardware was developed using an Arm based microcontroller (Texas Instruments TivaC) with a Zigbee mesh network (XBee module) that collects information about machines' operation status, using GPIO and ADCs, and sends it wirelessly to a cloud server that computes several high level managerial KPI. I was responsible for defining the requirements of the hardware platform, for bringing up the board, and for developing the board's firmware. The firmware was written in C and C++ using FreeRTOS and Tivaware Board Support Package. During the development, I found and corrected bugs in the official Tivaware FreeRTOS port and a silicon bug in the TivaC UART. C/C++ / Git / SPI / I2C / UART / GPIO / TCP/IP / Board Bring up

2018 - 2019CHIEF SOFTWARE ARCHITECT

Crossover for Work

Product Support Manager for Enterprise Level SaaS Products like ResponseTek, Olive Software and Knowledge Marketing.

PSMGlass: analytics for Product Support Managers

PSMGlass is an analytics tool that gather support information from several different systems, like Zendesk, Jira and SQL databases, combine them and organize the information into a set of views that can be used by Product Support Managers and other managers to identify process and product gaps and improve support metrics. It considerably reduced the overhead of feeding data from different sources to spreadsheets, allowing the managers to concentrate on the data analysis itself. I was responsible for designing and implementing all features of the system, including frontend, backend, and integration with Jira and Zendesk.

Java / Spring / SQL / Jira / Zendesk / Data Analysis / HTML5 / JQuery / Python / Git

TCS Industrial

Federal University of Minas Gerais

Taught topics in Computer Architecture, Embedded Systems, and Digital Systems. Advised three master students. Researched on tools for Edge Computing and Verification of Computer Programs using Formal Methods like Model Checking.

15x2c: Transcompiler of Ladder to C

I5x2c is a transcompiler (a source-to-source compiler) written in Python that translates Rockwell's ladder programs into a C program with the purpose of formal verification. It is a work-in-progress and, as of now, it supports complex rung structure, the most used ladder instructions, tag definitions, multiple programs and routines. I5x2c uses PLY to build a single pass transcompiler that translates the original ladder program into a C code that implements an Accumulator Machine that models the behavior of the Rungs. I have implemented the entire transcompiler. (See in GitHub)

Python / Compilers / Regular Expression / Context-free Grammars / Linux

Assessment of Bluetooth 5 mesh for IoT Devices

In this project, we evaluated the Bluetooth 5 standard with respect to its suitability to home automation. We analysed security, privacy, range, and energy consumption of the standard by using the Fanstel's BT832 module, based on the Nordic nRF52832 QFAA SoC with ARM Cortex M4F. A proof of concept was created using Embedded C and Bare Metal. programming. I was the principal investigator of this project and advised a Junior developer. The project was a partnership between the Federal University of Minas Gerais and Neocontrol Home Automation.

C/C++ / Microcontrollers / PCB design / Board Bring up / Bare Metal / Networks / Encryption

Computer Architecture and Organization - Professor

I was the professor in charge of this course, that covers the entire computer stack up to the interface with the operating system, including processor, memory, peripherals, assembly language, interrupts, boot system, storage and bus interfaces, using the MIPS architecture as reference. I was responsible for both theory and practice portions of the course. Parallel with theory, the students were presented with a series of laboratory assignments where, under my supervision, they designed and implemented a custom processor using VHDL and FPGAs.

MIPS / VHDL / FPGAs / Assembly / Safe Boot / GPUs / Interrupts

Embedded Systems Design - Professor

I was the professor in charge of this course, that covers the embedded systems design process, from requirements to implementation using real devices. Topics included microcontrollers, embedded C, middleware, peripherals, embedded serial buses, basic networking. I was responsible for the practical portion of the course where the students used the STM32 microcontroller series with STM32CubeMX to implement personal projects.

C/C++ / Microcontrollers / Bare Metal / SPI / UART / I2C / CAN / Timers / Interrupts

Digital Systems - Professor

I was the professor in charge of this course, that is an introduction to Digital Systems and covers all aspects of digital systems from Logic Gates to RTL design, including how to implement high-level Finite State Machines in RTL. Topics also include memories, logic families, integrated circuits, FPGAs and VHDL. I was responsible for both theory and practice portions of the course. The students were presented with a series of laboratory assignments where they were gradually introduced to RTL design in practice. At the end, they built their own hardware accelerator. Logic Gates / Memory / RTL Design / VHDL / FPGAs

POSTDOCTORAL RESEARCHER 2013 - 2014

Awarded a Swiss Confederation Excellence Scholarship for Foreign Students for researching on biomedical signal processing techniques. Co-authored a patent, peer-reviewed papers and acted as technology consultant to the spin-off Smartcardia.

Estimation of blood pressure and pulse transit time using smartphones

In this project, we developed a new smartphone-based method to estimate Pulse Transit Time (PTT) reliably and subsequently Blood Pressure (BP) from the baseline sensors on smartphones. This new approach involves determining PTT by simultaneously measuring the time the blood leaves the heart, by recording the heart sound using the standard microphone of the phone and the time it reaches the finger, by measuring the pulse wave using the phone's camera. I was a key member of the team who developed the method and I was responsible for implementing algorithms for Android. Android NDK was used to allow native C code to be used in the signal processing algorithms and to improve the performance of the application.

C/C++ / Java / Android / Matlab / R / Git

PROFESSOR OF COMPUTER SCIENCE 2010 - 2016

Taught graduate and undergraduate level courses, in special Algorithms and Data Structures, Artificial Intelligence, Compilers, Automata Theory, and Introduction to Robotics. Researched on tools for Verification of Software and Hardware using Formal Methods like Model Checking.

Java / JavaScript / HTML / Bison/Yacc / Linux / Microcontrollers / FPGAs C/C++ /

Introduction to Robotics - Professor

I was the professor in charge of this course, that covers the use of embedded systems for robotics. Topics included microcontrollers, embedded C, middleware, peripherals, embedded serial buses, basic networking, sensors and actuators and basic control. I was responsible for the theory and practice of the course. After the theory, the students were presented with a series of laboratory assignments where, under my supervision, they solve common problems in robotics using the Texas Instruments' MSP430 microcontroller.

C/C++ / Microcontrollers / Bare Metal / SPI / UART / I2C / PWM / Timers / Interrupts

Algorithms and Data Structures - Professor

I was the professor in charge of this course, that covers the most used programming data structures and algorithms. The course was taught in C and in Java. C / Java

Automata Theory - Professor

I was the professor in charge of this course, that covers the automata theory, grammars, and formal languages. Finite Automata / Context-free Grammar / Formal Languages

Compilers - Professor

I was the professor in charge of this course, that covers an introduction to compilers. Lexers / Parsers / Semantic Analysis / Code Generation / Bison/Yacc / Ply

Fumec University

École Polytechnique Fédérale de Lausanne (EPFL)

2008 - 2016

SENIOR EMBEDDED SOFTWARE ENGINEER

Lead a technical team responsible for developing Wireless Sensor Network products.

Wasp: Wisecomm Advanced Sensor Platform

In this project, we developed a Wireless Sensor Network (WSN) platform for using in academia and on industrial environments. The platform is composed of three components: 1) main board with 4 layers of copper, featuring a TI's MSP430 microcontroller, a TI's CC2531 RF module, an onboard antenna; 2) sensor board, with different analog and digital sensors; 3) programming board, with USB and JTAG interfaces. I was responsible for defining the platform hardware requirements and manage the hardware development team, as well as bringing up the board and leading a team to develop the firmware. The firmware was developed using Bare Metal Embedded C. C/C++ / Eagle PCB / Bare Metal / Board Bring Up / SPI / I2C / UART / JTAG / Java

EDUCATION

LANGUAGES

2008 - 2012 PhD in Electrical Engineering Federal University of Minas Gerais Developed a method for speeding up the verification of Chip High-Level projects using Heuristic Functions. The method was implemented in SystemC, which is a C++ framework for Chip descriptions. Lead a team of undergraduate students.
 2005 - 2008 Master's Degree in Electrical Engineering Federal University of Minas Gerais Developed a method for measuring test coverage of High-Level Chip designs described using SystemC, which is a C++ framework for Chip designs described using SystemC, which is a C++ framework for Chip descriptions.
 2000 - 2005 Electrical Engineering Bachelor's Degree Federal University of Minas Gerais Developed on Scientific Initiation Projects funded by Brazilian agencies in the fields of Machine Learning and Embedded

Systems

Portuguese - Native English - Advanced (C1/C2 - IELTS) French - Intermediate (B2/C1-TEF) INTERESTS

Test and Verification Static Analysis and Formal Verification Embedded Systems and Edge Computing Reconfigurable Architectures Machine Learning

PUBLICATIONS

6 Academic Papers 1 US Patent