Allan Ecker

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Hardware and Software Engineer with Outstanding Skills in Digital Signal Processing, Embedded Engineering Including Firmware, Drivers, and Hardware. Resourceful, flexible and enthusiastic Engineering Professional with 6+ years of well-rounded experience in contributing to product development, research, and knowledge advancement in industry. Expert problem solver with proven track record for design success and improving analytical and operational processes. Excellent design skills in multiple fields combined with strong abilities to communicate and implement solutions.

Embedded Firmware and Hardware Skills

Digital Signal Processing	Audio DSP with dedicated DSP ICs and Windows APOs, Audio signal processing including Equalizers, Dynamic Range Compressors, Crossover Networks, and Spatial Audio, Spectral Analysis, Filter Design, and System Analysis using MATLAB, C, and Verilog. Publications in ITC 2012 and VST 2014 concerning DSP techniques for integrated Built-In Self-Test systems.
Software Development	Scripting: Asset processing with Python, build tooling with GNU make, driver management scripts with PowerShell Applications: Live Data Visualization with Java and Python Low Level: Software drivers in Linux using device tree, LKM and Virtual Serial Ports, and in Windows using WDK, Embedded software, bare metal and with RTOS, frameworks including Atmel AVR (Arduino and standalone), ARM, and TI MSP (RF detectors and monitoring equipment)
Programming Languages	Primary: C/C++, Python, MATLAB and Verilog Secondary: ARM/DSP Assembly, C#, Java, LabView and BASH Some use: HTML5/Javascript and x86 Assembly IDEs: Visual Studio, VSCode, Qualcomm MDE, and Tensilica Xtensa Source Control: Git or SVN, proficient in Git tree best practices.
Embedded Engineering	Hardware Prototyping of PCB with Altium Actuation: stepper and gear motors, thermal heaters, Proportional Integral Differential control of heater/thermocouple Sensors: 100Watt RF Monitoring, mA-scale current monitoring and oscilloscope front-end, optical, thermal, and RF detectors. Design for hostile RF environments such as near 100Watt, 1GHz sources Board Bring-Up and Software Design: Of custom AVR and MSP-based boards via ISP and interfacing TI Code Composer, IAR Workbench and open source alternatives. Complete, operational hardware and software designs including CNC Additive Manufacturing (3D Printing), Mobile Robotics Platforms, and Wireless Power Transmission Systems

Experience

2018-2022

Senior Software/Firmware Engineer/Microsoft

Developed software, firmware, and drivers for Microsoft Surface products. Acted as a DSP Architect for Bluetooth hearables and internal audio tools.

- **DSP Architecture:** Planning of audio features in multi-DSP scenarios, configuration of Audio DSP pipelines including Active Noise Cancelation, voice gating with bone conduction microphone, Equalizer, Compressor/Limiter and MBDRC. Topics of various investigations: Spatial Audio with HRTF customization, Echo Cancellation, Microphone Beamforming.
- **Firmware Development:** Qualcomm in C/ASM with MDE and QACT, Intel in C with Tensilica Xtensa
- **Software/Firmware Debugging:** Using WinDBG, MDE and Visual Studio: detected, diagnosed and remedied audio dropouts, HDCP errors, driver crashes, and driver configuration errors
- **Driver Maintenance:** Intel and Windows drivers with Visual Studio and Windows Driver Kit (WDK)
- **Microsoft Windows Audio Processing Objects (APO):** Expanding audio capabilities in C with Visual Studio, modeling with MATLAB, and Unit Testing with VSCppUnit framework
- **Unit Testing:** With TAEF, HLK, and VSCppUnit
- **Source Control:** Using Microsoft ADO to maintain single-trunk model in Git
- **System Communications:** Debugging I2S Audio Bus with Saleae Logic Pro 16, System bringup over I2C Data Bus using J-Link, System debug with HID
- **Bluetooth Audio:** firmware and DSP configuration for Qualcomm hearable SoCs
- **Agile Methodology:** Microsoft ADO, Sprint Planning, and Work Item Scoping
- **Silicon Partner Relations:** Vetting drivers, testing drivers with Microsoft Driver Verifier, asserting requirements for driver releases, and driving bug resolution
- **Design for Power and Battery Life:** Gathering data from multiple sources to generate power forecasts, predictions of battery life, and recommendations for architectural solutions to short battery life available through software changes

2014-2017

Lecturer/University of Washington

Taught undergraduate courses in the Engineering Department. Provided tutoring or support for graduate and undergraduate students. Courses included:

- **Fundamentals of Electrical Engineering:** Circuit and Systems Concepts, Resistors, Sources, Capacitors, Inductors, And Operational Amplifiers, etc.
- **Circuit Theory:** Circuit Analysis with Sinusoidal Signals, Frequency Response, Power and Energy
- **Devices and Circuits I & II:** Circuit Design, Bipolar Transistors, Linear Circuit Applications
- **Digital Circuits and Systems:** Digital Computer Systems, Logic, Boolean Algebra
- **Design of Digital Circuits and Systems:** Modeling Complex Digital Systems with Verilog
- **Introduction to Embedded Systems:** Specification, Design, Development, and Test of Embedded System Software
- **Embedded Linux:** Custom Linux Drivers, Loadable Kernel Modules (LKM) and communication busses such as RS232, I2C, and I2S

2011-2012

Intern/Broadcom

Engineered memory subcircuits for use in the integrated circuits manufacturing process. Prepared test programs for complex memory circuits using Verilog:

- **Gate Delay Tuning:** Manual calculation and resizing of gates to improve performance.
- **Yield Analysis:** Investigations of low-probability yield events using importance sampling
- **SRAM Design:** Tuning SRAM parameters such as sense amp drive strength for optimal yield

2009-2010

Research Assistant/Intel Research Labs

Researched innovative applications of wireless power transmission systems with the objective of inventing new ways to charge laptop computers wirelessly.

- **Cross-Domain Networking:** Using instruments operating on applications written in Java, MATLAB and LabView and connected by RS232, TCP/IP and GPIB as a unified system
- **RF Analysis:** Using AR Modular RF amplifier to create NWA-like analysis tools at 100 watts of signal power and frequencies in the gigahertz range

Education

Doctor of Philosophy, Electrical Engineering/University of Washington

Dissertation: "A Digital Method for Phase Noise Measurement" - In this work, a Digital Signal Processing (DSP) approach relying on Infinite Impulse Response Filters (IIR) implemented with fixed-point math is used to replace some of the signal evaluation properties of the Fast Fourier Transform (FFT), resulting in low-cost test capabilities for Integrated Circuits.

Publications

A. Ecker, K. Blakkan, M. Soma	"A Digital Method for Phase Noise Measurement", International Test Conference, 2012 - Describes the use of Digital Signal Processing (DSP) to perform evaluations of radio-spectrum signals (Wi-Fi, etc.)
A. Ecker, M. Soma	"A Method for Phase Noise Extraction from Data Communication", VLSI Test Conference, 2014 Evaluates

Side Projects

Fixed Point	DSP demo in fixed-point math. Constructed to show IIR filters can cope with quantization errors. Demo contains signal generators and a narrowband 2-tap IIR filter. The library demonstrates both a working IIR and failure modes caused by quantization and overflow errors.
Attocore	A "nanocomputer" described in Icarus Verilog, the Attocore can perform simple computation and is suitable for integration into student and hobbyist FPGA projects.
iVerilog-Examples	A collection of simple Icarus Verilog demonstrations designed to teach logic concepts with hands-on, simplified examples that illustrate one concept at a time.