

Craig Mautner

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SKILLS SUMMARY

Software engineer with 40 years of experience in embedded hardware and software design and development. Programming at all levels from kernel internals and device drivers through middleware and applications.

- **Languages:** Expertise in: Assembly, C, C++, and Python. Comfortable with Java, PHP, JavaScript, and more. Open to learning Rust, R, Go, Dart, ...
- **Processors:** ARM, PowerPC, Arduino, x86, 8052, 6802, PIC. 64-, 32-, 16- and 8-bit processor architectures. DSPs and SOCs
- **Operating systems and environments:** Linux, FreeRTOS, Android, Arduino, Windows, VxWorks, pSOS.
- **Technologies and Protocols:** USB, I2C, SPI, UART, Flash programming, Timers, DMA, DRAM, WiFi, Interrupt controllers, Memory controllers, Remote software update
- **Development tools:** In Circuit Emulators, logic analyzers, oscilloscopes, git, gdb, eclipse, IntelliJ, gcc, CMake, JTAG, spectrum analyzers. Multiple compilers, linkers, assemblers, and other debuggers, Schematic capture, PCB layout

Recent projects involve Linux on Xilinx ARM cores, camera protocol MIPI CSI-2, EtherCAT and CiA402 motor drivers, robot control application, the Android core framework and Android applications, MPEG video encryption, MPEG-2 transport, Set Top Box development, Arduino hardware and software, network protocols (TCP/IP, etc.), Digital Video Recorders, USB.

EDUCATION

- Master of Science - Computer Science and Engineering, UC San Diego, 1988-90
- Bachelor of Science - Physics, UC San Diego, 1977-83. Minors in Electrical Engineering and Mathematics

WORK HISTORY

Firmware Repairman

Feb 2023 – Present

Contract embedded engineering. Embedded/firmware development: firmware, drivers, RTOS, hardware/software bringup, bug fixing, architecture design

- Projects include:
 - Mission Local (Feb '23). Wordpress, PHP, and JavaScript programming to add comment-voting and quiz-statistics features for local online newspaper
 - Clockwork (Feb '23). diagnosing and fixing intermittent crashing of I2C driver for SF robotics company

Cruise, LLC

Feb 2020 – Feb 2022

Sr. Software Engineer.

- Camera stream multiplexor board. Linux user space application for combining multiple MIPI CSI-2 camera image streams. Application provided configuration, control and diagnostics for various camera models. Linux kernel drivers for accessing the cameras over physical and virtual I2C networks (TI FPD-Link III chipsets). Defined and implemented REST API for accessing board over TCP/IP network
- Camera firmware. Rearchitect vendor firmware in port to FreeRTOS. Maintenance of software to keep up with vendor releases. Addition of camera features to firmware as needed. Debug of problems in vendor firmware and sending fixes upstream

Modbot, Inc.

Jun 2017 – Feb 2020

Sr. Embedded Engineer.

- Modular Robot software and hardware. Responsible for all embedded firmware used at the company for motor driving and peripheral interfacing. Also involved in high-level C and C++ application software. Specifically wrote driver firmware for Brushless DC motors as well as EtherCAT/CiA402 communication protocol software for controlling the joints of a multi-axis robot. Wrote client and server software in C, C++ and Python for high level robotic control and testing. Designed electronic circuits and PCBs for communication, interface and test fixtures. Extensive collaboration with other hardware and software engineers for architecture, product planning and design and code reviews. Development platforms and technologies included XMOS XTimeComposer, TI Motorware, Infineon DAVE IDE, Microchip LAN9252 EtherCAT, Beckhoff software stack, Arduino, Lidar, interfaces to various COTS grippers, FTDI FT232H USB. Used Eagle CAD for schematic capture and PCB design.

Google, Inc.

Jun 2011 – Jun 2015

Sr. Software Engineer.

- Android Frameworks (Jan '12-Jun '15). Responsible for maintaining and implementing new features in Android's Activity Manager and Window Manager on Jellybean, KitKat, Lollipop and Marshmallow releases. The Activity Manager is responsible for startup and shutdown of applications, activities, and services. The Window Manager is responsible for providing graphical resources to these activities and for controlling the visual transitions between activities. My responsibilities included coding new features (multi-windows, hooks for Android Wear, Android TV, and Android Auto), maintenance of existing code, and support for Google application writers.
- Newsstand App (Jun '11-Dec '11). Application for publication, delivery, and perusal of magazines in hi-resolution format. This tablet-only application never made it to market.

Coastal Senior Consulting, Inc.

Jan 2002 – Jun 2011

President. Contract programming for embedded systems. Customers include:

- Secure TV (Oct '10-Jun '11). Encryption products for MPEG data streams over satellite and IPTV networks.
- eBook Technologies, Inc. (Feb '10-Dec '10). Converting ebook reader in C/C++ to java/C++ Android environment. Extensive JNI coding as well as multithreaded applications. User Interface and graphics development.
- Internal project Created Android application for tracking billable hours.
- Rovi (formerly Macrovision/Gemstar/TV Guide/Aptiv) (Oct '07-'09). Java port of cable Set Top Box guide application from C++ to OCAP/tru2way platform. Implementations of DVR, user interface, network utilities.
- Wind River (Jun '07-Sep '07). Testing and fixing of Linux drivers for handheld wireless phones.
- Verimatrix (Jul '05-May '07). Conditional Access system for MPEG Transport IPTV video delivery systems. Client code running on the Set Top Box, server code running on linux and Windows systems.
- Solekai Systems (Jul '04-Jul '05). DirecTV bitstream tool development. Windows C++ programming.
- Pioneer Digital Technologies (Jun '02-Jul '04). Cable TV Set Top Box development. Implemented PowerTV OS/API on linux base. Modified linux device drivers for Broadcom chip. Implemented DVR on linux raw filesystem. Implemented PowerKey conditional access API in linux.
- Personal Robotics, Inc. (Jan '02-Jun '02). Wrote simulator for vacuum cleaner robot vision system running on Linux. Simulator included creating random buildings with furniture in Virtual Reality Modeling Language (VRML). Displaying these worlds using OpenGL and POVray. Created user interfaces in gtk. Modeled movements and detected collisions with RAPID model library. Worked on mapping issues with robot.

MeKey, Inc.

Oct 2007 – Aug 2009

VP Engineering. Social Networking startup. Hardware design, coding and bring-up of PIC-based keyfob for securely transferring id's between fobs. Used Kicad EDA for schematic capture, pcb layout and gerbers

WIND RIVER SERVICES (formerly Doctor Design and Integrated Systems)

Sep 1992 – Jan 2002

Senior Member Technical Staff, Project Manager. Development, technical leadership and project management roles. Responsible for design and development of embedded computer and electronic systems. Tasks include: software and hardware implementation and debug; software and hardware architecture; design reviews, system specification; customer and vendor interface; proposal writing; formation and management of project teams.

Projects include:

- Microcoding and C code of Network Address Port Translation algorithm to C-5 Network Processor.
- C code to port multimedia middleware library to Set Top Box.
- Microcode for Motorola 8260 Communications Processor to assemble and route packets below the PowerPC level in a cell phone base station. Included writing a debugger in TCL/Tk.
- C code port of Bluetooth stack to VxWorks for Personal Digital Assistant. Architecture study for application manager for PDA.
- Architecture design and software specification for integration of TiVo consumer digital video recording system with DirecTV satellite reception.
- Cable Headend Transmitter – Architecture and management of team designing a rack-mounted device to receive messages over Ethernet and retransmit them over an RF cable-TV path.
- Set Top Box Software - Managed team of 15 engineers responsible for writing the software for second DirecTV Set Top Box on commercial market.
- Fingerprint Matching System – Cost reduction and performance enhancement of existing Automatic Fingerprint Identification System. Architected system, programmed Am29200 in C and assembly and three DSPs in C and assembly and design of two FPGAs.
- Wireless Cable Headend and Downconverter – Wrote C code and PIC assembly, architected and managed team responsible for the design of a Wireless Cable (Microwave transmission) transmission and reception system. Design included MC68340, NTSC encoder, PIC16C65 and two custom FPGAs.

Other projects include: architecture studies for various consumer devices, implementations of FPGA designs, design of network backup hardware, laptop security device, JAVA graphics porting, additional Set Top Boxes implementations, television Internet browser, bitstream generator capture system, fiber optic SCSI extender.

UC SAN DIEGO, COMPUTER SCIENCE AND ENGINEERING Sep 1988-Aug 1990, Sep 1997-May 2000
Ph.D. Candidate, Graduate Fellow. Research in Evolutionary Robotics. Used evolutionary algorithms to discover grammars that developed body plans and neural network control structures for robots. Master's project was a study of transitions to Chaos in Cellular Automata Rule Space. Coursework included Computer Architecture, Compilers, Operating Systems, Algorithms and Data Structures, Software Engineering, Imperative and Functional Programming Languages, Complexity Theory, Artificial Intelligence, Neural Networks, and Cognitive Science.

DATA/WARE DEVELOPMENT Aug 1983 – Sep 1992
Director of Engineering ('90-'92), *Project Manager* ('86-'88), *Product Development Engineer* ('83-'85).
Development of mainframe channel peripherals and test equipment.

TELEDYNE CONTROLS Feb 1985 – Oct 1985
Member Technical Staff. Design and coding of bit-slice floating point coprocessor for data acquisition.

SCRIPPS INSTITUTE OF OCEANOGRAPHY Sep 1981 – Aug 1983
Jr. Development Engineer. Design of devices for support and maintenance of geophysical observatory.

AWARDS AND HONORS

- [Patent #5455926](#) VIRTUAL ADDRESSING OF OPTICAL STORAGE MEDIA AS MAGNETIC TAPE EQUIVALENTS
- [Patent #5438674](#) OPTICAL DISK SYSTEM EMULATING MAGNETIC TAPE UNITS
- [Patent #8478980](#) SYSTEM AND METHOD FOR DEFINING PROGRAMMABLE PROCESSING STEPS APPLIED WHEN PROTECTING THE DATA
- [Patent #20100005520](#) PERSONAL AREA SOCIAL NETWORKING
- National Science Foundation Fellowship 1989 – 90.
- Powell Foundation Fellowship 1988 – 89.
- Graduated Cum Laude, Physics, UCSD 1983.

OTHER INTERESTS

- Member Board of Directors, Andytown LLC. Coffee wholesale and retail company based in San Francisco. 2017-present
- Remodel of a 1909 Edwardian in San Francisco's Bernal Heights. Seismic retrofit required adding moment frames, additional posts, beams, joists and rafters to existing structure. Replaced all existing services (gas lights, knob and tube electrical, galvanized water lines, telephone wiring) with new. Hallways and living space changed to open floor plan. Moved kitchen and bathrooms. Expanded attic rooms with vaulted ceilings. August 2015 – Jan 2017.
- Designed an Arduino shield to control a cube of LED panels. Fabricated and assembled PCB and programmed the Arduino. <https://github.com/cmautner>. June 2016
- President, Pi Properties Inc., 2001-present. Real estate investment holding company.
- Member Board of Directors, Bank of Hope, 2012 – 2017.
- President, Congregation Dor Hadash. Secular leader of 140 member Jewish Reconstructionist congregation. Responsible for committee makeup, budget, leading board meetings, selection of new rabbi. 2004 – 2005
- Member Board of Trustees, Congregation Dor Hadash, 1995 – 1998, 2004 – 2007.
- Board of Directors, LOLO Corporation. Toy company specializing in educational children's games. 2008 – 2010

PUBLICATIONS

Craig Mautner and Richard K. Belew. "Evolving Robotic Bauplans". In *Fifth Joint Symposium on Neural Computation*, page 93, University of California, San Diego, 1998. Institute for Neural Computation.

Craig Mautner & Richard K. Belew. "Evolving Robot Morphology and Control". *Proceedings of the Artificial Life and Robotics Conference (AROB99)*.

Craig Mautner & Richard K. Belew. "Coupling Morphology and Control in a Simulated Robot". in *Proceedings of the Genetic and Evolutionary Computation Conference (GECCO) 1999*.