ABBREVIATED PROFESSIONAL RESUME

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Address: 1998 Yarnall Road, Pottstown, PA. 19464

Degree: BEEE - Stevens Institute of Technology

Current Position - Freelance Electronic Design Engineer (since 1990)

GENERAL AREAS of EXPERTISE:
Analog and digital design, micro-processor hardware and embedded software design, chip-level video, LCD, & OLED design, printed circuit board design.

MICRO-PROCESSOR HARDWARE DESIGN:
Design of conventionally & battery powered, embedded, real-time control, measurement, USB, and communications systems using a wide variety of processors including Atmel AtMega & AtXMega Families, Arduino, FreeScale 32, 16 & 8-bit Families, 68000, 68332, 80186, 8051, 68HC11, 68705, PICs, Z80, NEC-MIPS, Microchip, and many others. End products range from machine controls, to InfiniBand Controllers, to avionics instruments, to handheld devices.

MICRO-PROCESSOR SOFTWARE DESIGN:
Design and implementation of embedded, real-time programs in C/C++ and assembler. Applications include avionics instruments, communications, I2C/SMB/IBML, distributed machine control systems, process control instrumentation, LCD & Video display sub-systems, and user interfaces for consumer products. Working experience with DO-178 Software Verification Process. Pagers & POCSAG protocol. Extensive experience on CodeWarrior, Kiel, Image-Craft, AVR Studio, Paradigm, Arduino and many other IDE platforms.

LCD MODULE-LEVEL VIDEO DESIGN:
Over 30 years of experience designing unique LCD display sub-systems including custom glass procurement, wide temperature applications, unusual physical configurations and non-standard scanning techniques.

Extensive experience with design and testing of large screen LCD's, associated video controllers (including Genesis, Pixel Works, ST-Micro), CCFL & LED backlight controllers and driver circuitry, video multiplexers, scalers, switches & test pattern generators, NTSC, HDMI, DVI, SDI & HD-SDI, Display Port interfaces. Military, industrial and other harsh environment applications.

***ANALOG DESIGN*:**
Many years of experience with A/D, D/A, op-amp circuits, instrumentation and transducer circuitry, HART Protocol, capacitance liquid level gauging, thermocouple & RTD temperature measurement, telephone interfaces, line & cable driving, modem design, switching regulators (including Top-Switch, Linear Tech & others), battery chargers, battery testers, synchro-resolver interfaces, metal detection & magnetometer systems, and low-noise PCB layout. Hot-Swap card &

power supply design. OEM Power supply testing and qualification. Autonomous & automotive motion control.

DIGITAL DESIGN:

Strong background and experience in high-speed control, data-handling and interface timing circuitry using all discrete logic families, programmable logic (Xilinx & Lattice FPGAs & CPLDs), FIFOs, DDRAMs, PCI-bus, EtherNet controllers, USB controllers and switches. Applications include PCI cards, mainframe interface cards, state-machine based controllers, and video display & LCD interface cards, LVDS and SERDES. Working familiarity with JTAG & Boundary Scan interfaces and many ISP techniques.

POWER SUPPLIES:

Design of switching regulators utilizing Top-Switch, Linear Tech, Simple Switcher, & other integrated regulators in low and medium current range, and up to 300 KHz switching speeds. Off-the-line switching regulators up to 150 watts. Testing of COTS and custom power supplies to determine power, control and monitoring deficiencies. Upgrading legacy designs to utilize up-to-date integrated solutions. Aircraft, automotive, shipboard & military vehicle (MIL-1275) applications.

PRINTED CIRCUIT BOARD DESIGN, MANAGEMENT and PROCUREMENT:

Design of simple to extremely complex printed circuit boards and assemblies both as a project manager and as a PCB layout operator. Experienced with many popular PCB-layout packages such as Altium, OrCad-Capture,etc. Hands-on multi-layer design proficiency with DipTrace. Direct procurement experience with Chinese PCB & PWA fabrication houses such as PCB-Way and JLC-PCB.

DSP HARDWARE DESIGN:

Basic experience in design of Analog Devices 2106x and 218x circuitry; specifically related to video telephony & compression applications.

PATENT PRACTICE:

Experience as expert witness in patent cases and interpreting & analyzing patent content within my areas of expertise. Working experience with practical fundamentals of patent law. Consulted with many patent firms and attorneys pertaining to infringement suits.

TECHNICAL WRITING:

Proposal writing, operating manuals, white papers, repair manuals, patent analyses, product brochure editing, product specifications, test procedures, technical proofreading and copy editing. Quite rarely according to my experience, I am an electrical engineer that LIKES to write.

WORK EXPERIENCE

Most recent employment (June 2021 thru Nov 2024) as an *employee* of Thermal Instrument Company, Trevose, Pa. as a Electronic Design Engineer. Prior to that I was retained as a consultant from 2018 thru June 2021 in the same capacity.) Primarily I designed the electronics and embedded microcontroller code (AtMega Family, C-language) for an industrial flow meter/transmitter. This included graphic LCD and GUI code and analog circuit design of the hot-wire anemometer technology used in this product. I was also responsible for procuring fast-turnaround prototype PCB & PWA from Chinese fab houses, and assembling same into product prototypes and test stands.

Prior to the above I was self-employed as a Freelance Electronic Product Design Engineer providing design and consulting services to many companies: Aydin Displays (now ElBit, Birdsboro,Pa.) , Neutronics (now MSA, Exton,Pa.), US Gauge-Ametek (now Ametek-PDS, Harleysville, Pa.), Schoenstedt Instruments (Kearneysville, WVa), Honeywell, Exxon, and many other smaller companies and start-ups in the industrial and military business sectors.

I am now semi-retired and open to part-time, short-term and similar employment or consulting opportunities such as **technical writing**, performing design critiques, product reviews, patent evaluations, etc. Also, I am very proficient at designing, and procuring fast-turnaround PCBs & PWAs from Chinese suppliers such as JLC-PCB and PCBWay.

END PRODUCTS

I have been involved to various degrees with the following end products and systems:

LCD VIDEO DISPLAYS:

DVI, HDMI, VGA, NTSC, PAL input video monitors and displays using LCDs from 4" to 68" and 640x480 to 1920x1200 pixels resolution. All aspects of video hardware and software design including user interfaces, video signal interfaces, LCD LVDS interfaces, LED & CCFL backlighting, test pattern generators, as well as programming Genesis and ST-Micro video controllers and Xilinx FPGAs. See US Patent # 9,232,588

AVIONICS:

Fuel Gauging Systems, Mach-Airspeed Indicators, Radio Altimeter Indicator, Air Data Computer, Barometric Altitude Rate Computer, EPR Indicator, ITT Measurement, Engine Tachometer, Radar Monitor Operator Interface, Software Testing, Flight Simulator Indicator Panel with Dichroic LCD, Active Matrix LCD Display with Dimmable Fluorescent Backlight, Synchro-to-Digital Converters, Flap Position Indicator, Miscellaneous LCD Cockpit Displays.

PROCESS CONTROL:

Capacitance fluid level transmitter with HART protocol; Honeywell: TDC-2000, EIU & GPCI, Mini-Computer Interfaces; 4-20 mA Xmitters; HART Protocol Instruments; IBM Series-1 Interface Cards; LCD Coating Bath Controller; Flow

Transmitter Controller; Pressure Transducer Tester; Portable 3-Phase Line Voltage Recorder; Freon Purity Monitor; Hot-wire/thermal flow meters.

MOTION CONTROL:

Precision Rotary Positioning Head, High Speed Newspaper Collating Machine Controller, Stepper Motor Driver, DC Motor Speed Controllers, Magnetic Tape Drives, KOMAX Wire Stripper, Locomotive Speed Recorder, Electro-Mechanical Panel Instruments, Speedboat Dual Engine Synchronizer.

MISCELLANEOUS:

Underground Cable Locators, Video Telephone with Digital Audio, Scuba Diving Computers(handheld), NTSC Video Equipment, Fire Fighter's Air Monitoring Computer(handheld),Fast Ni-Cad Battery Chargers, Holter Heart Monitor and Readback Unit, EEG & EKG, Noise Canceling Earphones, Infra-Red Remote Control Light Dimmer, Large Screen (52" diagonal) LCD monitor, Embedded-386/486 Race Track Wagering Terminals, IR Touch Screen, Apartment Building Door Entry System, Speakerphone, Recreational Metal Detectors, IBM Keyboard-to-RS232 Converter, Power Supply Testers, Fluorescent Light Dimmer, 3-D LCD Display Monitor (for NASA), Fire Alarm Strobe-Light Drivers, Solar Panel Sun-Tracking Mechanism, Wireless Thermostat, HVAC Water Overflow Alarm, Water Level Transducer, Freon Gas Identifier, Specialized USB Keyboards, Ultrasonic Oxygen Sensor, EZ-Pass Transponder, and others.

SOME RECENT PROJECTS

("**H**" and "**S**" refer to hardware and software design participation.)

HOT-WIRE INDUSTRIAL FLOW METER – redesign of an existing flow to include an all-weather LCD graphic display with an extensive operator and maintenance menu system. (**H&S**)

VIDEO MONITOR for MILITARY POSEIDON P8-A RECONNAISSANCE AIRCRAFT – This 24” high-definition monitor includes a patented, FPGA-based anti-flicker feature which smooths the display of sonar images. My participation included video controller design using an ST-Micro video controller IC, custom LED backlight controller design, analog front-end signal conditioning circuitry, and micro-processor based human controls interface & communications subsystem. (**H&S**)

FREON GAS ANALYZER – Portable unit used to identify & test the purity of many types of Freon gas used in the HVAC and refrigeration industry. Utilizes infra-red light source, IR sensor, and stepper-motor-driven filter wheel to determine spectral content of the gas-under-test. Dot-matrix LCD shows specifics of the resulting gas analysis to the operator. Designed low-noise analog front-end circuitry to boost millivolt signals to levels readable by 16-bit ADC. Wrote C-language firmware for the embedded Freescale MCF52259 32-bit processor. (**H&S**)

WIRELESS RESIDENTIAL THERMOSTAT – Wall mount transmitter worked in conjunction with all commercially available thermostats. Transmitter derived operating power from the thermostat’s 26 VAC supply. Receiver unit mounted at the HVAC unit, furnace or heat pump. Allowed multiple thermostats to control multiple heat/cool zones with only local power wiring at the thermostat. Designed hardware and software for both units. Utilized redundant, error-resistant data format to preclude false activations, crosstalk in multi-zone installations, and conflicts

with other wireless devices within reception range. Atmel microcontroller, modular 315 MHz RF xmitter and receiver. (**H&S**)

WATER CISTERN LEVEL GAUGE – This unique, wireless water level meter consists of a transmitter in a waterproof float and a wall-mount digital volume display. The transmitter float contained a MEMS angle sensor to measure the angular disposition of the float which is proportional to water depth. Digital depth was transmitted to the wall-mount receiver where it was converted to gallons according to configured cistern dimensions. Utilized Atmel AtMega microcontrollers and custom RF circuitry. (**S**)

EXPERT WITNESS in PATENT INFRINGMENT LAWSUITs – Worked with a Philadelphia intellectual law firm to develop a case for their client against a competitor who was potentially infringing the client's patent which dealt with a method of discriminating cross-lane interference for an automatic toll collection system (e.g. EZ-Pass). I was engaged as an expert in microprocessor hardware and software design. I read the involved patents, studied assembly language program listings of the competitor's system, determined areas of infringement, and prepared a 23-page report describing my findings. Case was settled out of court.

See also Air Measurement Technologies, Inc. vs. Akin Gump Strauss Hauer & Feld, L.L.P., et al in which I played a key role.in the development of the subject firefighter's computer and subsequent patent infringement investigations (1988 thru 2009).

AIRCRAFT ENGINE INTERFACE UNIT – Responsible for hardware and software design of the Internal Turbine Temperature (ITT) measurement subsystem for the Bell/Agusta 609 VTOL aircraft. Prepared many software documents in accordance with DO-178. This subsystem is 8051-based and communicates with a host 68332 via a dual port RAM. The project included designing a high-precision thermocouple-sensing analog front-end. All code was designed and implemented in ANSI-C in accordance with DO-178 Level A. ***(H&S)***

DSP-BASED VIDEO/DIGITAL TELEPHONE - Two versions of a portable video-telephone were designed based on Analog Devices,Inc. and 8x8,Inc.reference designs. This VP was designed to the H.324 POTS Video Telephony standard. The unit incorporates both traditional analog telephone capability and digital full-duplex echo-cancelling speakerphone technology. Both designs utilize high-speed video and audio DSP chips and V.34 modem technology. This fold-up unit incorporates an integral CCD camera and LCD color display. ***(H&S)***

DOOR ENTRY Security SYSTEM - This is a complex, wall mounted lobby box for residential apartment and commercial buildings. Connection to the apartments is made thru the public telephone system. Residents converse with lobby visitors and activate electric lobby door latch via DTMF codes from their standard telephone set. This is an 8051-based unit with an extensive non-volatile memory structure to hold tenant data. An integral modem allows a remote PC to interrogate and download the entry unit's data base of tenant names, entry codes, telephone numbers, etc. The unit incorporates a multi-line LCD/VF display, a vandal-proof keypad, a half-duplex speakerphone, a 2400 baud modem, DTMF detectors, Wiegand magnetic card readers and striker drivers for electric doors. See US Patent # 5,982,861 ***(H)***

IR HANDHELD REMOTE for a LIGHT DIMMER - Two AA batteries power this 1.5 x 5 x .5 inch wand used to control a high-end receptacle mounted light dimmer. This PIC-based design was required to reliably interpret various sequential keystrikes (single, double and triple "taps") and activate corresponding dimming and memory functions. ***(S)***

68332-BASED NEWSPAPER COLLATING MACHINE CONTROLLERS - This high speed machine "bundles" the Sunday supplements in printing plants across the country and in Europe. Multiple mechanical feeder heads are joined in a machine which can be up to 75 feet long. Each feeder drops a copy of its particular advertisement into the bundle as it travels on a circulating conveyer chain under the feeders. Each feeder has its own 68332-based controller which co-ordinates the action of picker-arms, drive clutches and the commands from a system control bus. Product thickness is measured on-the-fly with a sophisticated magnetic-resonance micrometer; missing product or multiple product feeds are reported to the system-controlling PC for automatic corrective action. The design relies heavily upon the 68332's unique TPU to measure pulse widths associated with product thickness. ***(H&S)***

HART-PROTOCOL INSTRUMENTS - HART protocol was developed by Rosemount as a digital communication supplement to traditional analog (4-20ma)process control transmitters. I have added HART capability to several instruments including a capacitance level xmitter. I have also developed several ISA card "masters" which allow a PC to communicate with HART-capable instruments. Some of these ISA-resident "masters" utilized Z80 and 8051 slave processors which interfaced to PC-host programs thru a dual-port RAM mapped into the ISA memory space. ***(H&S)***

Clients have included Aydin Monitors, TD Labs, Neutronics, InfiniCon Systems, Schoenstedt Instruments, Ametek, Litton, Smith Industries, Tseng Labs, Leeds & Northrup, Princo Instruments, Lutron, Integrated Circuit Systems (ICS), Philadelphia Inquirer, Auto-Tote, Graphic Management Associates, Analog Devices, Honeywell, Exxon, and many small companies and start-up enterprises.

Written elaboration of any of the above areas of expertise or projects will be gladly provided upon request, as well as professional references.

RECENT POSITIONS

Although I have been a freelance EE Design Engineer since 1990, working on & off-site as a contractor and doing business under the name of Gangi Engineering, I have also had several long-term relationships with my corporate clients. Some of these included years-long in-house assignments. These are two of the most recent…

In-house consultant and design engineer for Aydin Display Systems, Birdsboro, Pa. from 2005 thru 2016. Designed numerous large screen LCD displays and monitors for military and industrial applications. This included video controller PCBs and firmware composition. Traveled to many customer sites to analyze field problems and demonstrate new products. (Aydin has been purchased several times in the past few years. E.g. by Sparton in 2016.)

Design Engineer for Thermal Instruments, Trevose, Pa. from 2018 thru 2023 designing analog & microprocessor circuitry for a hot-wire anemometry-based industrial flow meter. This included designing firmware for the integral Atmel/Microchip AtMega2560 & 2561 micro-controllers using the Code-Vision IDE & MicroChip Studio. A small-scale dot-matrix graphic LCD was included in this flow meter for which I wrote all of the multi-font alphanumeric drivers in C-code. I was also responsible for designing the 4-layer multilayer PCBs using DipTrace for schematic capture and layout, as well as procuring the corresponding PCB's & PWA's from low-cost off-shore manufacturers.

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