Gary Sanders

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Professional Summary

Innovation and creation of new products from initial concept through to manufacturing is one of my passions. Through my company *Applied Concepts Engineering,* I have brought significant value to each company I've worked with, having created a solid track record in new product development. My skills include; product conceptualization, simulation, hardware design, embedded firmware, and application software. I bring a broad array of experience, consistent focus, unconventional ideas, and a sense of adventure in bringing a task to completion.

Skills

- Embedded hardware design, DSP, ARM, μP, FPGA/CPLD.
- Analog design, low noise preamp to A/D.
- Many aspects of signal processing FFT, IIR, FIR, Kalman, Non-linear convergence algorithms, Neural networks, Optimal matrix algorithms.
- Linear and non-linear signal processing.
- Control Systems, linear and nonlinear.
- Finite element modeling.
- RF Doppler frontends and mixers.
- Bluetooth and RF data connections.
- MEMS devices (accelerometers, magnetometers).
- Power supply design.
- International design to production liaison.
- Creation of intellectual property.
- Embedded C, C++, Assembly (real-time).
- Application level C#, C++, JavaScript, real time displays.
- Production test fixtures and test procedures.
- Temperature and motor control.
- H/W, S/W design experience with most aspects of medical ultrasound, patient monitoring and defibrillation.
- Ultrasound transducer modeling.
- Schematic capture and PCB layout and rapid prototyping.
- Tools: Altium, PADS, Cadence, OrCAD, Spice, Mathcad, Computer simulation modeling directly in C++.
- Free RTOS, Linux, Windows.
- Audio and instrumentation circuitry.
- Optical electronics

Experience

Lucent Medical Systems, Kirkland, WA.   **July 2014–Present**
Independent Consultant: Software, hardware, algorithm developer, technology creator   **Sept 1997–2004**

- ✓ Development of core technology to magnetically track the position of catheter tips, fluid valves, and tiny guide wires within the body.
- ✓ Created prototypes of a magnetic tracking system, allowing LMS to raise venture capital and win new business.
- ✓ Developed subsequent generations of tracking system products creating revenue from various medical device companies.
- ✓ Product development of the Stratavarius Hydrocephalous valve setting detector (see portfolio below)
- ✓ Development of a Helmholtz cage-based test system for manufacturing test and calibration.
- ✓ Ongoing creation of a multi-channel tracking system utilizing high speed sampling and spectral processing.
- ✓ This work included design and implementation of low noise analog amplifiers, magneto-resistive sensors, data acquisition, and embedded microprocessor (PIC/TI/ARM/DSP) with USB 2/3 interfaces to a host PC.
- ✓ Windows based applications implementing a magnetic location and tracking system plus user interface.
- ✓ This work uses neural networks and a non-linear convergence algorithm.
- ✓ Standalone battery-operated products using embedded DSP implementation of tracking algorithms.

Vmed Technology, Redmond, WA.   **Feb. 2001-June 2014**
Engineering Consultant, Independent Consultant: Principal Product Developer

- ✓ As the founding engineer, created 6 product lines serving the veterinary medicine community. This included a surgical monitoring product used nationwide in Banfield Pet Hospitals.
- ✓ This work included complete design of hardware, firmware, and Windows application.
- ✓ Creation of a low noise 10 MHz ultrasound Doppler product for blood pressure measurement.
- ✓ An MSP430 based Non-Invasive Blood pressure measurement product using an OEM blood pressure module.
- ✓ Several generations of MSP430 based wireless Bluetooth/Wi-Fi surgical monitoring products for measurement of ECG, Respiration, SpO2, CO2, O2, and Blood Pressure.
- ✓ Developed MFC C++ based Windows Applications for display of patient monitoring data as well as ECG data interpretation.
- ✓ Hardware and Software prototype development of an ARM/Linux/JavaScript based patient monitor using Node and Socket.io transport of real time data to a browser-based real time display.
- ✓ Implementation of manufacturing test fixtures/procedures and Windows based test application software.

Vertis Neuroscience, Seattle, WA   **Feb 2001-Sept 2004**
Engineering Consultant Independent Consultant: Hardware Engineer

- ✓ Developed electronics hardware to support animal and human clinical trials for an implanted neural stimulation device controlled via a dedicated RF wireless link.

Motorola, Wireless Data Group, Bothell, WA   **Feb 1997-Sept 1997**
Independent Consultant: Hardware/DSP Software Engineer   **Oct 1992-Nov 1993**

- ✓ Developed custom data transfer protocols and hardware to support them to be used with Motorola's private infrastructure for wireless data.
- ✓ Porting of DSP56166 CDPD cellular modem software to DSP56002 signal processor.
- ✓ The redesign and implementation in C language of CDPD DSP algorithm for transmission of data.
- ✓ Hardware design and implementation of a low-cost PCMCIA based radio modem PCB which included a Motorola 68340 microprocessor with a slave 68302 and DSP56156 used for modem data pump.
- ✓ Design support for an 80386 DOS-Windows based mobile workstation with wireless modem.
- ✓ I served as a technical liaison, facilitating the design transfer from Bothell to Motorola's manufacturing facility in Tel-Aviv Israel and Arad Israel.

Physio Control Corp., Redmond, WA   **Nov 1993-Feb 1997**
Independent Consultant: Principal Hardware Engineer   **Mar 1991-Oct 1992**

- ✓ On two separate occasions I contracted to conduct feasibility studies and analysis, which led to responsibilities as a principal design engineer for new product lines.
- ✓ Principal design architect for DaVinci product line emergency transport monitor.
- ✓ Lead/Principal electrical designer for a small battery-operated defibrillator (LifePak-500).
- ✓ A survey and evaluation of numerous speech and ECG data compression algorithms with a comparative study which assessed compressed speech quality.
- ✓ Design and implementation of an ECG compression algorithm based on linear prediction and arithmetic entropy encoding.
- ✓ Design of overall product electronics architecture and ECG/Patient impedance signal processing architecture.
- ✓ Circuit design and implementation of 68332/56002-based defibrillator product with electronic audio recording and playback capabilities.
- ✓ FPGA and PLD logic design using AHDL.
- ✓ Software for hardware functionality testing, Embedded FFT based self-tests of patient monitoring front end, ECG processing, and interface to an OEM speech compression algorithm.
- ✓ Created a PC based research platform for non-invasive Blood Pressure measurement.

Diagnostic Devices Group, Kirkland, WA   **Aug 1988-Mar 1991**
Principal Engineer

- ✓ As a founding employee of DDG, I conducted research and development of an ultrasound based, cardiac output blood flow monitor. This included a PC based research system using the TMS320 DSP, 8086 µP.
- ✓ Bench and clinical evaluation of flow algorithm to measure pulmonary blood flow.
- ✓ Finite element computer modeling of cardiac output flow algorithm and transducer
- ✓ Hardware and software design using the 68000 and DSP56001
- ✓ Analog video and RF electronics associated with Doppler ultrasound
- ✓ High speed digitizers and state machines

International Biomedics Inc., Bothell, WA   **Apr 1986-July 1988**
Senior Engineer

- ✓ Ultrasonic Doppler Fetal monitor product upgrade including DSP software development
- ✓ Design of a dual processor 8086 and TMS320 DSP board interfacing to the IBM AT ISA bus.
- ✓ Analog Doppler electronics and digitizers as well as design of ECG circuitry for fetal monitoring
- ✓ Analog electronics associated with fiber optic-based blood chemistry analyzer
- ✓ Finite element computer modeling of fetal monitoring ultrasound transducers.

Advanced Technology Laboratories, Bothell, WA   **Nov 1984-Mar 1986**
Electronics Engineer

- ✓ Computer modeling of transducers and beam formers
- ✓ Electrical design in ATL's phased array scan head
- ✓ Transducer manufacturing line support
- ✓ Hardware and software development for motor controllers

Additional experience summary available on request

Education

MS. Engineering -Calif. State Polytechnic University, Pomona.
B.S.E.E. -Calif. State Polytechnic University, Pomona. *Suma Cum Laude.*

Patents

- ❖ WO2017127722A1, "Low-Frequency Electromagnetic Tracking" Patent application pending
  https://patents.google.com/patent/WO2017127722A1

- ❖ US 7,334,582B2 "Electronic valve reader" https://patents.google.com/patent/US7334582B2

- ❖ US 6,263,230B1, "System and method to determine the location and orientation of an indwelling medical device" https://patents.google.com/patent/US6263230B1

- ❖ US 4,890,624A "Fetal heart rate counting system using digital signal processing"
  https://patents.google.com/patent/US4890624A

Product Portfolio links

Lucent Medical Sage tracking system
https://www.lucentmedical.com/technology/

Lucent Medical StrataVarius valve position detector
https://www.lucentmedical.com/case_study/stratavarius-shunt-valve-adjustment-tool/

Vmed Technology products (current production)
https://www.vmedtechnology.com/products.htm