

**Miro Samek, Ph.D.**

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**SPECIALTY:**

- Design and development of modern embedded real-time software based on UML state machines, frameworks, and patterns
- Disciplined software design for safety-critical devices (e.g., according to FDA regulations)
- Hardware/software co-design and hardware/software integration
- Board bringup, including startup code, interrupts, RTOS, device drivers
- Mentoring, training, and transfer of design skills to developers

**SUMMARY:**

Domain expert in all aspects of analysis, design, implementation and troubleshooting of real-time embedded (RTE) systems. Book author (*Practical UML Statecharts in C/C++, Second Edition*, Newnes 2008), regular speaker at the *Embedded Systems Conferences*, contributing editor to *C/C++ User's Journal* (in 2003), member of the editorial review board of the *Embedded Systems Design* magazine. Extensive industry experience ranging from safety-critical software development at GE Medical Systems (now GE Healthcare) through hard real-time embedded system design at two Silicon Valley companies specializing in GPS technologies. Proficient in UML, object-oriented analysis and design, real-time kernels, real-time frameworks, user interface design for medical and industrial applications, hardware/software integration, design patterns, networking, computer simulation, advanced numerical methods, data analysis and data visualization.

**TECHNICAL EXPERIENCE:**

Technology understanding:	Highest-level of proficiency in real-time programming, real-time kernels, and concurrency. Expert in UML, specifically state machines (statecharts), object-oriented programming, application frameworks, CASE tools, and design patterns.
Programming languages:	Fluent in C, C++, EC++ (embedded C++), various assemblers; as well as now obsolete languages such as: Pascal, FORTRAN, Basic, PL/M, PL/I and others.
Scripting/prototyping: RTOSs:	MATLAB®, Java, Tcl/Tk, Visual Basic, lex/yacc, shell scripts VxWorks, Embedded Linux (POSIX), Nucleus, ThreadX, µC/OS-II, RTOS-32, iRMX, developed/ported custom real-time preemptive kernels.
Development Environments: Target Processors:	Windows (XP/2000/NT/9x), UNIX (including Linux), VMS Expert in ARM/THUMB and ARM Cortex microcontrollers (TI, Atmel, NXP, ST), AVR, H(S)08, 68K, ColdFire, Renesas M16C/R8C/M32C, H8, HC11, TI MSP430, TMS320C28x, Microchip PIC18/PIC24/dsPIC, Cypress PSoC, Altera Nios II, x86/in real and 32-bit protected mode.
Software Tools:	Eclipse/CDT, IAR Embedded Workbench for various processors, Green Hills MULTI for ARM, ARM ADS/RealView, GNU tools (gcc, gdb, make), Visual C++, Renesas HEW, Keil 8051, Microtec Research C for MC68000, various version control software (e.g., Visual Source Safe, CVS, RCS, ClearCase), various defect tracking software (e.g., DDTs, Bugzilla), UML design automation tools (Rational Rose RT, ObjecTime toolset, i-Logix Rhapsody).
Hardware & Tools:	ICE, JTAG, BDM, ROM-monitors, boot-loaders, in-system flash programming, EE-PROM programmers, oscilloscopes, logic analyzers, network analyzers.

## WORK EXPERIENCE:

05/2005 – Present

### **Founder and President**

Quantum Leaps, LLC – Chapel Hill, NC (04/2007 – Present)

Quantum Leaps, LLC – Palo Alto, CA (till 04/2007)

Founded and managed Quantum Leaps, LLC—a company focused on developing and licensing of lightweight, open source, state machine-based frameworks for embedded real-time systems as well as consulting and training services in modern software technologies.

10/2003 – 04/2005

### **Lead Software Architect**

Global Locate, Inc. – San Jose, CA

Developed software architectures, designs and implementations of embedded software for the Global Locate Indoor-GPS® chipsets. Led the complete re-design of the firmware using UML state machines and an event-driven framework. Mentored/coached the software team in UML, object-oriented design, and design-by-contract methods. Developed the first implementations of emerging standards for mobile positioning such as SUPL (Secure User Plane) Location Platform, and RRLP (Radio Resource Location Protocol).

06/1998 – 10/2003

### **Lead Software Architect**

IntegriNautics Corporation (now Novariant) - Fremont, CA

Developed software architectures, designs and implementations for specialized GPS receivers and high precision vehicle navigation systems based on differential carrier-phase GPS. In particular, developed real-time framework based on UML statecharts and active objects and applied it in architecting a versatile and portable GPS receiver platform. Led the design of the in-vehicle Graphical User Interface for automatic GPS steering of farming vehicles. Developed a high performance preemptive real-time kernel for ARM/THUMB processor cores. Designed serial communication protocols and a uniform TCP/IP interface for all IntegriNautics devices like receivers, navigation coprocessors and GPS transmitters (pseudolites). Gained in-depth understanding of GPS, signal tracking details, and navigation processing. Developed high-performance linear algebra class library for use in real-time systems. Designed internal software standards and processes for designing, coding, documenting and testing software. Mentored/trained new employees. Brought up several custom L1/L2 GPS receiver boards and developed several Board Support Packages (BSPs).

05/1995 - 05/1998

### **Control Software Engineer**

GE Medical Systems (now GE Healthcare) - Milwaukee, WI

Performed analysis, design, implementation, documentation and testing of control real-time software for x-ray diagnostics imaging equipment according to ISO standards and FDA regulations. Particular domain of expertise concerned real-time exposure control, application software, and calibration/configuration system. Delivered high quality, timely designs, implementations and documentation for high-end GE vascular x-ray product line. Rated “excellent” in annual internal performance appraisals. Recognized by numerous Management Awards, including the GE Stock Option Award for 1997—an award very rarely granted to non-executive employees.

01/1994 - 12/1994

### **Post Doctoral Researcher**

GSI- Darmstadt, Germany

Conducted experiments on electron-positron emission in heavy-ion collisions at the UNILAC accelerator of GSI Darmstadt. Conceptualized and implemented all data reduction stages. Developed computer simulations of various physical scenarios required for interpretation of experimental results. Prepared publications and represented the team on conferences.

01/1990 - 12/1993

### **Graduate Researcher**

Heidelberg University, Germany

Made major contributions to all phases of design, assembly and testing of a new Electron-Positron Solenoid (EPOS), a large electron-positron pair spectrometer for heavy-ion experiments. Particular area of responsibility included: concept and implementation of real-time, distributed data acquisition system for readout of over 300 ADC and TDC channels. Designed original logic trigger and complete data acquisition software. Designed and implemented computerized experiment control and monitoring. Assembled and tested scintillator, gas and semiconductor detector arrays as well as accompanying electronics.

## EDUCATION:

- 1994 Ph.D. in physics from Jagiellonian University in Krakow/Poland.  
Note: The entire Ph.D. research was financed by Heidelberg University and was performed at GSI Darmstadt, Germany.
- 1988 M.S. in physics from Jagiellonian University in Krakow /Poland.  
Major: nuclear physics; Minor: computer science. Distinguished student.

## BOOKS:

- M. Samek, *Practical UML Statecharts in C/C+*, Second Edition, Newnes, imprint of Elsevier, 2008, ISBN-13 978-0-7506-8706-5.
- M. Samek, *Practical Statecharts in C/C+*, CMP Books, imprint of CMP Media, LLC, 2002, ISBN 1-57820-110-1.
- Chinese translation: ISBN 7-81077-415-8, Buaapress China, 2004
- Korean translation: ISBN 8-98997549-2, Acorn Publishing Company, 2004

## SELECTED ARTICLES:

- M. Samek, "A crash course in UML state machines", 3-part article published on *Embedded.com*, March 2009.
- M. Samek, "Use an MCU's low-power modes in foreground/background systems", *Embedded Systems Design*, September 2007, pp. 31-45.
- M. Samek, "Building Bare-Metal ARM Systems with GNU", 10-part article published on *Embedded.com*, July/August 2007. Voted second most popular *Embedded.com* article of the year.
- M. Samek and R. Ward, "Build a Super Simple Tasker", *Embedded Systems Design*, August 2006, pp. 18-37.
- M. Samek, "UML Statecharts at \$10.99", *Dr. Dobbs Journal*, May 2006.
- M. Samek, "Back to Basics", *C/C++ Users Journal*, December 2003, 45-51.
- M. Samek, "Patterns of Thinking", *C/C++ Users Journal*, October 2003, pp. 45-48.
- M. Samek, "An Exception or a Bug?", *C/C++ Users Journal*, August 2003, pp. 36-40.
- M. Samek, "Déjà Vu", *C/C++ Users Journal*, June 2003, pp. 35-39.
- M. Samek, "Who Moved my State?", *C/C++ Users Journal*, April 2003, pp. 28-34.
- M. Samek, "Quantum Programming for Embedded Systems: Toward a Hassle-free Multithreading", *C/C++ Users Journal*, March 2003, 18-26.
- M. Samek, "The Embedded Mindset", *C/C++ Users Journal*, February 2003, 39-45.
- M. Samek and P. Y. Montgomery, State-Oriented Programming, Hierarchical State Machines in C and C++, *Embedded Systems Programming*, Aug. 2000, pp. 22-43.
- M. Samek, Portable Inheritance and Polymorphism in C, *Embedded Systems Programming*, Dec. 1997, pp. 54-66.

## PATENTS:

- Co-inventor of U.S. patents 6,570,534 and 6,762,714: "Low cost system and method for making dual band GPS measurements".

## CONFERENCE PAPERS:

- M. Samek, "Low-power foreground/background systems", *Embedded Systems Conference Boston*, September 2009.
- M. Samek, "Event-Driven Programming for Embedded Systems", *Embedded Systems Conference Silicon Valley*, April 2009 and *Embedded Systems Conference Boston*, September 2009
- M. Samek, "Event-Driven Programming for Embedded Systems", *Embedded Systems Conference Silicon Valley*, April 2008.
- M. Samek, "Implementing Software with the Hierarchical State Machines for Traceability, Changeability, and Testability, while Maintaining Performance and Memory Efficiency", 3-hour workshop presented at the *Software Design for Medical Devices Conference*, San Diego CA, November 28, 2006.
- M. Samek, "UML Statecharts for Tiny Embedded Systems", presentation 2445 at the *GSPx 4-th International Signal Processing Conference*, Santa Clara CA, November 1, 2006.
- M. Samek, "Practical Statecharts for Embedded Systems - Updated", Proceeding of *Embedded Systems Conference, Silicon Valley*, 2006 as well as *Embedded Systems Conference Boston*, 2006.

- M. Samek, "Practical Statecharts for Embedded Systems - Updated", Proceeding of *Embedded Systems Conference San Francisco*, 2004 and 2005.
- M. Samek, "Quantum Programming for Embedded Systems", Proceeding of *Embedded Systems Conference San Francisco*, 2003 and Proceeding of *Embedded Systems Conference Boston*, 2003.

**INVITED TALKS:**

- M. Samek, "Hierarchical State Machines: A Fundamentally Important Way of Software Design", presentation at the Palo Alto Research Center (PARC) on May 6, 2004.
- M. Samek, "Hierarchical State Machines: A Fundamentally Important Way of Software Design", presentation at the Santa Clara University on October 23, 2003.
- M. Samek, "Hierarchical State Machines: A Fundamentally Important Way of Design", presentation at the Association of C and C++ Users, Silicon Valley Chapter, on March 11, 2003.