

## Patrick M. Mills

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I lead my teams with two-way communication, knowledge and experience-sharing, detailed preparation, and clear expectations tempered with compassion and human understanding. I have designed chips using gate level software as well as VHDL synthesis systems, designed circuit boards and hand-optimized the PCB routing. I have developed control systems for microprocessors, customized Kconfig SBC configurations, optimized and compiled Linux kernels, created a minimal ARM Linux root filesystem image generator, and developed drivers and generalized existing drivers to the latest kernel format on Linux and Windows. I have developed applications for consumers, business automation, and business optimization on Linux, Windows, MacOS, iOS, and Android. I have ported data centers to the cloud, and developed dynamic on-demand instance cloud implementations. I have optimized sequential data constrained applications into parallel implementations for vector and GPU processing reducing running time by hours to weeks. I program in the language that best fits the situation.

### Notable Projects

- Designed and implemented a high availability on-board media streaming platform with a 2000 node capacity capable of delivering real-time video to over 120K simultaneous viewers. The complete system includes a custom ruggedized multicore embedded system, EU/NA approved power system with integrated UPS, multi-node synchronization via high-bandwidth wireless technologies, command and control software, encryption, and HTML5 & mobile app delivery systems.
- Delivered C++11 Windows/MacOS/Linux near real-time video encoding and delivery library and application well ahead of management projections. Capable of software/hardware/GPU encoding/decoding/transcoding multiple simultaneous TCP/UDP/RTSP streams in various formats, encodings, sizes, and options while parsing/injecting/displaying ST0601, ST0102, ST0806, etc. Developed end-to-end system using WebSockets with custom Python server & HTML5+JavaScript.
- Worked with a California University on an embedded control system for a novel sensor for the Navy.
- Assembled and programmed soft real-time embedded Linux controllers with GPS, inertial guidance and encrypted radio links for unmanned aerial vehicles (UAV) funded by USAF Office of Scientific Research.
- Implemented an OpenCV based vision system integrated with Google Cloud Vision to identify, capture and convert paper invoices to an automated bill pay system. Created frontend apps in React Native with custom Java and Objective C; implemented the backend in Python.
- Created an event management system to handle a 2000+ person aerospace/government dinner, encoding complex organization membership rules as well as government regulations. Members submit invitations which are sent, tracked and collected automatically. Rules resolve overlapping invites with near optimal seating assignments. An advanced search system facilitates manual inspection and overrides; a dynamic SVG visualization shows table assignments by capacity, type and location with quick in-depth views.
- Worked with an ANSI standards group to move their hodge-podge of systems to an automated web-based workflow allowing complete control of membership processes and report generation. The email coordinated authenticated cloud services cut their staff overhead from 2 weeks to 2-3 days.
- Worked with marketing, creative, accounting and IT to implement first consumer oriented Azure pricing calculator. Users selected options and requirements using sliders and the system automatically found the best deal. Version two internationalized to eleven currencies and offered presets for common selections. Marketing controlled options by exporting to JSON via a custom plugin.
- Implemented a training registration, tracking and reporting system for the USAF Medical Service. Attendance increased over 240% over five years as new groups were added. A barcode tracking system identified class attendance; automatic reporting to superiors, improved attendance by over 50%. Implemented automatic CEU certificate generation; tracking, validating and authenticating attendees was so successful, the AMA granted our group the ability to automatically issue AMA PRA Category 1 credits without any additional required paperwork.
- Worked with Fujitsu on behalf of Dell to implement low-level drive inspection program to identify faulty drives. The single application ran transparently on seven Windows operating systems automatically extracting and dynamically loading VxD / system drivers as necessary. Users were presented with a simple, easy to follow result.
- Created custom PostgreSQL plugin to perform parallel real-time adaptive pattern matching over millions of records. System ranked potential matches increasing site usage 5x and reducing bounce rate by 50%.
- Developed a real-time 3D fractal landscape editor with dynamic texture placement and optimization used in several Bethesda Softworks game series including Terminator and The Elder Scrolls.
- Implemented a live image processing system for Dugway Proving Grounds. Approached after completion to extend the successful system, but had already built-in the upgrade – a define, new graphics card and recompile enabled it.

## Competencies

Collaboration Tools	Slack, JIRA, Zendesk, Confluence, Artifactory, Github/Bitbucket
Computer Languages	C, C++, C#, Objective C, Assembler (x7), Java, Pascal, Fortran, VB, Prolog, CLOS, PostScript
Scripting Languages	JavaScript, Perl, Python, PHP, HTML5, CSS3, XML, SQL, VHDL, C/Bourne/Bash
OS Platforms	Mobile (Android, iPhone/iPad, Blackberry), Windows, Linux, Mac OS X, Solaris
Cloud Platforms	Amazon EC2, Azure, Google, Rackspace, Salesforce
Development Software	GNU, Visual Studio, React Native, PhoneGap, Titanium, MFC, Borland C/C++, Watcom
Frameworks & Libraries	React, jQuery, Bootstrap, ASP.NET, Struts
Parallel Programming	CUDA, MMX/SSE, MPI, multi-threading
Databases	PostgreSQL, SQL Server, Sybase, Oracle, MySQL
Design Software	Cadence Allegro/OrCAD, Eagle, KiCad, Tanner, IntelliSuite, Synopsis
Modeling Software	Ansys, SolidWorks, Inventor, Mathematica, MATLAB
Animation Software	Maya, 3D Studio, MilkShape, Extreme 3D, Ray Dream Designer, Detailer, Panda 3D, Flash
Media Software	FFmpeg, Photoshop, Premiere, Fireworks, Illustrator, Paint Shop Pro, Audition
Embedded Chipsets	AMD, Atmel, Silicon Labs, Freescale, Intel, Marvell, Renesas, Xilinx, Zilog
Graphics	DirectX and OpenGL; Shaders: pixel, vertex and geometry
Security	SSL/TLS, PGP, Public Key, 3-DES, SHA

## Patents & Publications

Mills, Patterson, Zara, Smith. #8,184,351. Amplified bimorph scanning mirror, optical system and method of scanning.  
Nagel, McGill, Mills, Pai. #8,051,697. Self calibration devices for chemical and bio analytical trace detection systems.  
Mills, Patterson, Zara, Smith. #7,573,627. Amplified bimorph scanning mirror, optical system and method of scanning.  
Edwards, Hodson, Mills. #6,247,005. Expert system for research, data collection and analysis.

P Mills and J Zara. 3D Simulation of an Audible Ultrasonic Electrolarynx Using Difference Waves.

J Zara, P Mills, P Patterson. Polyimide MEMS Actuators for Medical Imaging.

P Patterson, P Mills, J Zara. Amplified Bimorph Scanning Mirror for Optical Coherence Tomography.

P Mills. Fuzzy Logic Control of a Four Rotor Autonomous Aerial Platform.

P Mills and J Bowles. Fuzzy Logic Enhanced Symmetric Dynamic Programming for Speech Recognition.

J Martinez, J Bowles, P Mills. A Fuzzy Logic Positioning System for an Articulated Robot Arm.

TM Conte, KN Menezes, PM Mills, BA Patel. Optimization of Instruction Fetch Mechanisms for High Issue Rates.

## Education

**The George Washington University**, Washington, DC. Doctor of Philosophy, Electrical Engineering

Dissertation: An Audible Ultrasound Electrolarynx. Research & Masters-Level Teaching Assistant. GPA 4.0, Golden Key International honor society. Recipient of *Emmanuel Beck Endowment Scholarship in Computer Engineering*.

Research: *Biomedical Imaging* – designed and programmed real-time (15 – 60 fps) Ultrasound and Optical Coherence Tomography (OCT) Imaging system, assembled and maintained imaging hardware. *Psychology* – designed, fabricated, assembled, and programmed wireless system for motion capture experiments.

**University of South Carolina**, Columbia, SC. Master of Science, Computer Engineering

Thesis: Fuzzy Speech Recognition. Research/Masters-Level Teaching Assistant. GPA 3.9, Eta Kappa Nu honor society.

Research: Very Long Instruction Word (VLIW) Computer Architecture model for HP/Intel in planning the Itanium.

**Swarthmore College**, Swarthmore, PA. Bachelor of Science, Engineering

Strong background in Engineering, Computer Science, Mathematics, Psychology, and English Literature.

*Engineering Graphics Lab*: Created full featured 2D/3D X-Windows library for Computer Graphics instruction.

*Jet Propulsion Labs*: Created Mac front end to control a resource allocation neural network analog integrated circuit.

*Engineering Apollo Computer Lab*: Senior systems administrator for entire network of HP/Apollo computers.

*Psychology Perception Lab*: Designed and implemented a Mac application to time microsecond visual responses to a sequence of images. Researcher defined timing and feedback options then recorded subjects' responses for analysis.

*NCSA Supercomputer Grant*: Developed back-propagation neural network models on a Cray Y-MP for Cognitive Psyc.

## Community Involvement

Member of IEEE & ACM. *Improve The World* – Designed, implemented, and tested portable, ultralight satellite-based communication system for use in humanitarian relief. Member of Technical Advisory Board. *BotBall* – Judge for KISS

Institute for Practical Robotics Botball Tournament. *Swarthmore College Climbing Club* – Competent instructor and guide. *Boy Scouts of America* – Eagle Scout, Order of the Arrow, God & Family, God & Country, Arrow of Light.