J. David Nichols

Department of Physics and Engineering

3900 Lomaland Drive, San Diego CA 92106

(619) 849–2219

DavidNichols@pointloma.edu

Experience

Senior Software Engineer — Daylight Solutions – 2015–2022

- Lead developer for ChemVision™ , the acquisition software for the Spero® mid-infrared microscope. Performed interfacing (Ethernet, USB) from the computer to internal microscope components, wrote analysis and artifact removal code.

- Wrote internal and customer facing documentation.

- Provided training and application support for scientific customers

- Mentored and provided support expertise to other engineers and support personnel. Guided student interns in their work.

- Carried out analysis of a variety of data (molecular spectra, optical image artifacts, instrument acceptance testing)

Programmer — Cabinet Vision – 2014–2015

- Did development on CabinetVision, a 3D modeling and design program for household rooms

- Performed enhancements to rendered appearance using OpenGL

- Added ability to export scene descriptions in COLLADA format

Scientific Programmer — Source Signal Imaging – 1994–2013

- Worked on EMSE Suite, a set of programs for performing functional brain imaging. EMSE is used by cognitive science researchers worldwide for mapping electric and magnetic fields measured outside the head back into their neural sources inside the head. This allows them to analyze brain response to specific stimuli, visualize active locations within the brain and perform statistical significance tests.

- Designed, implemented in C++, and documented the part of EMSE Suite dealing with MRI data. Used MRIs to create models of the head for the analysis, interpretation and visualization of electromagnetic sources.

- Collaborated with customers to determine their needs and work strategies. Collected and analyzed requirements, wrote functional design specifications, created test procedures and data suites for use in testing.

- Designed and implemented XML scripting commands to allow batch processing of time series and image data, allowing automated processing and creation of graphical results. XML commands were used to generate Python scripts for testing.

Assistant Professor of Physics — Point Loma Nazarene University – 1989–1993 (adjunct 2001–present)

- Taught a wide variety of courses

  - Earth science
  - Physics survey courses
  - General physics courses
  - Upper division electricity and magnetism with labs
  - Quantum mechanics
  - Intermediate C++
  - Excel
  - Matlab
  - Analog and digital electronics
  - Microprocessor interfacing

- Mentored students and supervised independent research projects.

  - Developed set of computer simulations for plasma physics. Solved dynamical equations, performed field calculations using Fourier methods, graphically displayed results.
  - Created system for real time data acquisition and analysis, including software and attached digital hardware.

- Created online materials and interactive exercises for general education courses.

Technical Qualifications

Programming Languages Strong C/C++, Python. Experience with a variety of other languages, including Matlab, Perl, *APL*, awk, bash, Fortran, Java, LISP, various assembly languages.

Operating Systems and Environments Various UNIX Systems (System V, BSD, AIX, Linux), Microsoft Windows (XP/Vista/7/8/10/11)

Graphical Interfaces Constructed software for display and manipulation of medical images. Created time-energy spectrograms from spacecraft data. Designed, implemented and tested GUIs using several object-oriented development environments including X-windows, zApp, Qt and MFC.

Systems Modeled

Image Processing, Spectral & Time Series Analysis
Created a set of general image processing operators for the analysis and segmentation of magnetic resonance images. Implemented a wizard interface to guide users through the tasks of importing images, determining the correct sets of anatomical regions and creating representations of the regions for visualization and further analysis. Developed procedures for the filtering, analysis and display of brain generated electrical signals. Analyzed molecular spectra in the mid-infrared, identified peaks, performed baseline correction. Created clustering models (k-means, hierarchical) for satellite, medical and pharmaceutical multi-spectral image sets.

Partial Differential Equations
- Determined electrostatic potentials using finite difference methods and Fourier transform techniques for use in spacecraft particle detectors.

- Investigated photon scattering in the head as a method of obtaining time-varying blood oxygen levels.
- Generated electrical and optical models of the head for use with finite and boundary element methods. The resulting models were used by cognitive science researchers to determine human brain response to specified sets of stimuli.

Probabilistic Models
Solved problems using Monte Carlo models to get equilibrium values of solid-state systems. Analyzed photon statistics for faint object camera. Performed image alignment using mutual information techniques.

Writing and Documentation Contributed to several successful proposals for funds submitted to NIH, NASA, NSF and the USAF. Coauthored articles published in scholarly journals. Provided user documentation (User Guides, FAQs) for programs. Wrote explanatory articles for class use while teaching at PLNU. Created the user guide for the Spero® mid-infrared microscope.

Education

University of California, San Diego	C. Phil., Physics
University of California, San Diego	M.S., Physics
Harvey Mudd College, Claremont CA	B.S., Physics