

KEITH WILEY

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Skills

- C, C++, Java, Python, Perl, Obj-C, Javascript, Matlab, HTML, CSS
- Eclipse, Xcode, Hadoop (MapReduce), Subversion, Doxygen, CPPUnit
- Image (FFT, wavelet, coaddition) and Acoustic (spectrogram) signal processing
- Mobile development on Android platform

Education

Ph.D. Computer Science	University of New Mexico, Albuquerque	Jul 2006
M.S. Computer Science	University of New Mexico, Albuquerque	Dec 2003
B.A. Psychology	University of Maryland, College Park	Dec 1997

Employment *University of Washington, Dept. of Astronomy, Feb 2010 – present*
Research Scientist IV – Work in the LSST group (under Andrew Connolly) on the development of massively parallel image processing routines using Hadoop. Work has focused on image coaddition, wherein multiple partially overlapping images are registered, stacked, and mosaiced into a single uniform result. Our test dataset is the SDSSDB, 30TB comprising millions of images, with future applications to LSST (60PBs). Our test cluster houses 892 machines which provide 700TB storage and 3568 concurrent processes.

University of Washington, Applied Physics Lab, May 2007 – Feb 2010

Software Engineer IV – Primary project: development on the *Sonar Simulation Toolkit* (under Robert Goddard) which uses eigenrays to approximate underwater acoustic transmission. Work included incorporation of new external libraries, large-scale OO design, development of new features, optimization and redesign for performance, refactorization, CPPUnit testing. Secondary project: development of a real-time data acquisition and FFT processing system with low data-loss tolerances, a need for rapid throughput, and preparation for future parallelism.

University of New Mexico, Jan 2007 – May 2007

Course Instructor – CS241, Data structures/algorithms, taught in C.

University of New Mexico, Jan 2001 – May 2006

Graduate Research Assistantships – see Research, below.

University of New Mexico, Sep 1999 – May 2003 (six semesters total)

Graduate Teaching Assistant – Intermediate (200-level) and Advanced (300-level) C++.

The Institute for Genomic Research, Sep 1997 – Aug 1999

Software Developer – C++ bioinformatics software development for DNA sequencing and closure analysis.

Personal Projects Only a few projects are described here. Please see my website for a comprehensive listing.

Image/Acoustic Signal Processing

- **Keith's Image Stacker** performs image stacking (coaddition), Laplacian sharpening, wavelet denoising, etc., all coded from scratch. It is used by amateur astrophotographers and has received positive reviews online and in the magazines *Astronomy* and *Sky & Telescope*.
- **WildSpectra** (collaboration: Dr. R. Haven Wiley, Biology dept, UNC-CH) is a Mac real-time spectrogram analyzer, used in Dr. Wiley's research lab and by researchers throughout the acoustic-biology community.
- **Keith's iPod Photo Reader** extracts images from iPod .ithmb image files. This required reverse engineering the undocumented image format from scratch.
- **Hadoop Image Coaddition**: Not a personal project, please see employment, above.

Android

- **WildSpectra Mobile** shows real-time scrolling spectrograms on *Android* devices. Post-recording editing/playback and file I/O are also provided.
- **Shead Spreet** is a spread sheet for *Android* devices with 130,000 installs, 5500 sales, and a 4.3/5 rating.

Distributed Computing

- *Distributed Mandelbrot Set* generates fractal images by farming job-segments to multiple computers over a network. Automatic load-balancing ensures optimal performance.
- *Hadoop Image Coaddition*: Not a personal project, please see employment, above.

HCI

- *Druid* (PhD thesis) is a vector drawing program which permits interwoven surfaces (Celtic knots, Olympic rings, etc.) and which provides an isomorphic efficient interface.

Artificial Life, Simulation: Evolutionary algorithms, robotics, flocking, etc. (please see my website).

Web Design: <http://keithwiley.com>, <http://music.keithwiley.com>, <http://moviehurl.keithwiley.com>

Positions, Publicity, Awards

- Proceedings chair for the *Computer Science at UNM Student Conference* committee, 2006.
- *Sky & Telescope* magazine. Software review: *Keith's Image Stacker* and *Keith's Astroimager*, Aug 2004.
- First place in the *International Online ALife Contest, Cyberbotics Webots*, khepera robot sim., Jul 1999.

Research

Winter 2003-Summer 2006, Ph.D. thesis, UNM, C.S. Dept
Design and implementation of *Druid* (see Personal Projects:HCI, above).

Summer 2003-Winter 2003, Ontology and Semantic Languages, UNM C.S. Dept/Sandia National Labs
Background research into the field of ontology and specific languages such as DAML+OIL and OWL.

Spring 2001-Spring 2002, Autonomous Robotic Glider, UNM C.S. Dept/Sandia National Labs
Use of genetic programming trees to evolve behavioral routines for autonomous robotic unpowered gliders.

Publications

Submitted

Wiley, K. B. The Fermi Paradox, Self-Replicating Probes, and the Interstellar Transportation Bandwidth. Submitted Oct 2011.

Peer Reviewed

Wiley, K. B., et al. Astronomy in the Cloud: Using MapReduce for Image Co-Addition. *Publications of the Astronomical Society of the Pacific (PASP)*, **123**(901), 366-380, 2011.

Wiley, K. B., et al. Astronomical Image Processing with Hadoop. *Astronomical Data Analysis Software and Systems (ADASS) XX*, 2010.

Wiley, K. B., et al. Parallel Distributed Image Coaddition with Hadoop. *Yahoo Hadoop Summit*, 2010.

Wiley, K. B., and L. R. Williams. Representation of Interwoven Surfaces in 2^{1/2}D Drawing. *IEEE Computer Graphics and Applications*, **27**(4), 70-83, 2006.

Wiley, K. B., and L. R. Williams. Representation of Interwoven Surfaces in 2^{1/2}D Drawing. *Proc. of CHI, Conference on Human Factors in Computing Systems*, Montréal, Canada, 2006.

Invited

Wiley, K. B., and S. Chambers. Long Exposure Webcams and Image Stacking Techniques. *The Art and Science of CCD Astronomy*, 2nd edition. Ratledge, David, editor, 2005.

Wiley, K. B. Long Exposure Webcams and Image Stacking Techniques for the Budget-Minded Astrophotographer. *Astronomy*. Bakich, Michael, editor, Dec, 2003.

Wiley, K. B. Pattern Evolver, An Evolutionary Algorithm that Solves the Nonintuitive Problem of Black and White Pixel Distribution to Produce Tiled Patterns that Appear Gray. *The Handbook of Genetic Algorithms*. Chambers, Lance D., editor. CRC Press, 1999.

Op-ed

Wiley, K. B. Implications of Computerized Intelligence on Interstellar Travel. *H+ Magazine*. Anissimov, Michael, editor. Sep, 2011.