Daniel Y. Abramovitch

Patents

- **(Pending/Agilent)** (Filed 2012) An application on a new state space architecture that enables measurement and control on a new class of problems.

- **(Pending/Agilent)** (Filed 2011) An application on a method of improving precision interferometry in the presence of air turbulence.

- **(Pending/Agilent)** (Filed 2011) An application on a method of automating the tuning of the controller for Atomic Force Microscopes (AFMs).

- **(Pending/Agilent)** (Filed 2011) An application on a method of improving imaging from Atomic Force Microscopes (AFMs).

- **US Patent # 7987006** (Issued July 26, 2011) **Automatic Generation of PID Parameters for an Atomic Force Microscope.** This patent is on a method of quasi-automatically tuning PID parameters to improve the control of Atomic Force Microscopes (AFMs).

- **(Pending/Agilent)** (Filed 2011) An application on a method of filtering with low latency to improve the control of Atomic Force Microscopes (AFMs).

- **US Patent # 8074291** (Issued December 6, 2011) **Harmonic Correcting Controller for a Scanning Probe Microscope** This patent is on a method of applying harmonic correction methods to improve the control of Atomic Force Microscopes (AFMs).

- **US Patent # 7843627** (Issued November 30, 2010) **Coherent Demodulation with Reduced Latency Adapted for Use in Scanning Probe Microscopes.** This patent teaches a high speed coherent demodulation method to improve the control of Atomic Force Microscopes (AFMs).

- **US Patent # RE41881** (Reissued October 26, 2010) **Re-Writable Optical Disk Having Reference Clock Information Permanently Formed on the Disk**. This a reissue of **US Patent #** 6046968 with expanded claims.

- **US Patent # 7768738** (Issued August 3, 2010) **Mitigating the Effects of Disturbances of a Disk Drive.** This patent shows how to more effectively use two linear accelerometers to cancel rotary and translational disturbances in a disk drive.

- **US Patent # 7701836** (Issued April 20, 2010) **Re-Writable Optical Disk Having Reference Clock Information Permanently Formed on the Disk**. This is related to **US Patent #** 6046968 with new claims.

- **US Patent # 7683567** (Issued March 23, 2010) **Method for Improving Scanning Probe Microscope Imaging by Inverse Filtering.** This patent uses inverse filtering to remove the effects of the measurement system on the images one gets from Atomic Force Microscopes (AFMs).

- **US Patent # 7607343** (Issued October 27, 2009) **System for Nano Position Sensing in Scanning Probe Microscopes Using an Estimator.** This patent relates to using an estimator to provide improved surface estimates in a scanning probe microscope that uses a MEMS actuator.

- **(Pending/Agilent, Publication: US2009/0107222)** (Filed 2007) **Scanning Probe Microscope with Improved Scanning Speed.** An application on the use of non-raster scan methods for Atomic Force

Microscopes (AFMs).

- **(Pending/Agilent, Publication: US2009/01112957)** (Filed 2007) **System and Methods for Data Sample Decimation and Display of Scanning Probe Microscope Images.** An application on image decimation methods for Atomic Force Microscopes (AFMs).

- **US Patent # 7472585** (Issued January 6, 2009) **Method for Rapid Seeks to the Measurement Surface for a Scanning Probe Microscope.** This patent relates to using an extra sensor on an SPM actuator to enable rapid movement of the probe onto and off of the surface.

- **US Patent # 7401502** (Issued July 22, 2008) **Nano Position Sensing and Surface Estimation in Scanning Probe Microscopy Using Reference Estimation.** This patent relates to using a substitute reference signal to improve both the tracking and surface estimation capabilities of an SPM control loop.

- **US Patent # 7321840** (Issued January 22, 2008) **Apparatus for Monitoring Tire Pressure.** This patent relates to solving a fundamental problem with tire pressure measurements.

- **(Pending/Agilent)** (Filed 2005) This patent application relates to **Intelligent Test Point Selection** for devices other than bit error rate testers.

- **(Abandoned/Avago)** (Filed 2004) **Optical Navigation System for Vehicles.** This application used optical mouse technology for tracking vehicle motion relative to the road.

- **(Pending/Agilent)** (Filed 2003) **Systems and Methods for Processing Instrument Data.** This patent application relates making measurement data easily accessible to any software application.

- **(Pending/Verigy, Publication: US20040208274)** (Filed 2003) **Method for Guaranteeing Stable Non-Linear PLLs.** This patent application uses Lyapunov redesign on a common class of non-linear PLLs to guarantee their stability.

- **(Pending/Agilent)** (Filed 2002) This patent application relates a novel design method for certain classes of phase-locked loops.

- **(Abandoned/Agilent)** (Filed 2001) **System and Method for Creating Web Pages from Processed Instrument Measurement Data.** This patent application taught a method for generating web pages directly from processed measurement data.

- **US Patent # 6973599** (Issued December 6, 2005) **Method and System for Constructing Valid Data for Memory-Based Tests**. This patent application relates to data generation for memory based Bit Error Ratio testing. The referenced prior art includes the Douglas Adams book, *Dirk Gently's Holistic Detective Agency.*

- **US Patent # 6961317** (Issued November 1, 2005) **Identifying and synchronizing permuted channels in a parallel bit error rate tester.** This patent application relates to synchronization in parallel channel Bit Error Ratio testers. The European Patent (# 1298830), was granted April 27, 2005.

- **US Patent # 6928036** (Issued August 9, 2005) **Harmonic correction in phase-locked loops**. This relates to PLL modifications for improving the performance of a write clock on an optical disk drive using what is known as harmonic cancellation. A separate set of claims from **US 6646964**.

- **US Patent # 6745148** (Issued June 1, 2004) **Intelligent Test Point Selection for Bit Error Rate Tester-Based Diagrams.** This patent application relates to intelligent generation of measurement points for BER based eye analysis.

- **US Patent # 6646964** (Issued November 11, 2003) **Harmonic correction in phase-locked loops**. This relates to PLL modifications for improving the performance of a write clock on an optical disk drive using what is known as harmonic cancellation.

- **US Patent # 6393596** (Issued May 21, 2002) **Missing pulse detector using synchronous detection**. This is on a method of encoding address information in high frequency wobbles for rewritable DVD drives. The European Patent (# 997873) was issued on July 24, 2002.

- **US Patent # 6046968** (Issued April 4, 2000) **Re-Writable Optical Disk Having Reference Clock Information Permanently Formed on the Disk**. This is on high frequency wobbles for rewritable DVD drives and is the fundamental patent of the DVD+RW format.

- **US Patent # 5909661** (Issued June 1, 1999) **A Method of Decomposing Position Error Signal Noise Sources in Magnetic and Optical Disk Drives.** This patent is on the PES Pareto Method of decomposing the noise sources in a disk drive control loop. The European Patent (# 881626) was issued on September 24, 2003.

- **US Patent # 5801895** (Issued September 1, 1998) **A Disk Drive Servo Demodulation System Which Suppresses Noise on the Position Error Signal.** This patent proposes a customizable coherent servo demodulation algorithm for disk drives, which dramatically lowers the injection of PES noise into the servo loop.

- **US Patent # 5663847** (Issued September 2, 1997) **Rejection of Disturbances on a Disk Drive By Use of an Accelerometer.** This patent deals with the use of extra sensors in disk drives.

- **US Patent # 5446648** (Issued in August of 1995) **Determination of Open Loop Response from Closed Loop Measurements**. This patent deals with extracting open loop responses from closed-loop measurements of multivariable systems.

Publications

Agilent/HP Internal Publications

- Four papers published at internal HP conferences, six general interest technical talks given to the Agilent and HP Labs communities. One paper and one poster presentation at a 2007 internal Agilent Technical Conference. On poster at a 2010 internal Agilent Technical Conference.

- Two internal classes generated and taught for the Agilent Labs Academy.

External Publications

- **Daniel Abramovitch, ``Low Latency Demodulation for Atomic Force Microscopes, Part I: Efficient Real Time Integration."** In the Proceedings of the 2011 American Control Conference, June, 2011, San Francisco, CA. This is part of an invited session that I co-organized.

- **Jeffrey A. Butterworth, Lucy Y. Pao, and Daniel Y. Abramovitch, "A Comparison of ILC Architectures for Nanopositioners with Applications to AFM Raster Tracking."** In the Proceedings of the 2011 American Control Conference, June, 2011, San Francisco, CA.

- **Daniel Abramovitch, ``Low Latency Demodulation for Atomic Force Microscopes, Part II: Efficient Calculation of Magnitude and Phase."** In the Proceedings of the 2011 International Federation of Automatic Control World Congress, August, 2011, Milan, IT.

- **Jeffrey Butterworth, Lucy Pao, and Daniel Abramovitch, ``Adaptive-Delay Combined Feedforward/Feedback Control for Raster Tracking with Applications to AFMs."** In the Proceedings of the 2010 American Control Conference, June 30, 2010, Baltimore, MD.

- **Daniel Abramovitch and Gene Franklin, ``Fifty-Five Years in Control: The Story of the CSS."** Presented at the 2009 IEEE Conference on the History of Technical Societies, August 7, 2009, Philadelphia, PA.

- **Daniel Abramovitch, ``A Tale of Three Actuators: How Mechanics, Business Models, and Position Sensing Affect Different Mechatronic Servo Problems."** In the Proceedings of the 2009 American Control Conference, June 10, 2009, St. Louis, MO. This is part of a tutorial session that I organized.

- **Daniel Abramovitch, Storrs Hoen, and Richard Workman, ``Semi-Automatic Tuning of PID Gains for Atomic Force Microscopes."** Proceedings of the 2008 American Control Conference, June 11, 2008, Seattle, WA.. This is part of a track of 3 invited sessions that I co-organized. This also appeared in the Asian Journal of Control, Volume 11, Number 2, March 2009.

- **Daniel Abramovitch, ``Some Useful Relationships Between PID Controllers and Second Order Sections."** In preparation. This work is relationships between PID controllers and second order filters that make the auto-tuning of PID controllers feasible.

- **Jeffrey Butterworth, Lucy Pao, and Daniel Abramovitch, ``The Effect of Nonminimum-Phase Zero Locations on the Performance of Feedforward Model-Inverse Control Techniques in Discrete-Time Systems."** In the Proceedings of the 2008 American Control Conference, June 11, 2008, Seattle, WA and in the Asian Journal of Control, Volume 11, Number 2, March 2009. This paper looks at state space methods of controlling AFMs, particularly using feedforward model inverse methods. In particular, model inverse methods become much more difficult with non-minimum phase zeros. This paper discusses these issues and ways around them.

- **Daniel Abramovitch, ``Efficient and Flexible Simulation of Phase Locked Loops, Part I: Simulator Design."** In the Proceedings of the 2008 American Control Conference, June 11, 2008, Seattle, WA. This work is on how to simulate this dynamically stiff, nonlinear feedback system.

- **Daniel Abramovitch, ``Efficient and Flexible Simulation of Phase Locked Loops, Part II: Post Processing and a Design Example."** In the Proceedings of the 2008 American Control Conference, June 11, 2008, Seattle, WA.. The second part of this paper deals with the post processing to extract useful information from the simulation results.

- **Jeffrey Butterworth, Lucy Pao, and Daniel Abramovitch, "A Comparison of Control Architectures for Atomic Force Microscopes."** Invited Keynote Paper at the 2008 IFAC Triennial World Congress, Seoul, Korea, July 2008, and in the Asian Journal of Control, Volume 11, Number 2, March 2009. This extended length paper comparing different control architectures for AFMs was requested by the invited session organizer.

- **Daniel Abramovitch, Sean Andersson, Lucy Pao, and Georg Schitter, ``A Tutorial on the Mechanisms, Dynamics, and Control of Atomic Force Microscopes."** In the Proceedings of the 2007 American Control Conference, July 11, 2007, New York, NY. This was the main paper of a tutorial session on atomic force microscopes.

- **Sean Andersson and Daniel Abramovitch, `` A Survey of Non-Raster Scan Methods with Application to Atomic Force Microscopy."** In the Proceedings of the 2007 American Control Conference. This paper surveyed non-raster scan methods in science and engineering with an eye to how non-raster methods could be applied to the control of atomic force microscopes.

- **Lucy Pao, Jeffrey Butterworth, and Daniel Y. Abramovitch ``Combined Feedforward/Feedback Control of Atomic Force Microscopes''** In the Proceedings of the 2007 American Control Conference, July 11, 2007, New York, NY. This paper surveyed existing methods for doing feedforward and feedback control in AFMs. The work was done as part of a collaboration with the University of Colorado at Boulder on the control of AFMs.

- **Daniel Abramovitch, ``The Outrigger: A Prehistoric Feedback Mechanism."** In the August 2005 issue of the *IEEE Control Systems Magazine.* An earlier version was in the *Proceedings of the 2003 IEEE Conference on Decision and Control*, December 2003. This plenary history paper changes the history of feedback mechanisms, proposing one that is far older than any previously documented one.

- **Daniel Abramovitch, ``Analog Computing in the Soviet Union: An Interview with Boris Kogan."** In the June 2005 issue of the *IEEE Control Systems Magazine.* An interview with one of the giants of the former Soviet Union's efforts in automatic control and simulation of dynamic systems.

- **Daniel Abramovitch and Gene Franklin, ``Fifty Years in Control: The Story of the CSS."** In the August 2005 issue of the *IEEE Control Systems Magazine.* Provides a retrospective of the 50 year history of the IEEE Control Systems Society.

- **Daniel Abramovitch,** A review of ***War, Technology, and Experience Aboard the USS Monitor*** by David A. Mindell, Johns Hopkins University Press, 2000. In the February 2004 issue of the *IEEE Control Systems Magazine*. Describes Mindell's historical book as a parable about technology transfer that goes far beyond the life of the ship.

- **Daniel Abramovitch, ``Lyapunov Redesign of Classical Digital Phase-Locked Loops."** Proceedings of the 2003 American Control Conference, June 2003. Lyapunov redesign method applied to a new set of PLLs.

- **Daniel Abramovitch, ``Phase-Locked Loops: A Control Centric Tutorial.''** *Proceedings of the 2002 American Control Conference*, May 2002. Tutorial on PLLs from a control loop perspective. Version to appear in the *IEEE Control Systems Magazine in 2004*.

- **Daniel Abramovitch and Gene Franklin, ``Disk Drive Control: The Early Years."** In the *Proceedings of the 2002 IFAC Congress*, July 2002, and in the *IFAC Annual Reviews in Control*, February 2003. Describes the early history of control of hard disk drives.

- **Daniel Abramovitch and Gene Franklin, ``A Brief History of Disk Drive Control."** In the June 2002 *IEEE Control Systems Magazine*. Describes the history of control of hard disk drives. **This paper was the winner of the 2003 *IEEE Control Systems Magazine* Outstanding Paper Award.**

- **Daniel Abramovitch, ``Magnetic and Optical Disk Control: Parallels and Contrasts."** *Proceedings of the 2001 American Control Conference*, June 2001. Tutorial on magnetic and optical disk drive control.

- **Daniel Abramovitch, ``Turning the Tracking Problem Sideways: Servo Tricks for DVD+RW Clock Generation."** *Proceedings of the 2000 American Control Conference*, June 2000. Control tricks applied to optical disk PLLs.

- **Daniel Abramovitch, David Towner, Craig Perlov, Josh Hogan, Michael Fischer, Carol Wilson, Ilkan Cokgor and Carl Taussig, ``High Frequency Wobbles: A Write Clock Generation Method for**

Rewritable DVD That Enables Near Drop-In Compatibility with DVD-ROMs'.' In the *Technical Digest of ISOM/ODS 1999 Conference* with full paper in the *Japanese Journal of Applied Physics* (February, 2000). The title says it all.

- **Daniel Abramovitch, ``Fuzzy Control as a Disruptive Technology.''** In the June 1999 *IEEE Control Systems Magazine*. This editorial resolves an apparent paradox in the application of fuzzy control to many commercial systems. It casts fuzzy control as a disruptive technology in the spirit of the Clayton Christensen book, *The Innovator's Dilemma*, and then makes some rather surprising predictions and suggestions based on that model.

- **Daniel Abramovitch and Linda Bushnell, ``Report on the Fuzzy versus Conventional Control Debate.''** In the June 1999 *IEEE Control Systems Magazine*. This report describes the debate between Lotfi Zadeh and Michael Athans at the 1998 IEEE Conference on Decision and Control.

- **Daniel Abramovitch, ``Customizable Coherent Servo Demodulation for Disk Drives.''** In the *Proceedings of the 1998 American Control Conference*, June 1998, and in the September 1998 *IEEE/ASME Transactions on Mechatronics*. A new servo demodulation algorithm for disk drives.

- **Daniel Abramovitch, Terril Hurst, and Dick Henze, ``An Overview of the PES Pareto Method for Decomposing Baseline Noise Sources in Hard Disk Position Error Signals.''** Two page digest in the *Proceedings of The Magnetic Recording Conference*, September 1997. Full paper in the January 1998 *IEEE Transactions on Magnetics*. This paper gives an overview of the PES Pareto Method for the magnetic recording community.

The PES Pareto Method was first presented in a set of papers at the 1997 American Controls Conference. These papers are available at the URL below.

- **Daniel Abramovitch, Terril Hurst, and Dick Henze, ``The PES Pareto Method: Uncovering the Strata of Position Error Signals in Disk Drives.''** *Proceedings of the 1997 American Control Conference*, June 1997. This paper describes the basis for the PES Pareto Method and the algorithm itself.

- **Terril Hurst, Daniel Abramovitch, and Dick Henze, ``Measurements for the PES Pareto Method of Identifying Contributors to Disk Drive Servo System Errors.''** *Proceedings of the 1997 American Control Conference*, June 1997. This paper describes the measurement methods used in the PES Pareto method.

- **Daniel Abramovitch, Terril Hurst, and Dick Henze, ``Decomposition of Baseline Noise Sources in Hard Disk Position Error Signals Using the PES Pareto Method.''** *Proceedings of the 1997 American Control Conference*, June 1997. This paper ties together the method with the measurements to show what is possible in decomposing PES signals.

- **Daniel Abramovitch, ``Rejecting Rotational Disturbances on Small Disk Drives Using Rotational Accelerometers.''** In the *Proceedings of the 1996 IFAC World Congress* in San Francisco, CA, July 1996 and in the November 1997 issue of *Controls Engineering Practice*. Also presented at the *1996 NSIC Annual Meeting* at Lake Tahoe, CA, June 1996. This paper gives a practical application of using the signal from a rotational accelerometer to minimize the effects of external shock and vibration. An practical adaptive, multi-rate scheme is developed and demonstrated experimentally.

- **Daniel Abramovitch, Feei Wang, and Gene Franklin, ``Disk Drive Pivot Nonlinearity Modeling Part I: Frequency Domain.''** *Proceedings of the 1994 American Control Conference*, June 1994. This paper applies the Swept-Sine, Describing-Function method to derive a two nonlinearity model for pivot friction in a disk drive actuator. The model/measurement matching is done in the frequency domain.

- **Feei Wang, Terril Hurst, Daniel Abramovitch, and Gene Franklin, ``Disk Drive Pivot Nonlinearity Modeling Part II: Time Domain."** *Proceedings of the 1994 American Control Conference*, June 1994. This compares the frequency domain model with time domain measurements. Other models are then compared to the laboratory measurements in both time and frequency domain.

- **Daniel Abramovitch, ``Some Crisp Thoughts on Fuzzy Logic."** *Proceedings of the 1994 American Control Conference*, June 1994. A longer version of this talk was presented by invitation of Lotfi Zadeh at UC Berkeley, February 1994. This paper takes a control systems view of how, why, and when fuzzy logic controllers work. An often cited paper which set the baseline for questioning the technical claims made by fuzzy logic proponents.

- **Feei Wang, Daniel Abramovitch, & Gene Franklin, ``A Method for Verifying Measurements and Models of Linear and Nonlinear Systems."** *Proceedings of the 1993 American Controls Conference*, June 1993. This paper derives the Swept-Sine, Describing-Function method of matching models and measurements of nonlinear systems.

- **Daniel Y. Abramovitch, ``The Banshee Multivariable Workstation: A Tool for Disk Drive Servo Research."** In *Advances in Information Storage Systems*, Vol. 5, 1993, ASME, and presented at the ASME Winter Annual Meeting, November 1992.This paper describes a laboratory test system that allows a DSP board to be cleanly interfaced to Matlab.

- **Rick Ehrlich, Carl P. Taussig, & Daniel Y. Abramovitch, ``Identification of Sampled Data Systems at Frequencies Beyond the Nyquist Rate."** *Proceedings of the 28th IEEE Conference on Decision and Control*, December 1989. This paper shows how frequency domain, non-parametric identification can be done with narrow bandwidth inputs at frequencies above the Nyquist frequency.

- **Daniel Y. Abramovitch, ``Lyapunov Redesign of Analog Phase-Lock Loops."** *IEEE Transactions on Communications*, December 1990. Also in the *Proceedings of the 1989 American Controls Conference*, June 1989. This paper shows how to use Lyapunov Redesign to design analog phase-lock loops for which the nonlinear model is stable. This is especially useful for higher order phase-lock loops.

- **Daniel Y. Abramovitch, ``Analysis and Design of a Third Order Phase-Lock Loop."** *Proceedings of the 1988 IEEE Military Communications Conference*, October 1988.

- **Daniel Y. Abramovitch, *Adaptive Control of Nonlinear Dynamic Systems*.** PhD thesis, Stanford University, 1988.

- **Daniel Y. Abramovitch & Gene F. Franklin, ``On the Stability of Adaptive Pole-Placement Controllers with a Saturating Actuator."** *IEEE Transactions on Automatic Control*, March 1990. Also in the *Proceedings of the 26th IEEE Conference on Decision and Control*, December 1987.

- **Daniel Y. Abramovitch, Robert L. Kosut, & Gene F. Franklin, ``Adaptive Control with Saturating Inputs."** *Proceedings of the 25th IEEE Conference on Decision and Control*, December 1986.

Most of these papers are available on line at dabramovitch.com.