

# Garett A. Sohl

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## Education:

- B.S. (1993), Rice University, Mechanical Engineering
- M.S. (1997), Univ. of CA, Irvine, Mechanical and Aerospace Engineering
- Ph.D. (Summer 2000), Univ. of CA, Irvine, Mechanical and Aerospace Engineering

Master's Thesis: Nonlinear Control of a Hydraulic Servosystem. A Lyapunov based nonlinear control law for a hydraulic servosystem was derived, simulated and implemented on an existing system to compare its tracking performance to typical industrial controllers.

Advisor: Prof. James E. Bobrow

Ph.D. Dissertation: Optimal Motions for Underactuated Manipulators. A Lie algebra based recursive formulation of rigid body dynamics was developed for a general class of mechanisms. The Lie algebra formulation allowed us to easily derive the analytic gradient of the recursive dynamics routine. These gradients were then used to develop optimal motions for several novel mechanisms by solving a nonlinear optimization problem. Advisor: Prof. James E. Bobrow

## Experience:

1993-2000 Graduate Researcher, Dept. of Mechanical And Aerospace Eng., Univ. of CA, Irvine. Implemented a controller for a hydraulic servosystem, developed a dynamic simulation and motion optimization package for robotic manipulators called C-STORM (Computer Simulation Tool for the Optimization of Robot Motions), served as UNIX system administrator for the Robotics and Automation laboratory, planned and implemented computer purchases for MAE department. Supervisor: Prof. James E. Bobrow.

1998-2000 Senior Researcher and Lab Manager, Robotics and Automation Lab, Univ. of CA, Irvine, Provided support for other students research covering areas of electronics, computer simulation and control, mechanical design and software development. Responsible for day-to-day operation of the Robotics and Automation Lab. Supervisor: Prof. J.M. McCarthy.

1995-2000 Teaching Assistant, Dept. of Mechanical and Aerospace Eng., Univ. of CA, Irvine. Served as teaching assistant for Engineering Design in Industry (MAE 188), Statics (E 30), Mechanical Systems Laboratory (MAE 106) and Vibrations (MAE 147). Gave lectures and provided tutoring support. Assisted in the preparation and grading of homework and tests.

1997 Software Contractor, Southwest Aerospace. Created C++ ground station software on IBM PC to receive telemetry information from an unmanned flight vehicle. Supervisor: Bryan Martin, Ph.D.

## Coursework: (GPA: 3.97)

- Dynamics and Control of Aerospace Vehicles (AE 175). Final project: Design and simulation of a stabilizing autopilot for an F104 fighter jet.
- Control of Robot Systems (MAE 202). Study of the problems involved in the control of robot systems. Final project: simulation and control of a 2 dof underactuated robot.
- Optimization Methods (MAE 206). Function optimization using linear programming, gradient descent methods and Lagrange multipliers for constrained problems.
- Dynamics (MAE 241). Graduate course in Lagrangian dynamics.
- Robotics (MAE 242). Kinematic and dynamic description of robotic systems.
- Theoretical Kinematics (MAE 244). Mechanism kinematics using quaternions.
- Linear Systems I (MAE 270A). Graduate course in linear control systems with emphasis on controllability, observability and feedback stabilization techniques.

**Coursework:** (continued)

- Robust Control Theory (MAE 272). Study of robust control techniques. Final project: Design of a robust controller for a benchmark two mass spring system.
- Optimal Control (MAE 274). Study of optimal control techniques including both direct and indirect methods.
- Nonlinear Feedback Systems (MAE 275). Nonlinear control techniques including sliding mode and Lyapunov based methods.
- Nonlinear Geometric Control (MAE 295). Seminar course on geometric linearization techniques for nonlinear control problems.

**Awards:**

- Parker Hannifin scholarship (1993-1995).
- GANN fellowship
- Two-time winner mechanical "tightrope walker" design contest sponsored by Toshiba.
- Ph.D. research funded by the National Science Foundation.

**Special Interests:**

Chess, Photography, Bridge, Flight Simulation.

**Skills:**

- Experienced researcher in dynamics and control of mechanical systems, linear and nonlinear control, optimization, and optimal control.
- UNIX System administration.
- Software development on UNIX and IBM PCs using C, C++, FORTRAN.
- Extensive software integration of Matlab and C++ using mex files, simulink s-functions and scripted m-files.
- Hardware control of hydraulic and pneumatic systems.

**Publications:**

1. Sohl, G.A. "Nonlinear Control of a Hydraulic Servosystem", Master's Thesis, Univ. of CA, Irvine, 1997
2. Sohl, G.A. and Bobrow, J.E., "Experiments and simulations on the nonlinear control of a hydraulic servosystem", *Proceedings of the 1997 American Control Conference*
3. Sohl, G.A. and Bobrow, J.E., "Experiments and simulations on the nonlinear control of a hydraulic servosystem", *IEEE Transactions on Control Systems Technology*, vol 7, (no. 2), March 1999
4. Sohl, G.A. and Bobrow, J.E., "Optimal motions for underactuated manipulators", *Proc. 1999 ASME Design Engineering Technical Conference*
5. Albro, J.V., Sohl, G.A., Bobrow, J.E. and Park, F.C., "On the computation of optimal high-dives", *IEEE Conference on Robotics and Automation*, 2000
6. Park, F.C., Bobrow, J.E., Sohl, G.A., et al., "Optimal robot motions for physical criteria", *Journal of Intelligent Robot Systems* (to appear 2000)
7. Sohl, G.A., "Optimal motions for underactuated manipulators", Ph.D. Dissertation, Univ. of CA, Irvine, 2000

**References:**

Prof. James E. Bobrow, Univ. of CA, Irvine, Dept. of Mechanical and Aerospace Engineering  
Prof. J. Michael McCarthy, Univ. of CA, Irvine, Dept. of Mechanical and Aerospace Engineering  
Prof. Kenneth Mease, Univ. of CA, Irvine, Dept. of Mechanical and Aerospace Engineering  
Scott Ploen, Ph.D., Jet Propulsion Laboratory, Pasadena, CA  
Bryan Martin, Ph.D., Jet Propulsion Laboratory, Pasadena, CA