

BioSketch for John Hauser

Professional Preparation

UC Berkeley, Electrical Engineering and Computer Sciences	PhD 1989
UC Berkeley, Electrical Engineering and Computer Sciences	MS 1986
US Air Force Academy, Electrical Engineering and Computer Science	BS 1980

Appointments

2022–present, Professor Emeritus of Electrical, Computer, and Energy Engr, CU Boulder
2023, Visiting Professor of Applied Mathematics, KAUST
1996–2021, Associate Professor of Electrical and Computer Engineering, CU Boulder
1998–2021, Courtesy Associate Professor of Aerospace Engineering Sciences, CU Boulder
2004–2007, Adjunct Professor of Information Engineering, Università di Padova, Italy
2009–2010, Visiting Professor, Instituto Superior Técnico, Lisboa, Portugal
1998–2006, Visiting Associate in Control and Dynamical Systems, Caltech
1999 Aug–Oct, Visiting Professor of Automatic Control, Lund Institute of Technology
1997 May–July, Visiting Professor, Laboratoire des Signaux et Systèmes CNRS, France
1992–1996, Assistant Professor of Electrical and Computer Engineering, CU Boulder
1989–1992, Fred O’Green Assistant Professor of Engineering, Univ of Southern California
1980–1986, US Air Force Officer and Pilot (1500 hours jet time)

John Hauser’s research interests include nonlinear dynamics and control, optimization and optimal control, aggressive maneuvering for high performance motorcycles and aircraft, and the modeling and control of air, land, and sea vehicles. Recent work has focussed on the development of optimization (and optimal control) tools and techniques for trajectory exploration with an eye toward characterizing the trajectory space (with limitations) of highly maneuverable nonlinear systems. His PROjection Operator based Newton method for Trajectory Optimization, *PRONTO*, finds application in the control of highly configurable land and sea vehicles (with propulsion vectoring) and in the analysis of racing motorcycles.

Selected Publications

- Thomas L Dearing, John Hauser, Xudong Chen, Marco M Nicotra, Christopher Petersen. Energy-Optimal Attitude Control Strategies with Control Moment Gyroscopes. *IEEE Transactions on Control Systems Technology*, 2024.
- Jieqiu Shao, Mantas Naris, John Hauser, Marco M Nicotra. Solving quantum optimal control problems using projection-operator-based Newton steps. *Physical Review A*, 2024.
- Thomas L Dearing, John Hauser, Christopher Petersen, Marco M Nicotra, Xudong Chen. Attitude trajectory optimization and momentum conservation with control moment gyroscopes. *IFAC-PapersOnLine*, 2023.

- Thomas L Dearing, John Hauser, Xudong Chen, Marco M Nicotra, Christopher Petersen. Efficient trajectory optimization for constrained spacecraft attitude maneuvers. *Journal of Guidance, Control, and Dynamics*, 2022.
- Jieqiu Shao, Joshua Combes, John Hauser, Marco M Nicotra. Projection-operator-based Newton method for the trajectory optimization of closed quantum systems. *Physical Review A*, 2022.
- Paul Rouse, John Hauser, and Pierre-Loïc Garoche. A Continuation Method for computation of H_∞ gains of Linear Continuous-Time Periodic Systems. *IEEE Conference on Decision and Control*, Jeju Island, South Korea, 2020.
- Marco Fabris, Angelo Cenedese, and John Hauser. Optimal Time-Invariant Formation Tracking for a Second-Order Multi-Agent System. *18th European Control Conference (ECC)*, Naples, Italy, 2019.
- Juan-Pablo Afman, Eric Feron, and John Hauser. Nonlinear Maneuver Regulation for Reduced-G Atmospheric Flight. *IEEE Conference on Decision and Control*, Miami Beach, FL, 2018.
- Jacob Cook and John Hauser. Transition to Hover for a Flying Wing with Electric Propulsion. *2018 American Control Conference*, Milwaukee, June 2018.
- Juan-Pablo Afman, Eric Feron, and John Hauser. Triple-Integral Control for Reduced-G Atmospheric Flight. *2018 American Control Conference*, Milwaukee, WI, June 2018.
- A Pedro Aguiar, Florian A Bayer, John Hauser, Andreas J Häusler, Giuseppe Notarstefano, Antonio M Pascoal, Alessandro Rucco, and Alessandro Saccon. Constrained Optimal Motion Planning for Autonomous Vehicles Using PRONTO. *Sensing and Control for Autonomous Vehicles*, 207-226, Springer, 2017.
- John Hauser and Jacob Cook. On the Formation Rejoin Problem. *10th IFAC Symposium on Nonlinear Control Systems (NOLCOS 2016)*, Monterey, California, Aug 2016.
- Alessandro Rucco, John Hauser, and Giuseppe Notarstefano. Optimal control of steer-braking systems: Non-existence of minimizing trajectories. *Optimal Control Applications and Methods* 37 (5), 965-979, 2016.
- Andreas J Häusler, Alessandro Saccon, A Pedro Aguiar, John Hauser, and António M Pascoal. Energy-optimal motion planning for multiple robotic vehicles with collision avoidance. *IEEE Transactions on Control Systems Technology* 24 (3), 867-883, 2016.
- John Hauser and Bassam Bamieh. Dynamics of a Driven Stirling Engine. *IEEE Conference on Decision and Control (CDC)*, Osaka, Japan, Dec 2015.
- Alessandro Rucco, Giuseppe Notarstefano, and John Hauser. An efficient minimum-time trajectory generation strategy for two-track car model. *IEEE Transactions on Control Systems Technology* 23(4):1505-1519, 2015.

- Marcus J. Holzinger, Daniel J. Scheeres, and John Hauser. Reachability Using Arbitrary Performance Indices. *IEEE Transactions on Automatic Control* 60(4):1099-1103, 2015.
- Alessandro Rucco, John Hauser, and Giuseppe Notarstefano. Optimal control of steer-braking systems: nonexistence of minimizing trajectories. *Optimal Control Applications and Methods*, 2015.
- Andreas Häusler, Alessandro Saccon, John Hauser, Antonio Pascoal, and A Pedro Aguiar. A Novel Four-Quadrant Propeller Model. *4th International Symposium on Marine Propulsors (SMP '15)*, Austin, June 2015.
- Alessandro Rucco, A Pedro Aguiar, and John Hauser. A Virtual Target Approach for Trajectory Optimization of a General Class of Constrained Vehicles. *IEEE Conference on Decision and Control (CDC)*, Osaka, Japan, Dec 2015.
- Alessandro Rucco, A Pedro Aguiar, and John Hauser. Trajectory Optimization for Constrained UAVs: a Virtual Target Vehicle Approach. *2015 International Conference on Unmanned Aircraft Systems (ICUAS)*, 236-245, IEEE, Denver, June 2015.
- Alessandro Rucco, Giuseppe Notarstefano, and John Hauser. Development and Numerical Validation of a Reduced-order Two-track Car Model. *EUCA European Journal of Control*, 20:4, 163–171, 2014.
- Alessandro Rucco, Giuseppe Notarstefano, and John Hauser. Optimal control based exploration of a rigid car with longitudinal load transfer. *IEEE Transactions on Control Systems Technology*, 22:3, 1070–1077, 2014.
- Alessandro Saccon, John Hauser, and Alessandro Beghi. (2014). Virtual Rider Design : optimal manoeuvre definition and tracking. In M. Tanelli, M. Corno, and S. Savaresi (Eds.), *Modelling, simulation and control of two-wheeled vehicles*, Hoboken: Wiley, 2014, pp. 83-118.
- Alessandro Saccon, John Hauser, and A. Pedro Aguiar. Optimal Control on Lie Groups: The Projection Operator Approach. *IEEE Transactions on Automatic Control*, 58:9, 2230–2245, 2013.
- Alessandro Saccon, John Hauser, and Alessandro Beghi. A Virtual Rider for Motorcycles: Maneuver Regulation of a Multi-body Vehicle Model. *IEEE Transactions on Control Systems Technology* 21:2, 332-346, 2013.
- David G. Meyer and John Hauser. Modeling and Exploration of an Active Helmet Design. *American Control Conference (ACC)*, Washington, June 2013.
- Alessandro Saccon, John Hauser, and Alessandro Beghi. Trajectory Exploration of a Rigid Motorcycle Model. *IEEE Transactions on Control Systems Technology* 20:2, 424-437, 2012.
- Florian Bayer and John Hauser. Trajectory Exploration in a Constrained Environment. *51st IEEE Conference on Decision and Control*, Maui, Dec 2012.

- John Hauser. On the Controllability of the Pendubot. *8th IFAC Symposium on Nonlinear Control Systems (NOLCOS 2010)*, Bologna, Italy, Sept 2010.
- Giuseppe Notarstefano and John Hauser. Modeling and Dynamic Exploration of a Tilt-Rotor VTOL Aircraft. *8th IFAC Symposium on Nonlinear Systems (NOLCOS 2010)*, Bologna, Italy, Sept 2010.
- Alessandro Saccon and John Hauser. An efficient Newton method for general motorcycle kinematics. *Vehicle System Dynamics* 47(2) 2009, 221–241.
- Peter MacMillin and John Hauser. Development and exploration of a rigid motorcycle model. *IEEE Conference on Decision and Control*. Shanghai, December 2009.
- Robert Bailey and John Hauser. On the periodically driven inverted pendulum. *IEEE Conference on Decision and Control*. Shanghai, December 2009.
- John Hauser and M. V. Sivaselvan. On the computation of compatible trajectories for hydraulic shakatables. *American Control Conference*, St. Louis, June 2009.
- Giuseppe Notarstefano and John Hauser. On the curvature of the trajectory manifold of nonlinear systems. *IEEE Conference on Decision and Control*, Cancun, December 2008.
- Alessandro Saccon, John Hauser, and Alessandro Beghi. A virtual rider for motorcycles: an approach based on optimal control and maneuver regulation. *3rd IEEE International Symposium on Communications, Control and Signal Processing (ISCCSP)*, St. Julians, Malta, March 2008.
- M. V. Sivaselvan and John Hauser. Trajectory exploration approach to hybrid simulation. In *Hybrid Simulation: Theory, Implementation and Applications*, Taylor and Francis, 2008.
- Stephen Waydo, John Hauser, Robert Bailey, Erik Klavins, Richard M. Murray. UAV as a reliable wingman: A flight demonstration. *IEEE Transactions on Control Systems Technology* 15(4):680–688, 2007.
- John Hauser and Alessandro Saccon. The driven rolling torus. *7th IFAC Symposium on Nonlinear Control Systems (NOLCOS 2007)*. Pretoria, South Africa, Aug 2007.
- Alessandro Saccon, Ruggero Frezza, and John Hauser. Reduced dynamic inversion for planar and spatial vehicles. *NOLCOS 2007*.
- Giuseppe Notarstefano, John Hauser, and Ruggero Frezza. Computing feasible trajectories for control-constrained systems: the PVTOL example. *NOLCOS 2007*.
- John Hauser and Alessandro Saccon. A barrier function method for the optimization of trajectory functionals with constraints. *IEEE CDC*. San Diego, December 2006.
- John Hauser and Alessandro Saccon. Motorcycle modeling for high-performance maneuvering: Maximum velocity profile estimation. *IEEE Control Systems Magazine*, 26(5):89–105, 2006.

- Hinke M. Osinga and John Hauser. The geometry of the solution set of nonlinear optimal control problems. *J. Dynamics and Differential Equations*, 18:881-900, 2006.
- Ali Jadbabaie and John Hauser. On the stability of receding horizon control with a general terminal cost. *IEEE Transactions on Automatic Control*, 50(5):674–678 May 2005.
- Giuseppe Notarstefano, John Hauser, and Ruggero Frezza. Trajectory manifold exploration for the PVTOL aircraft. *CDC-ECC '05*. Valencia, Dec 2005.
- John Hauser, Alessandro Saccon, and Ruggero Frezza. Aggressive motorcycle trajectories. *IFAC Symposium on Nonlinear Control Systems*, Stuttgart, 2004.
- John Hauser. An MPC approach to aggressive motorcycle maneuvering. *16th Int'l Symp. Mathematical Theory of Networks and Systems (MTNS2004)*, Leuven, 2004.
- John Hauser, Alessandro Saccon, and Ruggero Frezza. Achievable motorcycle trajectories. *IEEE Conference on Decision and Control*, Bahamas, 2004.
- Ryan Franz and John Hauser. Optimization based parameter identification of the Caltech ducted fan. *American Control Conference*, Denver, June 2003.
- John Hauser. A projection operator approach to the optimization of trajectory functionals. *IFAC World Congress*, Barcelona, July 2002.
- R.M. Murray, J. Hauser, A. Jadbabaie, M. Milam, W. Dunbar, and R. Franz. Online control customization via optimization based control. In G. Balas and T. Samad, eds., *Software Enabled Control: Information Technologies for Dynamical Systems*. John Wiley and Sons, 2002.
- Ali Jadbabaie and John Hauser. Control of a thrust-vectoring flying wing: A receding horizon/LPV approach. *Int'l J. Robust and Nonlinear Control*, 12(9):869-896, 2002.
- Ryan Franz, Mark Milam, and John Hauser. Applied receding horizon control of the Caltech ducted fan. *American Control Conference*, Anchorage, 2002.
- Ali Jadbabaie, Jie Yu, and John Hauser. Unconstrained receding horizon control of nonlinear systems. *IEEE Transactions on Automatic Control*, 46(5):776–783, 2001.
- John Hauser. Plenary Lecture: High Performance Maneuvering for Thrust Vectoring Aircraft. *IEEE Conference on Control Applications*, Mexico City, Sept 2001.
- John Hauser and David G. Meyer. The trajectory manifold of a nonlinear control system. *IEEE Conference on Control and Applications*, Tampa, Dec 1998.
- John Hauser and David G. Meyer. Trajectory morphing for nonlinear systems. *Automatic Control Conference*, Philadelphia, June 1998.
- Chung Choo Chung and John Hauser. Nonlinear H_∞ control around periodic orbits. *Systems and Control Letters*, 30:127–137, 1997.

- John Hauser and Rick Hindman. Aggressive flight maneuvers. *IEEE Conference on Decision and Control*, San Diego, 1997.
- Andrzej Banaszuk and John Hauser. Feedback linearization of transverse dynamics for periodic orbits. *Systems and Control Letters*, 26:95–105, 1995.
- Andrzej Banaszuk and John Hauser. Feedback linearization of transverse dynamics for periodic orbits in \mathbf{R}^3 with points of transverse controllability loss. *Systems and Control Letters*, 26:185–193, 1995.
- Chung Choo Chung and John Hauser. Nonlinear control of a swinging pendulum. *Automatica*, 31:851–862, 1995.
- Zhigang Xu and John Hauser. Higher order approximate feedback linearization about a manifold for multi-input systems. *IEEE Transactions on Automatic Control*, 40:833–840, 1995.
- John Hauser and Rick Hindman. Maneuver regulation from trajectory tracking: feedback linearizable systems. *IFAC Symposium on Nonlinear Control Systems Design*, Tahoe City, CA, June 1995.
- John Hauser and Chung Choo Chung. Converse Lyapunov functions for exponentially stable periodic orbits. *Systems and Control Letters*, 23:27–34, 1994.
- Zhigang Xu and John Hauser. Higher order approximate feedback linearization about a manifold. *Journal of Mathematical Systems, Estimation, and Control*, 4:451–465, 1994.
- Michael C. Lai and John Hauser. Computing maximal stability region using a given Lyapunov function. *Automatic Control Conference*, San Francisco 1993.
- John Hauser, Shankar Sastry, and George Meyer. Nonlinear control design for slightly non-minimum phase systems: application to V/STOL aircraft. *Automatica*, 28:665–679, 1992.
- John Hauser, Shankar Sastry, and Petar Kokotović. Nonlinear control via approximate input-output linearization: the ball and beam example. *IEEE Transactions on Automatic Control*, pages 392–398, 1992.
- John Hauser and Michael C. Lai. Estimating quadratic stability domains by nonsmooth optimization. *Automatic Control Conference*, Chicago 1992.
- John Hauser. Nonlinear control via uniform system approximation. *Systems & Control Letters*, 17:145–154, 1991.
- Shankar Sastry, John Hauser, Petar Kokotović. Zero dynamics of regularly perturbed systems may be singularly perturbed. *Systems & Control Letters*, 14:299–314, 1989.
- Ping Hsu, John Hauser, and Shankar Sastry. Dynamic control of redundant manipulators. *Journal of Robotic Systems*, 6:133–148, 1989.

- Arlene B. A. Cole, John E. Hauser, and S. Shankar Sastry. Kinematics and control of multifingered hands with rolling contact. *IEEE Transactions on Automatic Control*, 34:398–404, 1989.
- John E. Hauser, Learning control for a class of nonlinear systems. *IEEE Conference on Decision and Control*, Los Angeles, 1987.