Francesco Bullo

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Current Academic Employment

Professor (since Jul 2008; Associate Professor Jul 2004 - Jul 2008), Department of Mechanical Engineering
Associate Director, Center for Control, Dynamical Systems and Computation
Affiliate, Department of Electrical and Computer Engineering
Affiliate, Institute for Collaborative Biotechnologies
University of California at Santa Barbara *Summer 2004 – present*

Previous Academic Employment

Research Assistant Professor, Coordinated Science Laboratory
Assistant Professor, Department of General Engineering
Affiliate, Department of Electrical and Computer Engineering & Department of Aerospace Engineering
University of Illinois at Urbana-Champaign *Fall 1998 – Summer 2004*

Education

Ph.D., Control and Dynamical Systems, California Institute of Technology, Aug 1998
Laurea (joint B.S./M.S. equivalent), Electrical and Computer Engineering, University of Padova, Italy, Jun 1994

Research Interests

Multi-agent systems and complex networks with application to robotic and multi-vehicle coordination, distributed computing and optimization, power networks, sensor/actuator networks, social networks and camera networks. Earlier work on vehicle routing, geometric control, and motion planning.

Research Awards and Honors

Plenary Speaker:
- 11th SIAM Conference on Control & Its Applications, Baltimore, MD, USA, Jul 2011
- 17th IEEE International Conference on Control Applications, Saint Petersburg, Russia, Jul 2009
- 9th Workshop on Hybrid Systems: Computation and Control (HSCC), Santa Barbara, CA, USA, Mar 2006
- 25th Benelux Meeting on Systems and Control, Heeze, The Netherlands, Mar 2006
- 2nd IFAC Workshop Lagrangian & Hamiltonian Methods for Control, Seville, Spain, Apr 2003

SemiPlenary or Keynote Speaker:
- 20th Symposium on Mathematical Theory of Networks and Systems (MTNS), Melbourne, Australia, Jul 2012
- 2nd IFAC Workshop on Distributed Estimation and Control in Networked Systems, Annecy, France, Sep 2010
- Symposium on Recent Trends in Networked Systems and Cooperative Control, Stuttgart, Germany, Sep 2009
- 5th International Conference on Applied Mathematics and Computing, Plovdiv, Bulgaria, Aug 2008
- Workshop Networked Embedded Sensing and Control, South Bend, IN, USA, Oct 2005
- 16th Symposium on Mathematical Theory of Networks and Systems (MTNS), Leuven, Belgium, Jul 2004

IEEE Fellow, Class of 2010

O. Hugo Schuck Best Paper Award, American Automatic Control Council, 2011
Article selection for inclusion in SIGEST section of SIAM Review, Mar 2009
Outstanding Paper Award, IEEE Control Systems Magazine, 2008
Best Student Paper Award Winner (as advisor): CDC 2002, ACC 2006, ACC 2010
Best Student Paper Award Finalist (as advisor): ACC 2005, CDC 2005, CDC 2007

Young Investigator Award, Office of Naval Research, 2003
Xerox Foundation Award for Faculty Research, UIUC College of Engineering, 2003
Institute Fellowship, California Institute of Technology, Sep 1995 - Aug 1996
Laurea, Summa Cum Laude, University of Padova, Italy, 1994
Fellowship for Education Abroad Program, University of California at San Diego, 1992-1993

Teaching Awards and Activities

Instructional Improvement Award, UCSB Academics Program, 2010
Primo Professor, Kiosk UCSB Student Handbook, 2008-2010
Outstanding Faculty Member, Mechanical Engineering, UCSB, Spring 2008
Outstanding Advisor Award, UIUC College of Engineering, Spring 2004
List of Teachers Rated Excellent by their Students, UIUC, Spring 2001
Gamma Epsilon Excellence in Teaching Award, General Engineering Department, UIUC, Spring 2001

Invited Lecturer, Summer School of Automatic Control, Grenoble, France, Sep 2010
Invited Lecturer, Summer School on Networked Control Systems, Siena, Italy, Jul 2009
Invited Lecturer, Summer School on Modelling and Control of Complex Dynam. Systems, Bertinoro, Italy, Jul 2005
Invited Lecturer, Trimester in Control. Geometry and Engineering, Barcelona, Spain, Feb 2005
Invited Lecturer, Summer School, Dutch Institute for Systems and Control, Zeist, Netherlands, Jul 2002

Selected Invited Lectures

(2012): Lund Institute of Technology (Sweden), KTH Royal Institute of Technology (Sweden), UC San Diego
(2011): Baltimore (SIAM CT 11), CDC Control Systems Security Workshop in Orlando
(2010): UC San Diego (ITA Workshop), University of New Mexico, Los Alamos National Laboratory, Massachusetts Institute of Technology, ARL Adelphi Laboratory Center, California Institute of Technology, University of Southern California, University of Illinois at Urbana-Champaign, Northwestern University, University of Illinois at Chicago, University of Cagliari (Italy), CNRS Supélec (France), UC Irvine
(2009): UC San Diego (ITA Workshop), University of Liege (Belgium), University of Washington, Carnegie Mellon University, Block Island Workshop on Swarming, University of Lecce (Italy), University of Stuttgart (Germany, NE{S|T}COC Symposium), ETH Zürich (Switzerland)
(2008): UC San Diego (ITA Workshop), University of Siena (Italy), University of Pisa (Italy), UC Los Angeles, Yale University, City College of New York, University of Pennsylvania, Massachusetts Institute of Technology, Yale University (Frontiers in Distributed Communication, Sensing and Control Workshop), Johns Hopkins University
(2007): University of Illinois, Georgia Tech (RSS Workshop on Robotic Sensor Networks), Australian National University (Canberra, ACT)
(2006): UC Santa Cruz, UC Los Angeles (IPAM), Benelux Meeting on Systems and Control (Netherlands), HSCC (Santa Barbara), UC Los Angeles (Center for Systems, Dynamics and Control), Caltech, Boston University (NSF Workshop on Future Directions in Networked Sensing), Tokyo Institute of Technology (Japan)
(2005): Universitad Autònoma de Barcelona (Spain), California Institute of Technology (Workshop on Control, Estimation, and Communication), UC Berkeley, University of Notre Dame (Workshop on Networked Embedded Sensing and Control), EPFL (Workshop on Networked Embedded Systems and Distributed Sensing)
(2004): CNR Roma (Italy), Yale University, Boston University, Carnegie Mellon University, Ohio State University, Northwestern University
(2003): University of Pisa (Italy), Kyoto University (Japan), UC Santa Barbara, Block Island Workshop on Swarming, Wright-Patterson AFB, Stanford University, Honeywell, Virginia Tech, Caltech
(2002): Old Dominion University, University of Maryland at College-Park, University of Illinois at Chicago, Queen's University in Kingston (Canada), University of Twente (Netherlands)
(2001): California Institute of Technology, University of Pennsylvania, Massachusetts Institute of Technology, UC Santa Barbara, University of Padova (Italy)
(2000): Queen's University in Kingston (Canada), Arizona State University, Washington University in St. Louis
(1999): Mathematisches Forschungsinsitut Oberwolfach (Germany), University of Michigan, UC Berkeley, Washington University in St. Louis, Princeton University

Service

Vice-President for Technical Activities, IEEE Control Systems Society, Jan 2011 – Dec 2012
Member, Board of Governors, IEEE Control Systems Society, Jan 2007 – Dec 2009, 2011-2012
Member, IEEE, 1994-present (Member since 1994, Senior Member since 2003, Fellow since 2010)
Member, SIAM, 2000-present
Member, ASME, 2009-present
NSF Panelist, CMS 2002, 2004, 2005, 2009. CISE 2005, and 2010. ECS 2007, 2009. CPS 2011.
ARO Proposal Reviewer, 2005, 2006, 2007, 2008, 2009, 2010
AFOSR Proposal Reviewer, 2005, 2007, 2008, 2010, 2011
ASME/RSI Peer Review Panel, Office of Science and Technology, DOE, Jun 2001, Aug 2001
Proposal Reviewer: MIUR Reviewer (Ministero dell'Università e della Ricerca, Italy) in 2005, 2008, 2009, Swiss National Science Foundation in 2009, Dutch Technology Foundation in 2009, Qatar National Research Foundation in 2009 and 2011, Netherlands Organisation for Scientific Research in 2011.
Chair, TC on Manufacturing Automation and Robotic Control, IEEE Control System Society, Jul 2004 - Dec 2008

Editorships:
- Editorial Board, Mathematics of Control, Signals, and Systems, Jan 2011 - Dec 2012
- Editorial Board, IEEE Transactions on Automatic Control, Jan 2005 - Dec 2008
- Editorial Board, SIAM Journal of Control and Optimization, Jan 2005 - Dec 2010
- Editorial Board, ESAIM: Control, Optimization, and the Calculus of Variations, Jan 2003 - Dec 2006
- Conference Editorial Board, IEEE Control System Society, Sep 1999 - May 2005
- Special issue of SIAM J. Control and Optim., "Control and Optimization in Cooperative Networks," Jan 2009

Conference Chair or Co-Chair
- Santa Barbara Workshop: Decision, Dynamics and Control in Multi-Agent Systems, Santa Barbara, Jun 2011
- IFAC Workshop Lagrangian & Hamiltonian Methods in Nonlinear Control, Nagoya, Jul 2006

Workshop Organizer or Organizing Committee:
- Workshop on "Dynamic Vehicle Routing," Robotics Science and Systems, Jun 2011
- Workshop on "Dynamic Vehicle Routing," American Control Conference, Jun 2010
- Invited MiniTutorial at SIAM Conference on Applications of Dynamical Systems, May 2009
- Workshop on "Distributed Control of Robotic Networks," IEEE Control and Decision Conference, Dec 2008
- Workshop on "Cooperative MultiAgent Systems," Centro De Giorgi, Pisa, Dec 2007
- MiniSymposium at SIAM Conference on Applications of Dynamical Systems, May 2005
- Workshop on "Geometric Control of Mechanical Systems," IEEE Control and Decision Conference, Dec 2004
- ONR Workshop on Autonomous and Intelligent Systems, UIUC, May 2003
- Workshop on Nonlinear Control of Mechanical Systems, UIUC, Oct 2002
- MiniSymposium at SIAM Conference on Control and Its Applications, Jul 2001
- IFAC Workshop on Lagrangian and Hamiltonian Methods, Princeton, Mar 2000
- Midwest Mechanical Motion Meeting, Fall 1999, 2000, 2001, 2002
- Workshop on Mechanics, Dynamics and Control, Caltech, Dec 1997

Program Committees:
- 2001, 2003 and 2007 IEEE American Control Conference
- 2004, 2005, 2007, 2008, 2010 and 2012 IEEE Control and Decision Conference
- 2003 IEEE/RSJ International Conf. on Intelligent Robots & Systems
- 2006 Mediterranean Conference on Control Applications
- 2006 IEEE International Conference on Robotics and Automation
- 2006 Robotics: Science and Systems Conference
- 2006 IFAC Workshop on Multivehicle Systems
- 2009 Conference on Robot Communication and Coordination

University Service at UCSB
College of Engineering, Member of the Executive Committee, Sep 2006 - Aug 2008, Sep 2010 - Aug 2012
College of Engineering, Member of Graduate Outreach and Advancement Committee, Jan 2007 - Jun 2010
ME, ViceChair and Chair of the Graduate Program, Jul 2006 - Jun 2010
ME, Member of Graduate Committee, Sep 2005 - Jun 2006, Sep 2010 - present
ME Space Committee, Member Jul 2004 - May 2008, Chair Jun 2008- Jun 2009. Member Sep 2009 - Jun 2010
ME Promotions/Merit Committee, Member, Jul 2010– Jun 2011
CCDC, Associate Director, Jul 2011 – present

Advising

Current Graduate Students and Postdocs

(i) Peng Jia (postdoc, ME UCSB)
(ii) Fabio Pasqualetti (Ph.D. student, ME UCSB)
(iii) Vaibhav Srivastava (Ph.D. student, ME UCSB)
(iv) Anahita Mirtabatabaei (Ph.D. student, ME UCSB)
(v) Florian Dörfler (Ph.D. student, ME UCSB)
(vi) Rushabh Patel (Ph.D. student, ME UCSB)
(vii) John W. Simpson-Porco (Ph.D. student, ME UCSB)
(viii) Jeffrey R. Peters (Ph.D. student, ME UCSB)
(ix) Pushkarini Agharkar (Ph.D. student, ME UCSB)
(x) Winston Mei (Ph.D. student, ME UCSB)

Former PhD Students and Employment after Graduation

(i) Gregory J. Toussaint (Ph.D., co-advised, ECE UIUC, Aug97-Jun00), Deputy Department Head and Assistant Professor, US Air Force Academy, Colorado
(ii) W. Todd Cerven (Ph.D., co-advised, AAE UIUC, Aug97-Jun03), Senior Member of Technical Staff, The Aerospace Corporation, Chantille, Virginia
(iii) Giuseppe Notarstefano (Ph.D., co-advised, ECE, University of Padova, Sep03-Apr07), Assistant Professor, Università di Lecce, Italy
(iv) Anurag Ganguli (Ph.D., ECE UIUC, Aug02-Apr07), Senior Research and Development Engineer at Utopia-Compression Corporation, Los Angeles, California
(v) Ketan Savla (Ph.D., ECE UCSB, Aug03-Aug07), Research Scientist, MIT
(vi) Sara Susca (Ph.D., ECE UCSB, Sep04-Dec07), Senior Engineer, Honeywell Research Labs
(vii) Nikolaj Nordkvist (Ph.D., co-advised, Math, Technical University of Denmark, Sep04-Jan08), Instructor, Leeward Community College
(viii) Stephen L. Smith (Ph.D. student, ME UCSB, Sep05-Sep09), Assistant Professor, Electrical and Computer Engineering, University of Waterloo, Canada
(ix) Shaunak D. Bopardikar (Ph.D., co-advised, ME UCSB, Sep05-Mar10), Senior Research Scientist, UTRC
(x) Karl J. Obermeyer (Ph.D., ME UCSB, Sep05-Jun10), Research Scientist, Numerica Corporation
(xi) Sandra H. Dandach (Ph.D., ME UCSB, Aug07-Jun11), Senior Research Scientist, UTRC
(xii) Joey W. Durham (Ph.D., ME UCSB, Sep07-Jun11), Research Scientist, Kiva Systems

Former PostDoc Advisees and Employment after Graduation

(i) Jorge Cortés (Ph.D., Math, Universidad Carlos III, Spain, Sep 2001). Visiting PhD Student ('01) and PostDoc, CSL UIUC, Sep '02-'04, Associate Professor at University of California at San Diego
(ii) Sonia Martínez (Ph.D., Math, Universidad Carlos III, Spain, Feb 2002). Visiting PhD Student ('01) and PostDoc, UCSB, Dec '03-'05, Associate Professor at University of California at San Diego
(iii) Kurt Plarre (PostDoc, CCDC and ICB), Postdoc at University of Memphis
(iv) Gábor Orosz (PostDoc, CCDC, Sep 2008-Aug 2010), Assistant Professor at University of Michigan
(v) Ruggero Carli (PostDoc, CCDC, Feb 2008-Aug 2010), Assistant Professor at the Universitá di Padova

Former M.S. Students and Employment after Graduation

(i) Peter K. Sochacki (M.S., ECE UIUC, Jan 2000), now at Anderson Engineering
(ii) Arvind Hosagrahara, (M.S., GE UIUC, Jun 2001), now at MathWorks
(iii) Ross Gadient (M.S., GE UIUC, Jun 2001), now at Boeing
(iv) Timur Karatas (M.S., GE UIUC, Jun 2001)
(v) Craig Robinson (M.S., GE UIUC, Dec 2003), now at UIUC
(vi) Mark Disch (M.S., ECE UIUC, Jun 2004), now at GE Energy
(vii) Sulema Aranda (M.S., ECE UIUC, Aug 2004), now at Lockheed Martin
(viii) Chunkai Gao (M.S., ME UCSB, Sep 2007)
(ix) Nathan Owen (M.S., ME UCSB, Jun 2009), now at Boeing Space & Intelligence Systems
(x) Giulia Piovan (M.S., ME UCSB, Jun 2010), now PhD student at UCSB
(xi) Lee Nguyen (M.S., ME UCSB, Jun 2010)

Publications

Manuscripts are listed in reverse chronological order. All manuscripts and related presentations are available electronically at `http://motion.me.ucsb.edu`.

Books

- F. Bullo and A. D. Lewis. *Geometric Control of Mechanical Systems*. Texts in Applied Mathematics. Springer, 2004
- F. Bullo, J. Cortés, and S. Martínez. *Distributed Control of Robotic Networks*. Applied Mathematics Series. Princeton University Press, 2009. Available at http://www.coordinationbook.info (8683 downloads during period 1jun08-31dec11)

Edited Books

- F. Bullo and K. Fujimoto, editors. *Lagrangian and Hamiltonian Methods for Nonlinear Control 2006*, volume 366 of *Lecture Notes in Control and Information Sciences*. Springer, 2007. (Proceedings of the 3rd IFAC Workshop, Nagoya, Japan, July 2006)

Special Issues

- F. Bullo, J. Cortés, and B. Piccoli. Special issue on control and optimization in cooperative networks. *SIAM Journal on Control and Optimization*, 48(1):vii–vii, 2009

Journal Articles

[72] G. Piovan and F. Bullo. On coordinate-free rotation decomposition: Euler angles about arbitrary axes. *IEEE Transactions on Robotics*, January 2011. To appear

[71] G. Piovan, I. Shames, B. Fidan, F. Bullo, and B. D. O. Anderson. On frame and orientation localization for relative sensing networks. *Automatica*, February 2011. To appear (Revised in Sep 2011)

[70] S. H. Dandach and F. Bullo. Distributed sequential algorithms for regional source localization. *Automatica*, March 2011. Conditionally accepted

[69] F. Pasqualetti, A. Franchi, and F. Bullo. On cooperative patrolling: Optimal trajectories, complexity analysis and approximation algorithms. *IEEE Transactions on Robotics*, January 2011. To appear

[68] J. W. Durham, R. Carli, P. Frasca, and F. Bullo. Discrete partitioning and coverage control for gossiping robots. *IEEE Transactions on Robotics*, November 2010. to appear

[67] F. Pasqualetti, R. Carli, and F. Bullo. Distributed estimation via iterative projections with application to power network monitoring. *Automatica*, March 2011. To appear

[66] S. H. Dandach, R. Carli, and F. Bullo. Accuracy and decision time for sequential decision aggregation. *Proceedings of the IEEE*, 100(3), 2012. To appear

[65] F. Bullo, R. Carli, and P. Frasca. Gossip coverage control for robotic networks: Dynamical systems on the space of partitions. *SIAM Journal on Control and Optimization*, 50(1):419–447, 2012

[64] F. Pasqualetti, A. Bicchi, and F. Bullo. Consensus computation in unreliable networks: A system theoretic approach. *IEEE Transactions on Automatic Control*, 57(1):90–104, 2012

[63] J. W. Durham, A. Franchi, and F. Bullo. Distributed pursuit-evasion without global localization via local frontiers. *Autonomous Robots*, 32(1):81–95, 2012

[62] V. Srivastava, J. Moehlis, and F. Bullo. On bifurcations in nonlinear consensus networks. *Journal of Nonlinear Science*, 21(6):875–895, 2011

[61] G. Notarstefano and F. Bullo. Distributed abstract optimization via constraints consensus: Theory and applications. *IEEE Transactions on Automatic Control*, 56(10):2247–2261, 2011

[60] F. Dörfler and F. Bullo. On the critical coupling for Kuramoto oscillators. *SIAM Journal on Applied Dynamical Systems*, 10(3):1070–1099, 2011

[59] F. Bullo, E. Frazzoli, M. Pavone, K. Savla, and S. L. Smith. Dynamic vehicle routing for robotic systems. *Proceedings of the IEEE*, 99(9):1482–1504, 2011

[58] S. D. Bopardikar, S. L. Smith, and F. Bullo. On vehicle placement to intercept moving targets. *Automatica*, 47(9):2067–2074, 2011

[57] M. Pavone, A. Arsie, E. Frazzoli, and F. Bullo. Distributed algorithms for environment partitioning in mobile robotic networks. *IEEE Transactions on Automatic Control*, 56(8):1834–1848, 2011

[56] K. J. Obermeyer, A. Ganguli, and F. Bullo. Multi-agent deployment for visibility coverage in polygonal environments with holes. *International Journal on Robust and Nonlinear Control*, 21(12):1467–1492, 2011
[55] M. Pavone, E. Frazzoli, and F. Bullo. Adaptive and distributed algorithms for vehicle routing in a stochastic and dynamic environment. *IEEE Transactions on Automatic Control*, 56(6):1259–1274, 2011
[54] V. Srivastava, K. Plarre, and F. Bullo. Randomized sensor selection in sequential hypothesis testing. *IEEE Transactions on Signal Processing*, 59(5):2342–2354, 2011
[53] F. Morbidi, F. Bullo, and D. Prattichizzo. Visibility maintenance via controlled invariance for leader-follower vehicle formations. *Automatica*, 47(5):1060–1067, 2011
[52] K. J. Obermeyer, A. Ganguli, and F. Bullo. A complete algorithm for searchlight scheduling. *International Journal of Computational Geometry & Applications*, 21(1):101–130, 2011
[51] S. D. Bopardikar, S. L. Smith, F. Bullo, and J. P. Hespanha. Dynamic vehicle routing for translating demands: Stability analysis and receding-horizon policies. *IEEE Transactions on Automatic Control*, 55(11):2554–2569, 2010
[50] G. Orosz, J. Moehlis, and F. Bullo. Robotic reactions: Delay-induced patterns in autonomous vehicle systems. *Physical Review E*, 81(2):025204(1–4), 2010
[49] S. L. Smith, M. Pavone, F. Bullo, and E. Frazzoli. Dynamic vehicle routing with priority classes of stochastic demands. *SIAM Journal on Control and Optimization*, 48(5):3224–3245, 2010
[48] R. Carli, F. Bullo, and S. Zampieri. Quantized average consensus via dynamic coding/decoding schemes. *International Journal on Robust and Nonlinear Control*, 20(2):156–175, 2010
[47] S. Martínez, J. Cortés, and F. Bullo. A catalog of inverse-kinematics planners for underactuated systems on matrix groups. *Journal of Geometric Mechanics*, 1(4):445–460, 2009
[46] S. L. Smith and F. Bullo. The dynamic team forming problem: Throughput and delay for unbiased policies. *Systems & Control Letters*, 58(10-11):709–715, 2009
[45] S. L. Smith and F. Bullo. Monotonic target assignment for robotic networks. *IEEE Transactions on Automatic Control*, 54(9):2042–2057, 2009
[44] J. J. Enright, K. Savla, E. Frazzoli, and F. Bullo. Stochastic and dynamic routing problems for multiple UAVs. *AIAA Journal of Guidance, Control, and Dynamics*, 34(4):1152–1166, 2009
[43] K. Savla, F. Bullo, and E. Frazzoli. Traveling Salesperson Problems for a double integrator. *IEEE Transactions on Automatic Control*, 54(4):788–793, 2009
[42] A. Ganguli, J. Cortés, and F. Bullo. Multirobot rendezvous with visibility sensors in nonconvex environments. *IEEE Transactions on Robotics*, 25(2):340–352, 2009
[41] S. D. Bopardikar, F. Bullo, and J. P. Hespanha. A cooperative Homicidal Chauffeur game. *Automatica*, 45(7):1771–1777, 2009
[40] R. Carli and F. Bullo. Quantized coordination algorithms for rendezvous and deployment. *SIAM Journal on Control and Optimization*, 48(3):1251–1274, 2009
[39] K. Plarre and F. Bullo. On Kalman filtering for detectable systems with intermittent observations. *IEEE Transactions on Automatic Control*, 54(2):386–390, 2009
[38] J. Cortés and F. Bullo. Nonsmooth coordination and geometric optimization via distributed dynamical systems. *SIAM Review*, 51(1):163–189, 2009
[37] K. Savla, G. Notarstefano, and F. Bullo. Maintaining limited-range connectivity among second-order agents. *SIAM Journal on Control and Optimization*, 48(1):187–205, 2009
[36] S. Susca, F. Bullo, and S. Martínez. Gradient algorithms for polygonal approximation of convex contours. *Automatica*, 45(2):510–516, 2009
[35] S. D. Bopardikar, F. Bullo, and J. P. Hespanha. On discrete-time pursuit-evasion games with sensing limitations. *IEEE Transactions on Robotics*, 24(6):1429–1439, 2008
[34] N. Nordkvist and F. Bullo. Control algorithms along relative equilibria of underactuated Lagrangian systems on Lie groups. *IEEE Transactions on Automatic Control*, 53(11):2651–2657, 2008
[33] K. Savla, E. Frazzoli, and F. Bullo. Traveling Salesperson Problems for the Dubins vehicle. *IEEE Transactions on Automatic Control*, 53(6):1378–1391, 2008
[32] S. Susca, S. Martínez, and F. Bullo. Monitoring environmental boundaries with a robotic sensor network. *IEEE Transactions on Control Systems Technology*, 16(2):288–296, 2008
[31] C. Gao, J. Cortés, and F. Bullo. Notes on averaging over acyclic digraphs and discrete coverage control. *Automatica*, 44(8):2120–2127, 2008
[30] S. Martínez, F. Bullo, J. Cortés, and E. Frazzoli. On synchronous robotic networks – Part II: Time complexity of rendezvous and deployment algorithms. *IEEE Transactions on Automatic Control*, 52(12):2214–2226, 2007
[29] S. Martínez, F. Bullo, J. Cortés, and E. Frazzoli. On synchronous robotic networks – Part I: Models, tasks and complexity. *IEEE Transactions on Automatic Control*, 52(12):2199–2213, 2007

[28] F. Bullo and A. D. Lewis. Reduction, linearization, and stability of relative equilibria for mechanical systems on Riemannian manifolds. *Acta Applicandae Mathematicae*, 99(1):53–95, 2007
[27] S. Martínez, J. Cortés, and F. Bullo. Motion coordination with distributed information. *IEEE Control Systems Magazine*, 27(4):75–88, 2007 **(Outstanding Paper Paper Award)**
[26] J. Cortés, S. Martínez, and F. Bullo. Robust rendezvous for mobile autonomous agents via proximity graphs in arbitrary dimensions. *IEEE Transactions on Automatic Control*, 51(8):1289–1298, 2006
[25] A. Ganguli, J. Cortés, and F. Bullo. Maximizing visibility in nonconvex polygons: Nonsmooth analysis and gradient algorithm design. *SIAM Journal on Control and Optimization*, 45(5):1657–1679, 2006
[24] S. Martínez and F. Bullo. Optimal sensor placement and motion coordination for target tracking. *Automatica*, 42(4):661–668, 2006
[23] F. Bullo and D. Liberzon. Quantized control via locational optimization. *IEEE Transactions on Automatic Control*, 51(1):2–13, 2006
[22] J. Cortés and F. Bullo. Coordination and geometric optimization via distributed dynamical systems. *SIAM Journal on Control and Optimization*, 44(5):1543–1574, 2005 **(Selected for inclusion in SIGEST section of SIAM Review, Mar 2009)**
[21] F. Bullo and A. D. Lewis. Low-order controllability and kinematic reductions for affine connection control systems. *SIAM Journal on Control and Optimization*, 44(3):885–908, 2005
[20] J. Cortés, S. Martínez, and F. Bullo. Spatially-distributed coverage optimization and control with limited-range interactions. *ESAIM: Control, Optimisation & Calculus of Variations*, 11:691–719, 2005
[19] M. W. Spong and F. Bullo. Controlled symmetries and passive walking. *IEEE Transactions on Automatic Control*, 50(7):1025–1031, 2005
[18] F. Bullo. Trajectory design for mechanical systems: from geometry to algorithms. *European Journal of Control*, 10(5):397–410, 2004
[17] W. T. Cerven, F. Bullo, and V. L. Coverstone. Vehicle motion planning with time-varying constraints. *AIAA Journal of Guidance, Control, and Dynamics*, 27(3):506–508, 2004
[16] J. Cortés, S. Martínez, T. Karatas, and F. Bullo. Coverage control for mobile sensing networks. *IEEE Transactions on Robotics and Automation*, 20(2):243–255, 2004
[15] S. Martínez, J. Cortés, and F. Bullo. Analysis and design of oscillatory control systems. *IEEE Transactions on Automatic Control*, 48(7):1164–1177, 2003
[14] F. Bullo and A. D. Lewis. Kinematic controllability and motion planning for the snakeboard. *IEEE Transactions on Robotics and Automation*, 19(3):494–498, 2003
[13] W. T. Cerven and F. Bullo. Constructive controllability algorithms for motion planning and optimization. *IEEE Transactions on Automatic Control*, 48(4):575–589, 2003
[12] J. W. Melody, T. Başar, and F. Bullo. On nonlinear controllability of homogeneous systems linear in the controls. *IEEE Transactions on Automatic Control*, 48(1):139–143, 2003
[11] J. Cortés, S. Martínez, and F. Bullo. On nonlinear controllability and series expansions for Lagrangian systems with dissipative forces. *IEEE Transactions on Automatic Control*, 47(8):1396–1401, 2002
[10] F. Bullo and M. Žefran. On mechanical control systems with nonholonomic constraints and symmetries. *Systems & Control Letters*, 45(2):133–143, 2002
[9] F. Bullo and M. Žefran. Modeling and controllability for a class of hybrid mechanical systems. *IEEE Transactions on Robotics and Automation*, 18(4):563–573, 2002
[8] F. Bullo. Series expansions for analytic systems linear in controls. *Automatica*, 38(9):1425–1432, 2002
[7] F. Bullo. Averaging and vibrational control of mechanical systems. *SIAM Journal on Control and Optimization*, 41(2):542–562, 2002
[6] F. Bullo and K. M. Lynch. Kinematic controllability for decoupled trajectory planning in underactuated mechanical systems. *IEEE Transactions on Robotics and Automation*, 17(4):402–412, 2001
[5] F. Bullo. Series expansions for the evolution of mechanical control systems. *SIAM Journal on Control and Optimization*, 40(1):166–190, 2001
[4] F. Bullo. Stabilization of relative equilibria for underactuated systems on Riemannian manifolds. *Automatica*, 36(12):1819–1834, 2000
[3] F. Bullo, N. E. Leonard, and A. D. Lewis. Controllability and motion algorithms for underactuated Lagrangian systems on Lie groups. *IEEE Transactions on Automatic Control*, 45(8):1437–1454, 2000
[2] F. Bullo and R. M. Murray. Tracking for fully actuated mechanical systems: A geometric framework. *Automatica*, 35(1):17–34, 1999
[1] E. Masry and F. Bullo. Convergence analysis of the sign algorithm for adaptive filtering. *IEEE Transactions on Information Theory*, 41(2):489–495, 1995

Book Chapters

[11] G. Notarstefano and F. Bullo. Network abstract linear programming with application to cooperative target localization. In A. Chiuso, L. Fortuna, M. Frasca, L. Schenato, and S. Zampieri, editors, *Modelling, Estimation and Control of Networked Complex Systems*, Understanding Complex Systems, pages 177–190. Springer, 2009

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[3] F. Bullo and R. M. Murray. Proportional derivative (PD) control on the Euclidean group. In *European Control Conference*, volume 2, pages 1091–1097, Rome, Italy, June 1995

[2] F. Bullo, R. M. Murray, and A. Sarti. Control on the sphere and reduced attitude stabilization. In *IFAC Symposium on Nonlinear Control Systems*, pages 495–501, Tahoe City, CA, USA, June 1995

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Research Funding

Completed Projects

(i) University of Illinois Research Board, *Stability and Locomotion in Robotic Mechanisms and Autonomous Vehicles*, F. Bullo, $25K, 1/99 – 01/00.

(ii) Army Research Office, DAAD 190110716, *Trajectories for Locomotion Systems: A Geometric and Computational Approach via Series Expansions*, F. Bullo, $210K, 9/01–8/04.

(iii) National Science Foundation, Robotics and Human Augmentation Program, IIS-0118146, *Algorithmic and Differential-Geometric Trajectory Design.* F. Bullo (PI, $155K) and S. M. Lavalle (Co-PI), total amount $300K, 9/01–8/04.

(iv) National Science Foundation, Dynamic Systems and Control Program, CMS-0100162, *Perturbation Methods for Nonlinear Control of Lagrangian Systems,* F. Bullo, $163K, 9/01–8/04.

(v) National Science Foundation, Control, Networks, and Computational Intelligence Program, ECS-0122412, *Layered Architectures for Complex Networked Systems,* M. W. Spong (PI), F. Bullo (Co-PI, $67K), total amount $270K, 9/01–8/04.

(vi) University of Illinois Initiative in Trustworthy Networked Systems, *AeroTruNet: A Trustworthy Networked Aerospace System*, E. Frazzoli (PI), F. Bullo (Co-PI), $40K, 10/02–10/03.

(vii) Office of Naval Research, Mathematical, Computer, and Information Sciences Division, FY03 Young Investigator Program, N00014-03-1-0512, *Distributed and Adaptive Coordination Algorithms for Mobile Sensing Networks*, F. Bullo, $300K, 6/03–5/06.

(viii) Defense Advanced Research Projects Agency and Air Force Office of Scientific Research, MURI Program, F49620-02-1-0325, *Cooperative Networked Control of Dynamical Peer-to-Peer Vehicle Systems*, Consortium of UIUC (lead), Stanford, MIT, G.E. Dullerud (PI), F. Bullo (Co-PI, $300K), total amount $5M, 5/02–8/07.

(ix) National Science Foundation, Dynamic Systems and Control Program, CMS-0442041 (former CMS-0301423) *Collaborative Research: Kinematic Reductions for Underactuated Mechanical Systems*, F. Bullo, $160K, 9/03 – 8/07.

(x) National Science Foundation, Robotics and Human Augmentation Program, IIS-0525543 (former IIS-0330008) *SENSORS: Cooperative Robotics and Geometric Optimization for Mobile Sensors*, F. Bullo, $300K, 9/03 – 8/08.

(xi) National Science Foundation, Dynamic Systems and Control Program, CMS-0626457 *Distributed Illumination Problems for Visually-guided Agents*, F. Bullo, $240K, 9/06 – 8/09.

(xii) Office of Naval Research, DURIP Program, N00014-08-1-0791, *DURIP: Large-Scale Multimodal Wireless Sensor Network*, B. S. Manjunath (PI), F. Bullo (Co-PI), total amount $655K, 5/08–4/09.

(xiii) Army Research Office, Institute for Collaborative Biotechnology, W911NF-09-D-0001, *Bio-inspired Stochastic Search and Decision Making for Robotic Networks*, F. Bullo and J. Moehlis, total amount $350K, 6/07–12/09.

(xiv) Office of Naval Research, Mathematical, Computer, and Information Sciences Division, N00014-07-1-0721, *Algorithmic Coordination in Robotic Networks*, F. Bullo, $304K, 1/07–6/10.

(xv) National Science Foundation, Division of Computer and Network Systems, CNS-0834446, *Collaborative Research: CSR-EHCS(EHS), TM: Distributed Sensing on Camera Sensor Networks via Robust Dynamic Consensus on Manifolds*, F. Bullo, $163K, 9/08–8/11.

(xvi) Army Research Office, MURI Program, W911NF-05-1-0219, *Scalable Swarms of Autonomous Robots and Mobile Sensors*, Consortium of UPenn (lead), UC Santa Barbara, MIT, Yale, UC Berkely, V. Kumar (PI), F. Bullo (Co-PI, $725K), total amount $5M, 5/05–7/11.

Current Projects

(i) Air Force Office of Scientific Research, MURI Program, FA9550-07-1-0528 *Behavioral Dynamics in the Cooperative Control of Mixed Human/Robotics Teams*, Consortium of BU (lead), Princeton, University of Washington, UCSB, J. Baillieul (PI), F. Bullo (Co-PI, $742K), total amount $7.3M, 5/07–6/12.

(ii) National Science Foundation, Robotics and Human Augmentation Program, IIS-0904501 *RI: Medium: Collaborative Research: Minimalist Mapping and Monitoring*, S. Suri (PI) and F. Bullo (Co-PI, $432K), total amount $1.28M, 8/09–7/13.

(iii) National Science Foundation, CyberPhysical Program, CPS-1035917 *CPS: Medium: Collaborative Research: Dynamic Routing and Robotic Coordination for Oceanographic Adaptive Sampling*, F. Bullo (PI, $360K) and S. Suri (Co-PI), total amount $1.05M, 10/10–9/13.

(iv) Army Research Office, Institute for Collaborative Biotechnology, W911NF-09-D-0001, *Bio-inspired Information Propagation and Opinion Dynamics in Social Networks* and *Opinion Dynamics in Social Networks*, F. Bullo, $342K, 12/09–11/12.

(v) Army Research Office, W911NF-11-1-0092, *Dynamic Routing and Coordination in Multi-Agent Networks*, F. Bullo, $500K, 3/11–2/15.

(vi) National Science Foundation, CyberPhysical Program, CPS-1135819 *CPS: Medium: Collaborative Research: The CyberPhysical Challenges of Transient Stability and Security in Power Grids*, F. Bullo (PI, $375K), total amount $1.12M, 9/11–8/14.