

## CV - Professor Anton S. Shiriaev

Date and place of birth: March 27, 1970, Kirov, USSR  
 Nationality: Swedish, Russian  
 Present position: Professor, The Department of Engineering Cybernetics, NTNU  
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### Education:

1993: Master of Science in applied mathematics, St. Petersburg State University, Russia  
 1997: Ph.D. in applied math, St. Petersburg State University, Russia. (Supervisor Professor Vladimir Andreevich Yakubovich)

**Fields of interest:** Industrial, educational and service robotics, control theory, application in medicine and biology, applied math

### Work experience:

2014: Professor (part time), Automatic Control Department, Lund University, Sweden  
 2009-present: Professor (full), NTNU, Trondheim, Norway.  
 2003-2014: Professor (full), Umeå University, Umeå, Sweden (on leave since 2009).  
 2003: Research Associate of the 1<sup>st</sup> Class, CNRS, Grenoble, France.  
 2000-2003: Assistant, Associate Professor, University of Southern Denmark, Odense, Denmark.  
 1998-99: Postdoctoral fellow, Dept. of Engineering Cybernetics, NTNU, Trondheim, Norway.  
 1996-98: Researcher, Russian Academy of Sciences, St. Petersburg, Russia

### Other positions and professional activities:

2011: Visiting Professor to University of Texas in Dallas, Richardson, USA;  
 2009: Visiting Professor to Tokyo Institute of Technology, Tokyo, Japan;  
 2009: Visiting Professor to University of Twente, the Netherlands;  
 2007: Visiting Professor to Institut de Recherche en Communications et Cybernetique and CNRS, Nantes, France;  
 2006: Visiting Professor to the Intelligent Systems Research Centre, Sungkyunkwan University, Suwon, Republic of Korea;  
 2005, 2010: Visiting Professor to Department of Automatic Control, Lund University, Sweden;  
 2005: Visiting Professor to the Department of Electronic Systems, Aalborg University, Denmark

**Publications:** 42 refereed journal papers, more than 110 conference publications and book-chapters. A large number of guest lectures and several invited presentations on international conferences, including

2010: the 5<sup>th</sup> Workshop on Dynamical Walking 2010, MIT, USA  
 2007: the IFAC 3<sup>rd</sup> Workshop on 'Periodic Control Systems,' St. Petersburg, Russia  
 2002: the Annual Meeting of the Danish Mathematical Society, Denmark  
 2000: the IFAC Workshop on 'Lagrangian and Hamiltonian Methods for Nonlinear Control,' Princeton University, USA.

### Research projects (recent or large):

- 2012-2015: *Norwegian Research Council*, the main applicant of the project 'Trajectory Planning, Numerical Analysis and Stabilization for Mechanical Systems: Case Studies in Industrial Automation and Walking Robots,' (~10 MNOK).

- 2010-2012: *Swedish Research Council*, the co-applicant and principal investigator of the project 'Active Control of Compressor Systems Based on New Methods of Nonlinear Dynamic Feedback Stabilization. Part II' (~2 MSEK). The coordinator: Prof. Rolf Johansson (Lund University, Sweden);
- 2009-2013: *Norwegian Research Council*, the co-applicant and principal investigator of the KMB project 'Next generation robotics for Norwegian industry' supported (~ 30 MNOK). The coordinator: Dr. Ingrid Schjølberg (SINTEF, Norway);
- 2009: *NTNU*, the project leader and principal investigator of the project 'Robotics Lab for Advanced Perception and Collaborative Manipulation' supported (~ 1,8 MNOK);
- 2004-2008: the leader of the industry driven project 'Smart Crane Lab' supported by *SveaSkog AB and Komatsu Forest AB* (~ 900 KEuro)

#### Networks:

- 2006-2008: The leader of Swedish Korean Robotics Network (Umea University, KTH, and SKKU) supported by the Swedish Foundation for International Cooperation (STINT)

#### Awards:

- 2009: the Fellow of the Japanese Society of Promotion of Science
- 2002: the recipient of the Talent Project awarded by the Danish Technical Research Council (STVF), (~120.000 Euro).
- 1995: the recipient of the 1st degree Diploma of the 4<sup>th</sup> Baltic Olympiad on Automatic Control, St. Petersburg, Russia.

**Supervision:** 35 M.Sc. students, 9+4 Ph.D. students (main supervisor+co-supervisor), 7 post-doctoral researchers

### Publication List (2009-2015)

#### A. Original articles in refereed scientific journals for 2009-2015

- [J1] Gusev S.V., Paramonov L.V., Pchelkin S., Robertsson A., L. Freidovich and A. Shiriaev, 'On extension of PD+ regulator for orbital stabilization of a fully actuated mechanical system,' a full paper to appear in *Journal of Applied Mathematics and Mechanics*, 2015.
- [J2] Morales D., P. La Hera, S. Westerberg, L. Freidovich and A. Shiriaev. 'Path-Constrained Motion Analysis: An Algorithm to Understand Human Performance on Hydraulic Manipulators,' a full paper to appear in *IEEE Transactions on Human-Machine Systems*, 2015. DOI: [10.1109/THMS.2014.2366873](https://doi.org/10.1109/THMS.2014.2366873)
- [J3] Pchelkin S., A. Shiriaev, L. Freidovich, U. Mettin, S. Gusev, Woong Kwon, and L. Paramonov. 'A Dynamic Human Motion: Coordination Analysis,' *Journal of Biological Cybernetics*, 109(1): 47-62, 2015. DOI: 10.1007/s00422-014-0624-4
- [J4] Efimov D., W. Perruquetti and A. Shiriaev. 'On existence of oscillations in hybrid systems,' *Nonlinear Analysis: Hybrid Systems*, 12: 104-116, 2014.
- [J5] Shiriaev A.S., L. Freidovich, and M.W. Spong. 'Controlled invariants and trajectory planning for underactuated mechanical systems,' *IEEE Transactions on Automatic Control*, 59(9): 2555-2561, 2014.
- [J6] Ortíz D., S. Westerberg, P.X. La Hera, U. Mettin, L. Freidovich, and A. Shiriaev. 'Increasing the level of automation in the forestry logging process with crane trajectory planning and control,' *Journal of Field Robotics*, 31(3): 343-363, 2014. DOI: 10.1002/rob.21496

- [J7] Shiriaev A.S., L. Freidovich, and M.W. Spong. 'A remark on Controlled Lagrangians approach,' *European Journal of Control*, 19: 438-444, 2013. DOI: [10.1016/j.ejcon.2013.09.004](https://doi.org/10.1016/j.ejcon.2013.09.004)
- [J8] Westerberg S. and A.S. Shiriaev. 'Virtual Environment-Based Teleoperation of Forestry Machines: Designing Future Interaction Methods,' *Journal of Human-Robot Interaction*, 2(3): 84-110, 2013.
- [J9] La Hera P.X., A.S. Shiriaev, L.B. Freidovich, U. Mettin and S.V. Gusev. 'Stable walking gaits for three-link planar biped walker with one actuator,' *IEEE Transactions on Robotics*, 29(3): 589-601, 2013. DOI: [10.1109/TRO.2013.2239551](https://doi.org/10.1109/TRO.2013.2239551)
- [J10] Shiryayeva L., H. Antti, W.P. Schröder, R. Stimpbeck and A.S. Shiriaev. 'Pair-wise multi-comparison and OPLS analyses of cold-acclimation phases in Siberian spruce,' *Metabolomics*, vol. 8 (Supplement 1): 123-130, 2012.
- [J11] Meza-Sanchez I.M., L.T. Aguilar, A.S. Shiriaev, L.B. Freidovich, and Yu. Orlov. 'Periodic Motion Planning and Nonlinear H-inf-Tracking Control of a 3-DOF Underactuated Helicopter,' *International J. of Systems Science*, 42(5): 829-838, 2011.
- [J12] Shiriaev A.S., L.B. Freidovich and S.V. Gusev. 'Transverse linearization for controlled mechanical systems with several passive degrees of freedom,' *IEEE Transactions on Automatic Control*, 55(4): 893-906, 2010. DOI: [10.1109/TAC.2010.2042000](https://doi.org/10.1109/TAC.2010.2042000).
- [J13] Freidovich L.B., A. Robertsson, A.S. Shiriaev and R. Johansson. 'Friction compensation based on LuGre model,' *IEEE Transactions on Control Systems Technology*, 18(1): 194-200, 2010. DOI: [10.1109/TCST.2008.2010501](https://doi.org/10.1109/TCST.2008.2010501)
- [J14] Gusev S., S. Johansson, B. Kågström, A.S. Shiriaev, and A. Varga. 'Numerical evaluation of solvers for the periodic Riccati differential equation,' *BIT Numerical Mathematics*, 50: 301-329, 2010. DOI: [10.1007/s10543-010-0257-5](https://doi.org/10.1007/s10543-010-0257-5)
- [J15] Shiriaev A.S., L.B. Freidovich, R. Johansson, and A. Robertsson. 'Global stabilization for a class of coupled nonlinear systems with application to active surge control,' *Dynamics of Continuous, Discrete and Impulsive Systems: Series B*, 17(6): 875-908, 2010. (In special issue dedicated to 60<sup>th</sup> birthday of Prof. Hassan Khalil)
- [J16] Mettin U., P. La Hera, L.B. Freidovich, and A.S. Shiriaev. 'Parallel elastic actuators as control tool for preplanned trajectories of under-actuated mechanical systems,' *International Journal of Robotics Research*, 29(9): 1186-1198, 2010. DOI: [10.1177/0278364909344002](https://doi.org/10.1177/0278364909344002)
- [J17] La Hera P., L. Freidovich, U. Mettin, A.S. Shiriaev. 'Swinging-up the Furuta pendulum via stabilization of preplanned trajectory: theory and experiments,' *IFAC Journal of Mechatronics*, 19(8): 1240-1250, 2009. DOI: [10.1016/j.mechatronics.2009.07.005](https://doi.org/10.1016/j.mechatronics.2009.07.005)
- [J18] Freidovich L.B., U. Mettin, A.S. Shiriaev, and M.W. Spong. 'A Passive 2-dof walker: hunting for gaits using virtual holonomic constraints,' *IEEE Transactions on Robotics*, vol. 25, no. 5, pp. 1202-1208, 2009. DOI: [10.1109/TRO.2009.2028757](https://doi.org/10.1109/TRO.2009.2028757)
- [J19] Shiriaev A.S. and L.B. Freidovich. 'Transverse linearization for impulsive mechanical systems with one passive link,' *IEEE Transactions on Automatic Control*, 54(12): 2882-2888, 2009. DOI: [10.1109/TAC.2009.2033760](https://doi.org/10.1109/TAC.2009.2033760)
- [J20] Freidovich L., P. La Hera, U. Mettin, A. Robertsson, A.S. Shiriaev and R. Johansson. 'Stable periodic motions of Inertia Wheel Pendulum via virtual holonomic constraints,' 11(5): 548-556, *Asian Journal of Control*, 2009. DOI: [10.1002/asjc.135](https://doi.org/10.1002/asjc.135)
- [J21] Freidovich L., A.S. Shiriaev, F. Gomez-Estern, F. Gordillo and J. Aracil. 'Modification via averaging of partial-energy-shaping control for orbital stabilization,' *International Journal of Control*, 82(9): 1582-1590, 2009. DOI: [10.1080/00207170802596272](https://doi.org/10.1080/00207170802596272)
- [J22] Freidovich L., A.S. Shiriaev, F. Gordillo, F. Gomez-Estern and J. Aracil. 'Partial-energy-shaping control for orbital stabilization of high frequency oscillations of the Furuta pendulum,' *IEEE Transactions on Control Systems Technology*, 17(4): 853-858, 2009.

## B. Book chapters for 2009-2014

- [BC1] Freidovich L. and A.S. Shiriaev. 'Transverse linearization for underactuated non-holonomic mechanical systems with application to orbital stabilization,' *Lecture Notes in Control and Information Sciences*, Vol. 417, pp. 245-258, 2012.

## C. Some of original contributions to refereed scientific conferences for 2010-2014

- [C1] Andersson A., A. Robertsson, A.S. Shiriaev, R. Johansson. 'Robustness of the Moore-Greitzer Compressor Model's Surge Subsystem with New Dynamic Output Feedback Controllers,' in *the Proceedings of the 19<sup>th</sup> IFAC World Congress*, pp. 3690-3695, 2014.
- [C2] Kolyubin S. and A.S. Shiriaev. 'Dynamics-consistent motion planning for underactuated ships using virtual holonomic constraints,' in *the Proceedings of MTS/IEEE Oceans*, 2014.
- [C3] Kolyubin S. and A.S. Shiriaev. 'Feasibility Analysis and Controller Design for Underactuated Ship Maneuvering: 4-DOF Case,' in the Proceedings of Royal Institution of Naval Architects - 10th Symposium on High Speed Marine Vehicles, HSMV, Naples, 2014.
- [C4] Pchelkin S., A.S. Shiriaev, A. Robertsson, L. Freidovich. 'Integrated Time-optimal Trajectory Planning and Control Design for Industrial Robot Manipulator,' in *the Proceedings of IEEE/RSJ IROS*, Tokyo, 2013.
- [C5] Efimov D., W. Perruquetti, A. Shiriaev. 'Conditions of Existence of Oscillations for Hybrid Systems' in *the Proceedings of NOLCOS*, 2013.
- [C6] Rubanova A., A. Robertsson, A.S. Shiriaev, L. Freidovich, R. Johansson. 'Analytic Parameterization of Stabilizing Controllers for the Surge Subsystem of the Moore-Greitzer Compressor Model,' in *the Proceedings of the American Control Conference*, 2013.
- [C7] Johansson R., A. Robertsson and A. Shiriaev. 'Observer-based strictly positive real (SPR) variable structure output feedback control,' in *the Proceedings of the 12<sup>th</sup> IEEE International Workshop on Variable Structure Systems*, Mumbai, pp. 452-457, 2012.
- [C8] Shiriaev A., L. Freidovich and M.W. Spong. 'A remark on Controlled Lagrangian approach for completely integrable mechanical systems,' in *the Proceedings of IFAC Workshop on Lagrangian and Hamiltonian methods for nonlinear control*, Bertinoro, Italy, pp. 54-59, 2012.
- [C9] Pchelkin S., A. Shiriaev, U. Mettin, L. Freidovich, Tadayoshi Aoyama, Zhiguo Lu, and Toshio Fukuda. 'Shaping Energetically Efficient Brachiation Motion for a 24-DOF Gorilla Robot,' in the Proceedings of the *IEEE/RSJ IROS*, 2011.
- [C10] Gordillo F., L. Freidovich, A. Shiriaev, F. Gomez-Estern. 'On generating pre-defined periodic motions in underactuated mechanical systems: the cart-pendulum example,' in *the Proceedings of the IFAC World Congress*, Milano, 2011.
- [C11] Mettin U. and A. Shiriaev. 'Ball-Pitching Challenge with an Underactuated Two-Link Robot Arm,' in *the Proceedings of the IFAC World Congress*, Milano, 2011.
- [C12] Park Yeon-Chool, A. Shiriaev, Sukhan Lee. '3D Log Recognition and Pose Estimation for Robotic Forestry Machine,' in *the Proceedings of the IEEE International Conference on Robotics and Automation (ICRA)*, 2011.
- [C13] Ortíz D., S. Westerberg, P. La Hera, U. Mettin, L. Freidovich, A. Shiriaev. 'Experiments on open-loop driver assistance for automatic crane motion of forestry machines,' in *the Proceedings of the IEEE International Conference on Robotics and Automation (ICRA)*, 2011.
- [C14] Pchelkin S., A. Shiriaev, L. Freidovich, U. Mettin, and Wong Kwon. 'Natural Sit-Down and Chair-Rise Motions for a Humanoid Robot,' in *the Proceedings of the 49<sup>th</sup> Conference on Decision and Control (CDC)*, Atlanta, 2010.
- [C15] Bätz G., U. Mettin, M. Scheint, D. Wollherr and A.S. Shiriaev. 'Ball Dribbling with an Underactuated Continuous-Time Control Phase: Theory & Experiments,' in *the Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Taipei, 2010.
- [C16] Freidovich L. and A.S. Shiriaev. 'Transverse linearization for an underactuated compass-like biped robot and analysis of the closed-loop system,' in *the Proceedings of the 8<sup>th</sup> IFAC Symposium on Nonlinear Control Systems (NOLCOS)*, Bologna, 2010.
- [C17] Mettin U., A.S. Shiriaev, L.B. Freidovich and M. Sampei. 'How to Pitch a Ball: Optimal Motion Planning for a Simplified Model of a Human Arm,' in *the Proceedings of the IEEE International Conference on Robotics and Automation (ICRA)*, 2010.
- [C18] Mettin U., A.S. Shiriaev, G. Bätz, D. Wollherr. 'Ball Dribbling with an Underactuated Continuous-Time Control Phase,' in *the Proceedings of the IEEE International Conference on Robotics and Automation (ICRA)*, 2010.