Curriculum Vitae
of
Yuri L. Sachkov

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Personal Data

Born: November 23, 1964, in Dniepropetrovsk, USSR.

Citizenship: Russia.

Address: Program Systems Institute, Russian Academy of Science, Pereslavl-Zalessky 152020, Russia.

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Education: Doctor of Science in Mathematics (habilitation), Steklov Mathematical Institute, 2008, (reviewers Professors A.A.Agrachev, A.A. Melikyan, M.I.Zelikin), title "Controllability and optimal control for invariant control systems on Lie groups and homogeneous spaces"

Post-doctoral fellow, SISSA (Scuola Internazionale di Studi Avanzati), Trieste, Italy, 1999–2001, (supervisor Prof. A. A. Agrachev),

Doctorant, Steklov Mathematical Institute, 1998–1999, (consultant Prof. A. A. Agrachev),

Ph.D. in Mathematics, Moscow State University, 1992 (supervisor Prof. A. F. Filippov), title "Controllability of 3-dimensional bilinear systems"

M.S. in Mathematics, Moscow State University, 1986 (supervisor Prof. O.A. Oleinik), title "Generalized solutions to Laplace equation".

Foreign Languages: English (proficient), Italian (some), Ucrainian (excellent :).

Positions: Chief of Control processes research centre, Program Systems Institute (PSI), Russian Academy of Sciences, since 2009.
Full Professor, Department of Mathematics, University of Pereslavl, since 2009.
Senior researcher, Program Systems Institute, Russian Academy of Sciences, 1995–2009.
Associate Professor, Department of Mathematics, University of Pereslavl, 1994–2009.
Researcher, PSI, 1993 – 1994.
Teacher, Department of Mathematics, University of Pereslavl, 1993 – 1994.
Junior researcher, PSI, 1989 – 1993.

Research Interests: Sub-Riemannian Geometry, Right-Invariant Control Systems on Lie Groups, Optimal Control, Bilinear Systems, Nonlinear Geometric Control Theory, Motion Planning, Applications to Robotics, Mechanics, and Reconstruction of Images.

Teaching Experience

Supervisor of PhD theses since 2009.

Defended PhD theses:

1. Alexei Mashtakov (2012)
2. Andrey Ardentov (2012)

Current PhD students:

1. Ivan Beschastnyj (Pereslavl, Russia)
2. Yasir Awais Butt (Islamabad, Pakistan)

Various Courses on Geometric Control Theory and ODEs in Trieste, Rouen, Pereslavl, since 1997.

Lecturer of Calculus in University of Pereslavl, since 1993.

Advisor of bachelor and master theses, since 1996.

Research and Teaching Visits

Universities of Lille, Dijon, Augsburg, Coimbra, Aveiro, Trieste, Rouen, Milano, Brno, Eindhoven (since 1995).

Professional Activities

Managing Editor of *Journal of Dynamical and Control Systems*, Springer, since 2007.

Member of the Editorial Board of *Journal of Dynamical and Control Systems*, Kluwer Academic / Plenum Publishers, New York, London, and Dordrecht, since 1996.

Member of the Editorial Board of *Journal of Mathematical Sciences*, Springer, since 2012.

Member of the Editorial Board of Journal *Program Systems: Theory and Practice*, since 2010.

Grants

Numerous research grants from the Russian Foundation for Basic Research, INTAS, Russian Government, Landau Network — Centro Volta (Italy) (since 1995).

Conferences Organized

1. Youth symposium with international participation "Control theory: new methods and applications", September 22-26, 2009, Pereslavl-Zalessky, Russia

2. International conference "Control and optimization of nonholonomic systems", July 8–13, Pereslavl-Zalessky, Russia 2011

Reviewer

Journal of Dynamical and Control Systems, Springer, since 1996.

Mathematical Reviews, American Mathematical Society, since 1999.

International Journal of Control, since 2000.

Russian Journal *Referativnij Zhurnal*, 1995–1996.

Applied Mathematics Letters, since 2009.

Russian-English Translator

Journal of Mathematical Sciences, Springer, since 2000.

Moscow University Mathematics Bulletin, Allerton Press, 1995–1999.

Publications

Books

1. (with A.A. Agrachev) Control Theory from the Geometric Viewpoint, Springer-Verlag, 2004; *Russian version*: Geometric Control Theory, Moscow, Fizmatlit, 2005.

2. Controllability and symmetries of invariant systems on Lie groups and homogeneous spaces (in Russian), Moscow, Fizmatlit, 2007.

Papers in Reviewed Journals

1. Controllability of 3-dimensional Bilinear Systems, *Vestnik Moskovskogo Universiteta, Ser. Math. Mech.*, (1991), 3: 26–30 (in Russian, translated into English in *Moscow University Mathematics Bulletin*).

2. Invariant Domains of 3-dimensional Bilinear Systems, *Vestnik Moskovskogo Universiteta, Ser. Math. Mech.*, (1991), 4: 23–26 (in Russian, translated into English in *Moscow University Mathematics Bulletin*).

3. Positive Orthant Controllability of 2-dimensional and 3-dimensional Bilinear Systems, *Differentcialnije Uravnenija*, (1993), 2: 361–363 (in Russian, translated into English in *Differential Equations*).

4. Positive Orthant Controllability of Single-input Bilinear Systems, *Mat. zametki*, **85** (1995), 3: 419–424 (in Russian, translated into English in *Mathematical Notes*).

5. Invariant Orthants of Bilinear Systems, *Differentcialnije uravnenija*, **31** (1995), 6: 1094–1095 (in Russian, translated into English in *Differential equations*).

6. Controllability of Hypersurface and Solvable Invariant Systems, *Journal of Dynamical and Control Systems*, **2** (1996), 1: 55–67.

7. Controllability of Affine Right-Invariant Systems on Solvable Lie Groups, *Discrete Mathematics and Theoretical Computer Science*, **1** (1997), 239–246.

8. On Positive Orthant Controllability of Bilinear Systems in Small Codimensions, *SIAM Journ. Control and Optimization*, **35** (1997), 1: 29–35.

9. Controllability of Right-Invariant Systems on Solvable Lie Groups, *Journal of Dynamical and Control Systems*, **3** (1997), 4: 531–564.

10. On Invariant Orthants of Bilinear Systems, *Journal of Dynamical and Control Systems*, **4** (1998), 1: 137–147.

11. Classification of controllable systems on low-dimensional solvable Lie groups, *Journal of Dynamical and Control Systems*, **6** (2000), 2: 159–217.

12. Exponential mapping in the generalized Dido problem (in Russian), *Matem. Sbornik*, **194** (2003), 9: 63–90. English translation: *Sbornik: Mathematics* (2003), 194(9):1331–1360.

13. Symmetries of Flat Rank Two Distributions and Sub-Riemannian Structures, *Transactions of the American Mathematical Society*, **356** (2004), 2: 457–494.

14. Discrete symmetries in generalized Dido's problem, *Sbornik: Mathematics*, 197 (2006), 2: 235–257.

15. The Maxwell set in the generalized Dido problem, *Sbornik: Mathematics*, 197 (2006), 4: 595–621.

16. Complete description of the Maxwell strata in the generalized Dido problem, *Sbornik: Mathematics*, 197 (2006), 6: 901–950.

17. Optimality of Euler's elasticae (in Russian), *Doklady Mathematics*, Vol. 76 (2007), No. 3, 817–819.

18. Maxwell strata in Euler's elastic problem, *Journal of Dynamical and Control Systems*, Vol. 14 (2008), No. 2 (April), 169–234.

19. Conjugate points in Euler's elastic problem, *Journal of Dynamical and Control Systems*, 2008 Vol. 14 (2008), No. 3 (July), 409–439.

20. (with A. Ardentov) Solution of Euler's elastic problem (in Russian), *Avtomatika i Telemekhanika*, 2009, No. 4, 78–88. (English translation in *Automation and remote control*.)

21. (with A. Ardentov, V. Kasimov, A.Mashtakov) Reconstruction of images via variational principle (in Russian), *Program products and systems*, 2009, No. 4, 126–127.

22. (with A. Ardentov) Parallel algorithms and programs for modelling of Euler elasticae (in Russian), *Program products and systems*, 2009, No. 4, 71–73.

23. (with I. Moiseev) Maxwell strata in sub-Riemannian problem on the group of motions of a plane, *ESAIM: COCV*, 16 (2010), 380–399.

24. Conjugate and cut time in the sub-Riemannian problem on the group of motions of a plane, *ESAIM: COCV*, 16 (2010), 1018–1039.

25. Symmetries and Maxwell strata in the ball-plate problem, *Sbornik Mathematics*, V. 201 (2010), N 7, 1029–1091.

26. Cut locus and optimal synthesis in the sub-Riemannian problem on the group of motions of a plane, *ESAIM: COCV*, 17 (2011), 293–321.

27. (with S. Levyakov) Stability of Euler elasticae centered at verices or inflection points, *Proceedings of the Steklov Institute of Mathematics*, V. 271 (2010), 187–203.

28. (with A.Ardentov) Extremal trajectories in nilpotent sub-Riemannian problem on Engel group, *Sbornik Mathematics*, 202 (2011), No. 11, 31–54. English translation: *Sbornik: Mathematics* (2011), 202(11):1593–1616.

29. (with A. Mashtakov) Extremal trajectories and Maxwell points in the plate-ball problem, *Sbornik Mathematics*, 202 (2011), No. 9, 97–120.

30. Closed Euler Elasticae, *Proceedings of the Steklov Institute of Mathematics*, V. 278 (2012), 218-232.

31. (with A.Ardentov, I.Beschastnyj, A.Mashtakov) Interface for study of sub-Riemannian geodesics on 3D Lie groups, *Program Products and Systems*, 2012, No. 4, pp. 200–203.

32. (with A.Ardentov, A.Mashtakov) Parallel Algorithm and Software for Image Inpainting via Sub-Riemannian Minimizers on the Group of Rototranslations, *Numer. Math. Theor. Meth. Appl.*, 2013, Vol. 6, No. 1, pp. 95-115.

33. (with A.Ardentov) Conjugate points in nilpotent sub-Riemannian problem on the Engel group, *Journal of Mathematical Sciences*, (2013), to appear. `arXiv:1209.2865v1 [math.OC] 13 Sep 2012`

34. (with E.Sachkova) Exponential mapping in Euler's elastic problem, *submitted*. `arXiv:1303.1746v1 [math.OC] 7 Mar 2013`

35. On Carnot algebra with the growth vector $(2, 3, 5, 8)$, *submitted*. `arXiv:1304.1035v1 [math.OC] 3 Apr 2013`

36. (with Y.A.Butt, A.I. Bhatti) Parametrization of Extremal Trajectories in Sub-Riemannian Problem on Group of Motions of Pseudo Euclidean Plane, *submitted*.

37. (with U. Boscain, R. Duits, F. Rossi) Optimal control for reconstruction of curves without cusps, *submitted*, `arXiv:1203.3089v1 [math.OC] 14 Mar 2012`

38. (with E.Sachkova) Sub-Riemannian geodesics on the Carnot group with the growth vector $(2, 3, 5, 8)$, *submitted*

39. (with A.Ardentov) Global structure of exponential mapping in sub-Riemannian problem on the Engel group, *submitted*

40. (with I.Beschastnyj) Riemannian and sub-Riemannian geodesics on $SO(3)$, *submitted*

41. Global structure of exponential mapping in generalized Dido's problem, *submitted*

42. Casimir functions and co-adjoint orbits on the Carnot group with the growth vector $(2, 3, 5, 8)$, *submitted*

43. (with M.Zaidelman) Maxwell points in Dubins' problem, *submitted*

44. (with A.Mashtakov) Sub-Riemannian geodesics on $SL(2)$, *submitted*

Survey and Tutorial Works

1. Survey on Controllability of Invariant Systems on Solvable Lie Groups, in: *Differential Geometry and Control*, Proceedings of the AMS Summer Research Institute on Differential Geometry and Control, Boulder, USA, July 1997, Proceedings of Symposia in Pure Mathematics, **64** (1999), 297–317.

2. Controllability of Invariant Systems on Lie Groups and Homogeneous Spaces, in: *Progress in Science and Technology, Series on Contemporary Mathematics and Applications, Thematical Surveys*, Vol. 59, *Dynamical Systems-8*, All-Russian Institute for Scientific and Technical Information (VINITI), Ross. Akad. Nauk, Moscow, 1998 (to appear); English transl: *J. Math. Sci.*, v. 100, No. 4, 2000, 2355–2427.

3. Control Theory on Lie Groups, *Journal of Mathematical Sciences*, Vol. 156, No. 3, 2009, 381-439.