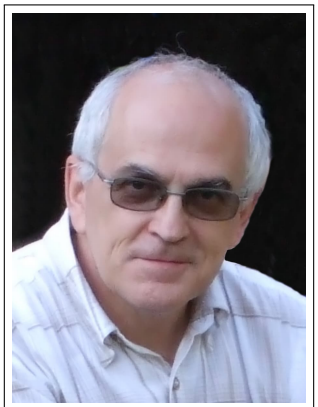
Higher School of Modern Mathematics
Moscow Institute of Physics and Technology
(National Research University)
Institutsky lane, 9
141701 Moscow region, Dolgoprudny
Russia
+7 903 1253191
koziakin.vs@mipt.ru
kozyakin.github.io
kozyakin
0000-0002-6465-0040
Victor_Kozyakin
QuhA8hoAAAAJ
ArXiv: kozyakin_v_1



Victor Kozyakin

Personal Information

Date of Birth	April 16, 1950
Place of Birth	Gorkii, USSR
Nationality	Russian
Marital Status	Married

Education

1967–1972	**M.Sc. in Mathematics**, *Voronezh State University, Mathematical Faculty*, Voronezh (Russia)
1973–1976	**Ph.D.**, *Institute for Control Problems, Academy of Sciences of the USSR*, Moscow (Russia)

Degrees

degree	Doctor of Physical and Mathematical Sciences (Dr.Sc.)
year	1992
institution	National Research Institute of System Studies, Moscow, Russia
thesis	Methods of stability analysis of desynchronized impulse systems

degree	Candidate of Physical and Mathematical Sciences (Ph.D.)
supervisor	Prof. M.A. Krasnosel'skii
year	1979
institution	Institute of Electronic Technology, Moscow, Russia
thesis	Some problems of the theory of bifurcations of periodic motions (phenomenon of subfurcation)

Participation in scientific grants

Executive in charge	RFBR (Russian Foundation for Basic Research) Grants 93-01-00884, 96-15-96048, 97-01-00692, 99-01-00333, 00-15-96116, 03-01-00258, 04-01-00330, 06-01-00256, 06-01-72552, 09-01-00119, 10-01-00175, 10-01-93112, 13-01-13105, 14-50-00150
Executive in charge	Grant of the President of the Russian Federation "Scientific Schools" 1532.2003.1
Executive	RSF (Russian Science Foundation) Grant 16-11-00063, 2016–2018
Executive	Australian Research Council Grants A 8913 2609 and A 6953 2878, 1993–1997
Executive	DFG Forschungschwerpunkt "Ergodentheorie, Analysis und effiziente Simulation dynamischer Systeme" (Germany), 1999–2000
Executive	CRG-961115 "Computational complexity of control problems" (France), 2001

Scientific Activities

2003–now Member of the *International Society of Difference Equations* (http://www.isdeds.com)

2001-2024 Member of the Editorial Board of the electronic journal *Information Processes* (http://www.jip.ru)

2011-2022 Member of the Editorial Board of the journal *Discrete Dynamics in Nature and Society* (https://www.hindawi.com/journals/ddns/)

1996-2000 Member of the Dissertation Soviet K.064.12.04 (scientific degree's qualification board) at the Yaroslavl State University

2001-2022 Member of the Dissertation Soviet D.002.077.01 (scientific degree's qualification board) at the Institute for Information Transmission Problems

2011-2022 Member of the Dissertation Soviet D.002.077.03 (scientific degree's qualification board) at the Institute for Information Transmission Problems

Scientific Interests

- Systems analysis (control theory, discrete event systems theory, desynchronized systems, mathematical modeling)
- Nonlinear analysis and its applications, bifurcation theory
- Linear functional analysis
- Qualitative problems of differential equations and operator equations
- Influence of temporal/spatial discretization on the behavior of continuous dynamical systems
- Investigation of the joint/generalized spectral radius for a set of linear operators

Employment History

Aug. 2024–now Higher School of Modern Mathematics, Moscow Institute of Physics and Technology (National Research University). Description of work: study of the generalized spectral radius of a family of linear operators.

1990–Aug. 2024 Institute for Information Transmission Problems. Russian Academy of Sciences. Senior Researcher, Leading Researcher, Principal Researcher, Deputy Head of the Sector of Mathematical Methods in the Control Theory. Description of work: study of stability of asynchronous systems. Introduced new notions of stability in classes of desynchronization and developed methods for studying the stability of asynchronous systems. Investigation of the influence of controllability-type on transients in asynchronous systems. Applications of the stability theory of asynchronous systems to the analysis of the dynamics of datagram networks. Investigation of the influence of temporal/spatial discretization on the dynamics of continuous systems. Study of the stability of asynchronous Hopfield-Tank neural networks. Investigation of the problem of generalized spectral radius of a family of linear operators.

1992–1993 Hebrew State University. Faculty of Computer Science. Moscow. Associate Professor. Work description: lectures in linear algebra and geometry. Supervision of students.

1988–1990 Research Institute of Control Problems, "NPO ASU Moskva" of the Moscow City Executive Committee. Senior Researcher. Work description: study of stability of phase and frequency desynchronized systems. Development of symbolic dynamics technique for studying stability of frequency desynchronized systems. Modeling of air pollution in the Moscow region.

1976–1988 National Cardiology Research Center. Russian Academy of Medical Sciences, Moscow. Senior Engineer, Junior Researcher, Senior Researcher, Leading Researcher, Head of the Group of Computer Real-time Diagnostics of Cardiac Rhythm in Coronary Care Units, Head of the Group of Image Processing. Work description: estimation of electrocardiogram parameters. Development of an automated computer system for real-time diagnosis in coronary care units. Development of new algorithms for fast smoothing of electrocardiograms and fast removal of artifacts, based on the principle of "median filtering". Development of reliable algorithms based on median filtering for determination of wave parameters of electrocardiogram (QRS-complexes and P-wave) and for edge detection in radioisotope images. Topological classification of singularities. New necessary and sufficient conditions for topological classification of singularities for sub-definite mappings. Application of the developed methods to the study of the Hopf bifurcation problem.

1973–1976 Institute for Control Problems. Academy of Sciences of the USSR, Moscow. Postgraduate student. Thesis description: study of bifurcation effects accompanying the loss of equilibrium of autonomous/periodic differential/difference equations. It was found that the loss of stability is generally accompanied by the bifurcation of long periodic solutions whose periods grow to infinity at the moment of bifurcation. This phenomenon was called the phenomenon of subfurcation. Later, the simple explanation of the phenomenon of subfurcation was given by V. Arnold (but only for a sufficiently smooth case).

1972–1973 Institute of Mathematics of the Voronezh State University, Voronezh. Engineer. Description of the work: analysis of vibrostability conditions for 2nd order differential equations.

Brief Biography

Victor Kozyakin was born in 1950 in the city of Gorky (now Nizhny Novgorod), USSR. He studied mathematics at Voronezh State University (USSR), and then specialized as a post graduate at the Institute of Control Sciences of the USSR Academy of Sciences.

Received a Ph.D. in physics and mathematics from the Institute of Electronic Technology in Moscow (USSR), and a Doctor of Science in mathematics (Doctor of Physics and Mathematics) from the National Research Institute for Systems Studies in Moscow (USSR) in 1979 and 1991, respectively.

From 1976 V. Kozyakin has been working at the National Cardiology Research Center, Russian Academy of Medical Sciences, in Moscow. He was a senior engineer, junior research fellow, senior research fellow, leading research fellow, head of the real-time computer diagnostics group for cardiac arrhythmias in the intensive care unit, head of the imaging group in the radioisotope research laboratory.

From 1988 to 1990 V. Kozyakin has been a senior researcher at the Research Institute of Control Problems ("NPO ASU Moscow").

From 1990 to August 2024 V. Kozyakin has been working at the Institute of Information Transmission Problems of the Russian Academy of Sciences, Moscow (Russia). During this time he held the positions of senior researcher, leading researcher, principal researcher and deputy head of the sector of mathematical methods of control theory. His main scientific interest during this period was the study of the stability of asynchronous systems. His interests also include the study of stability in various classes of desynchronization, the study of the influence of controllability type properties on transient processes in asynchronous systems, applications of the theory of stability of asynchronous systems to the analysis of the dynamics of data transmission networks, the study of the effect of temporal/spatial discretization on the dynamics of continuous systems, the study of the stability of asynchronous neural networks. Recently, he has studied the joint/generalized spectral radius problem for a family of linear operators. V. Kozyakin is co-author of 3 monographs, about 200 articles and conference talks.

From August 2024, he has been working at the Higher School of Modern Mathematics at MIPT and is engaged in the further development of the theory of joint/generalized spectral radius for a family of linear operators.

V. Kozyakin is the author of 3 monographs, about 200 articles and conference reports.

Monographs

[1] Bobylev N.A., Boltyanskii V.G., Vsekhsvyatskii S.Yu., Kalashnikov V.V., Kozyakin V.S., Kolmanovskii V.B., Kravchenko A.A., Krasnosel'skii A.M., Pokrovskii A.V. *Mathematical systems theory*, Moscow, Nauka, 1986, 166 pp. (in Russian)

[2] Asarin E.A., Kozyakin V.S., Krasnosel'skii M.A., Kuznetsov N.A., *Analysis of the stability of asynchronous discrete systems*, Moscow, Nauka, 1992, 408 pp. (in Russian)

[3] Diamond P., Kloeden P., Kozyakin V., Pokrovskii A., *Semi-hyperbolicity and bi-shadowing*, American Institute of Mathematical Sciences, 2012. Vol. 1 of AIMS Series on Random and Computational Dynamics. xvi+217 pp.

Full list of publications (about 200) see at https://kozyakin.github.io/en/publications. Selected publications are cited below.

Selected Publications

[1] E. Asarin, J. Cervelle, A. Degorre et al., *Entropy games and matrix multiplication games*, in: 33rd Symposium on Theoretical Aspects of Computer Science, (STACS 2016), (eds.) N. Ollinger and H. Vollmer, vol. 47 of *LIPIcs. Leibniz Int. Proc. Inform.*, pp. 11:1–11:14, Schloss Dagstuhl–Leibniz-Zentrum fuer Informatik, Dagstuhl, Germany, 2016, doi:10.4230/LIPIcs.STACS.2016.11, URL https://drops.dagstuhl.de/opus/volltexte/2016/5712/.

[2] A. Bhaya, E. Kaszkurewicz and V. S. Kozyakin, *Existence and stability of a unique equilibrium in continuous-valued discrete-time asynchronous Hopfield neural networks*, IEEE Trans. Neural Netw., **7** (1996), 620–628, doi:10.1109/72.501720, URL https://ieeexplore.ieee.org/document/501720.

[3] R. Cross and V. S. Kozyakin, *Double exponential instability of triangular arbitrage systems*, Discrete Contin. Dyn. Syst. Ser. B, **18** (2013), 349–376, doi:10.3934/dcdsb.2013.18.349, URL https://www.aimsciences.org/article/doi/10.3934/dcdsb.2013.18.349, arXiv:1204.3422.

[4] V. Kozyakin, *A dynamical systems construction of a counterexample to the finiteness conjecture*, in: Proceedings of the 44th IEEE Conference on Decision and Control, 2005 and 2005 European Control Conference. CDC-ECC'05., pp. 2338–2343, 2005, doi:10.1109/CDC.2005.1582511, URL https://ieeexplore.ieee.org/document/1582511.

[5] V. Kozyakin, *On accuracy of approximation of the spectral radius by the Gelfand formula*, Linear Algebra Appl., **431** (2009), 2134–2141, doi:10.1016/j.laa.2009.07.008, URL https://www.sciencedirect.com/science/article/pii/S0024379509003590, arXiv:0810.2856.

[6] V. Kozyakin, *An explicit Lipschitz constant for the joint spectral radius*, Linear Algebra Appl., **433** (2010), 12–18, doi:10.1016/j.laa.2010.01.028, URL https://www.sciencedirect.com/science/article/pii/S0024379510000418, arXiv:0909.3170.

[7] V. Kozyakin, *Iterative building of Barabanov norms and computation of the joint spectral radius for matrix sets*, Discrete Contin. Dyn. Syst. Ser. B, **14** (2010), 143–158, doi:10.3934/dcdsb.2010.14.143, URL https://www.aimsciences.org/article/doi/10.3934/dcdsb.2010.14.143, arXiv:0810.2154.

[8] V. Kozyakin, *Polynomial reformulation of the Kuo criteria for V-sufficiency of map-germs*, Discrete Contin. Dyn. Syst. Ser. B, **14** (2010), 587–602, doi:10.3934/dcdsb.2010.14.587, URL https://www.aimsciences.org/article/doi/10.3934/dcdsb.2010.14.587, arXiv:0907.0571.

[9] V. Kozyakin, *The Berger-Wang formula for the Markovian joint spectral radius*, Linear Algebra Appl., **448** (2014), 315–328, doi:10.1016/j.laa.2014.01.022, URL https://www.sciencedirect.com/science/article/pii/S0024379514000408, arXiv:1401.2711.

[10] V. Kozyakin, *Hourglass alternative and the finiteness conjecture for the spectral characteristics of sets of non-negative matrices*, Linear Algebra Appl., **489** (2016), 167–185, doi:

10.1016/j.laa.2015.10.017, URL https://www.sciencedirect.com/science/article/pii/S0024379515006126, arXiv:1507.00492.

[11] V. Kozyakin, *Minimax joint spectral radius and stabilizability of discrete-time linear switching control systems*, Discrete Contin. Dyn. Syst. Ser. B, **24** (2019), 3537–3556, doi:10.3934/dcdsb.2018277, URL https://aimsciences.org/article/doi/10.3934/dcdsb.2018277, arXiv:1712.06805.

[12] V. Kozyakin, *Non-Sturmian sequences of matrices providing the maximum growth rate of matrix products*, Automatica J. IFAC, **145** (2022), Paper No. 110574, 10, doi:10.1016/j.automatica.2022.110574, URL https://www.sciencedirect.com/science/article/pii/S0005109822004356, arXiv:2112.00391.

[13] V. Kozyakin, A. Krasnosel'skii and D. Rachinskii, *Asymptotics of the Arnold tongues in problems at infinity*, Discrete Contin. Dyn. Syst., **20** (2008), 989–1011, doi:10.3934/dcds.2008.20.989, URL https://www.aimsciences.org/article/doi/10.3934/dcds.2008.20.989.

[14] V. S. Kozyakin, *Algebraic unsolvability of problem of absolute stability of desynchronized systems*, Autom. Remote Control, **51** (1990), 754–759.

[15] V. S. Kozyakin, *Structure of extremal trajectories of discrete linear systems and the finiteness conjecture*, Autom. Remote Control, **68** (2007), 174–209, doi:10.1134/S0005117906040171, URL https://link.springer.com/article/10.1134/S0005117906040171.

[16] V. S. Kozyakin, A. Bhaya and E. Kaszkurewicz, *A global asymptotic stability result for a class of totally asynchronous discrete nonlinear systems*, Math. Control Signals Systems, **12** (1999), 143–166, doi:10.1007/PL00009848, URL https://link.springer.com/article/10.1007/PL00009848.