



17TH INTERNATIONAL CONFERENCE ON STABILITY AND OSCILLATIONS OF NONLINEAR CONTROL SYSTEMS (PYATNITSKIY'S CONFERENCE)

The 17th International Conference on Stability and Oscillations of Nonlinear Control Systems (Pyatnitskiy's Conference) took place on June 3–5, 2026, at the Trapeznikov Institute of Control Sciences, the Russian Academy of Sciences (ICS RAS). Following the established tradition, the event was organized by ICS RAS with the support of the Department of Power Engineering, Mechanical Engineering, Mechanics, and Control Sciences RAS and the Scientific Council on Control Theory and Processes. Chairman of the Organizing Committee was V.N. Tkhai, Chief Researcher of Laboratory No. 16 (Dynamics of Nonlinear Control Processes).

The conference was dedicated to presenting and discussing new results obtained by Russian and foreign researchers in the following areas:

- General problems of stability and stabilization;
- Nonlinear oscillations: general problems and methods;
- Lyapunov functions methods;
- Smooth and nonsmooth dynamics;
- Problems of controllability and observability;
- Robust control problems;
- Control in mechanical and electromechanical systems;
- Control in mechatronic systems and robotic control;
- Oscillations, stability, and stabilization in the network and coupled systems;
- Stability and control of hybrid systems and switched systems.

The conference was held in person. Over the course of three days, 14 sessions took place, including three plenary sessions. The conference featured six plenary and 117 sectional talks by leading scholars from Armenia, Vietnam, Kyrgyzstan, Uzbekistan, and Russia. Russian participants represented research organizations and universities from 16 cities.

During the first plenary session (June 3), two talks were delivered. The first, entitled “E.S. Pyatnitskiy: Scholar, Teacher, and Organizer. On the 90th Anniversary of His Birth,” was presented by I.N. Bara-

banov (ICS RAS). The speaker outlined the scientific biography of E.S. Pyatnitskiy, Corresponding Member of the RAS, Dr. Sci. (Eng.), Prof., and Laboratory Head at ICS RAS. In the second talk (“Development of Methods for the Stability Analysis of Positive Systems”), A.Yu. Aleksandrov (St. Petersburg State University) reviewed the existing stability analysis methods for positive dynamic systems. The main focus was on the problem of diagonal stability (constructing diagonal Lyapunov functions and Lyapunov–Krasovskii functionals). Applications to population dynamics and control of mobile agent formations were considered.

The second plenary session included two talks as well. The first was dedicated to Academician A.B. Kurzhanski, who had served on the Program Committee of the conference for many years. In the talk by M.I. Gusev (Krasovskii Institute of Mathematics and Mechanics, UB RAS), Kurzhanski's contribution to the development of mathematical control theory was discussed, along with his fundamental results in the theory of differential equations and their applications, control theory and motion parameter estimation, inverse problems of dynamics, methods of mathematical modeling, and systems analysis. Kurzhanski's role as an outstanding educator and organizer of science was emphasized. The second talk of that session was entitled “Features of Motion Control of Small Satellites in Near-Earth and Interplanetary Missions.” The author—M.Yu. Ovchinnikov (Keldysh Institute of Applied Mathematics RAS)—provided a historical overview of the emergence and development of small spacecraft, focusing on the evolution of methods and approaches to stabilize angular and translational (orbital) motion for individual near-Earth spacecraft and their groups, including spacecraft designed for interplanetary missions. The features of small spacecraft motion control were considered, taking into account limited control resources at all stages of their development.

At the third plenary session, the first talk (“Adaptive State Estimation for Stochastic Systems under Structural and Parametric Uncertainty in Navigation Data Processing Problems”) was delivered by



O.S. Amosov (ICS RAS). The author addressed the adaptive state estimation problem of stochastic systems under structural and parametric uncertainty. Conventional methods for solving this problem were compared with those based on artificial intelligence, with an assessment of the advantages and disadvantages of both groups. As possible applications, Amosov considered adaptive estimation under structural and parametric uncertainty for target tracking and for the integration of navigation data in heterogeneous unmanned systems. The second talk of the session, by I.B. Furtat (Institute for Problems in Mechanical Engineering RAS), was entitled “Divergent Method in Control Problems, Stability and Oscillation Studies with Application to the Control of Mechatronic Systems and Objects in the Oil and Gas Industry.” It was devoted to the development of a divergence method for studying the stability of autonomous and non-autonomous dynamic systems. As shown by the author, the necessary stability conditions within the method take the form of a classical continuity equation. For stability analysis, the concept of a density function was introduced, and new sufficient stability conditions based on such a function were derived using the divergence method. The divergence method and the density function were applied to design control laws. Theoretical aspects of the divergence method (generalizations of Bendixson’s theorem and Dulac’s criterion from the 2D case to phase spaces of an arbitrary dimension) were described. Also, the divergence method was applied to analyze stability in the Andronov–Vyshnegradskii problem and to detect hidden oscillations. Finally, the divergence method was applied to control a vibration setup with a guaranteed oscillation frequency within specified limits; to control stepper motors in mechatronic elements of spacecraft; to control the gas-lift operation of oil wells; and to control submersible pumps in oil wells with operating mode constraints and a guaranteed oil flow rate.

The program of sectional sessions was organized according to the topics of the conference.

At the sessions on general problems of stability and stabilization, both theoretical problems and those related to the control, stability, and stabilization of particular objects were considered. For example, the following deserve to be mentioned: stability and dynamics of the reaction-diffusion model for the spread of viral infection (K.A. Ryumina, RUDN University); the equilibrium and stability of rotating droplets in an electric field (A.G. Petrov, Ishlinsky Institute for Problems in Mechanics RAS); stability of planning mode during a ski jump (O.G. Privalova, Institute of Mechanics, Moscow State University); damping the oscillations of a load suspended on an inextensible cable to a moving object (A.M. Formalskii, Institute of Me-

chanics, Moscow State University); bifurcations of self-oscillatory regimes of a walking mechanism with a wind turbine in a wind flow (M.A. Garbuz, Institute of Mechanics, Moscow State University); and others. Among the theoretical problems considered, note the following: stabilization of time-invariant bilinear complex systems (V.A. Zaitsev, Udmurt State University); the Hyers–Ulam stability of fractional differential equations with Caputo derivative and discontinuous trajectories (A.N. Seseikin, Krasovskii Institute of Mathematics and Mechanics, UB RAS); sliding modes of functional-differential equations with discontinuous right-hand part (I.A. Finogenko, Matrosov Institute of System Dynamics and Control Theory, SB RAS); guaranteed error estimates for the identification of coefficients of difference equations (A.A. Lomov, Novosibirsk State University); terminal control of linear systems with output constraints (S.A. Vrazhevsky, Institute for Problems in Mechanical Engineering RAS); and others.

A separate session was focused on the development of the method of Lyapunov functions. It addressed different issues: the use of Lyapunov functionals for systems with delay (A.V. Egorov, P.E. Makoveeva, St. Petersburg State University; O.V. Druzhinina, ICS RAS); the derivation of Popov’s criterion without the S-procedure (V.A. Kamenetskiy, ICS RAS); stability criteria for periodic difference inclusions (M.V. Morozov, ICS RAS); and others.

One session was devoted to control and stability of oscillations. It considered diverse problems as follows: periodic motions of a non-autonomous Hamiltonian system (O.V. Kholostova, Moscow Aviation Institute); stability of multifrequency oscillations in a reversible mechanical system (V.N. Tkhai, ICS RAS); forced vibrations of a loaded rotating tire with a variable contact area length (I.F. Kozhevnikov, Federal Research Center “Computer Science and Control” (FRC CSC) RAS); oscillations of a pendulum partially filled with liquid in a flow medium (A.P. Golub, Institute of Mechanics, Moscow State University); analysis of cycles in a third-order system with discontinuous right-hand side (Yu.V. Morozov, ICS RAS); and others.

A large group of talks dealt with control in mechanical, electromechanical, and mechatronic systems. Over three sectional sessions, the following problems were discussed: control of a space robot (E.I. Somov, Samara State Technical University); magnetic attitude control of a satellite (Y.V. Mashtakov, Keldysh Institute of Applied Mathematics RAS); feedforward control of the bending of an elastic cantilever in an electric field (G.V. Kostin, Ishlinsky Institute for Problems in Mechanics RAS); battery charging control (M.Z. Dosaev, Institute of Mechanics, Moscow State University); the block synthesis of a wheeled platform

control system (J.G. Kokunko, ICS RAS); a time-optimal problem for a double linear inverse pendulum (I.M. Ananievski, Ishlinsky Institute for Problems in Mechanics RAS); and others.

Among the problems of smooth and nonsmooth dynamics addressed by conference participants, note the following: the estimation of the accuracy of approximate continuous friction force models (M.V. Belichenko, Moscow Aviation Institute); motion of a bead on a swing (A.A. Burov, FRC CSC RAS); application of continued fractions in the problem of adaptive control for heat exchange processes (S.V. Solodusha, Melentiev Energy Systems Institute, SB RAS); the transgression effect in nonholonomic systems with small degrees of freedom (A.S. Kuleshov, Moscow State University); and others.

The session on robust control problems was dedicated to the memory of B.T. Polyak. It addressed different issues as follows: data-driven robust control design under structured uncertainty (R.S. Biryukov, Lobachevsky State University of Nizhny Novgorod); the invariant ellipsoid approach to reject structural perturbations (K.A. Lastochkin, ICS RAS); a discrete analog of Kharitonov's theorem (R.O. Omorov, Institute of Mechanical Science, Automation and Geomechanics, the National Academy of Sciences of the Kyrgyz Republic); calculation of the anisotropic norm in mathematical models (I.R. Belov, ICS RAS); parametric robustness of quadcopter control methods (N.B. Filimonov, ICS RAS); and others.

The conference program, the abstracts of all talks, and the plenary presentations and video recordings of the plenary sessions can be found on the conference website: <https://stab26.ipu.ru/>. The electronic proceedings of the conference are freely available on the con-

ference website and will be indexed in the Russian Science Citation Index (RSCI).

Let us emphasize the high level of scientific discussions at the sessions. The participants demonstrated active engagement in the event.

The in-person format of Pyatnitskiy's Conference, for the first time since 2018, allowed researchers to gather in a familiar setting to discuss their results and share new ideas in face-to-face communication.

Deputy Chairman of the Organizing Committee
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Cite this paper

Barabanov, I.N., 17th International Conference on Stability and Oscillations of Nonlinear Control Systems (Pyatnitskiy's Conference). *Control Sciences* **4**, 84–86 (2026).

Original Russian Text © Barabanov, I.N., 2026, published in *Problemy Upravleniya*, 2026, no. 4, pp. 99–102.



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