Chronicle

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Abstract

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Information about the Samarkand Symposium

From October 9 to 16, 1964, an inter-university symposium on the qualitative theory of differential equations and its applications was held in Samarkand.

Below is the report on the symposium by the chairman of the organizing committee, Corresponding Member of the Academy of Sciences of the Uzbek SSR I. S. Kukles.

The inter-university symposium on the qualitative theory of differential equations and its applications was held in the Soviet Union for the first time. At various mathematical congresses and conferences there had at best been only sections devoted to the qualitative theory of equations. The Samarkand symposium was attended by a large number of mathematicians from various cities of the country who are conducting research in the qualitative theory of differential equations and its applications to the theory of nonlinear oscillations.

Three sections worked on the following topics: 1) qualitative theory of differential equations in the plane; 2) qualitative theory of differential equations in n-dimensional space ($n \geqslant 3$) and limit cycles; 3) qualitative methods in the theory of nonlinear oscillations.

At the sectional and plenary sessions of the symposium 82 reports were presented. At two plenary sessions the following reports were heard.

V. V. **Nemytskii.** On the classification of singular points in n-dimensional space. The question to which the report was devoted presents great difficulties, since the very methodology of classification and distinction of singular points in n-dimensional space has scarcely been developed at all. Therefore the report, which outlined a program and methods of research in this area, was highly relevant and interesting.

Yu. A. **Mitropolskii.** On one method of qualitative investigation of a differential equation of nonlinear mechanics. The author proposes a new effective method for studying a system of equations of nonlinear mechanics with n degrees of freedom, containing a small parameter.

A. D. **Myshkis.** The state and problems of the theory of differential equations with retarded argument. Recently an extensive literature has appeared devoted to the theory of differential equations with retarded, or deviating, argument. In his survey report the speaker described the current state of the subject and the new work of Soviet and foreign mathematicians on the indicated question.

I. S. **Kukles.** Research in the qualitative theory of differential equations in Uzbekistan and Tajikistan. Samarkand and Dushanbe mathematicians working in the field of the qualitative theory of differential equations have in recent years dealt with the following topics: a) distinction of center and focus, b) development of Frommer's method for analytic and nonanalytic functions, c) qualitative investigation of characteristics as a whole in the plane, d) behavior of characteristics in three-dimensional space (in particular, the study of infinitely distant singular points), e) qualitative investigation of integral surfaces in n-dimensional space, f) application of qualitative methods in the theory of oscillations and, in particular, the problem of isochronicity, g) limit cycles.

I. P. **Makarov.** On work in the qualitative theory of differential equations in Ryazan. In Ryazan the following questions were developed: a) investigation of complex singular points by the method of rupture, b) criteria of roughness at infinity and as a whole, c) limit cycles, d) general theory of homogeneous equations, e) study of the behavior of characteristics with the help of Plyukare and isocline indices, f) generalization of some results of N. N. Luzin in stability theory, g) application of the qualitative theory of equations to the theory of mechanisms and to several other questions.

V. A. **Yakubovich.** Periodic and almost periodic solutions of nonlinear differential equations of automatic control. The author considers the system (in vector form)

$$\dot{x} = Ax + b\varphi(\sigma) + f(t), \quad \sigma = (c, x)$$

and finds an effective criterion for the existence of periodic and almost periodic solutions and their absolute stability.

At the second plenary session an informational report was heard by Corresponding Member of the Academy of Sciences of the BSSR Prof. F. I. Fedorov on the journal "Differential Equations," the composition of the editorial board of this journal, and the questions with which it will be concerned.

We now list the sectional reports.

First section. N. A. Lukashevich (Minsk). On the number of singular points of the second group and the problem of isochronicity of the center for certain systems of differential equations.

Kh. R. Latipov, Sh. R. Shiripov (Samarkand). On the distribution of singular points of the equation $dy/dx = Q(x, y)/P(x, y)$ (where Q and P are polynomials of degree n).

K. E. Malkin (Moscow). On coefficient criteria for a center.

B. A. Kovalev (Odessa). Investigation of the character of the singular points of one system of equations.

A. N. Berlinskii (Odessa). On the behavior of trajectories of one system of differential equations on the Poincaré sphere.

I. S. Kukles, M. Khasanova (Samarkand and Dushanbe). On the distribution of singular points of the first and second groups.

N. B. Khaimov (Dushanbe). On the distribution of singular points of one differential equation.

V. V. Potlov (Ryazan). On the behavior of trajectories of homogeneous-type systems.

S. Kh. Aranson (Gorky). First-degree systems of roughness on the torus.

M. T. Terekhin (Ryazan). Periodic solutions and contact curves.

Z. N. Kurbanova (Chardzhou). Qualitative investigation of differential equations with several singular points.

R. T. Valieva (Kazan). Solution of the inverse problem of the qualitative theory of differential equations.

I. S. Kukles (Samarkand). Distinction problems in Frommer' s theory.

I. M. Grigorivker (Ryazan). On the question of computing Poincaré indices.

I. V. Khairutdinov (Dushanbe). Qualitative investigation of one differential equation.

V. A. Krasnogorov (Samarkand). On an application of one method of orthogonal trajectories.

I. S. Kukles (Samarkand). On topologically distinct pictures of the behavior of the characteristics of the equation $dy/dx = Q(x, y)/P(x, y)$ (where Q and P are polynomials of the second degree) in the Poincaré disk.

N. V. Azbelev and Z. B. Tsaluk (Izhevsk). Application of theorems on differential and integral inequalities to problems of the qualitative theory of differential equations.

K. S. Sibirskii (Kishinev). Invariants of linear representations of groups of transformations of the phase plane and their application to the qualitative theory of differential equations.

A. T. Nazmutdinov (Kazan). Qualitative investigation of certain differential equations.

A. T. Turaev (Samarkand). On infinitely remote singular points of one system.

A. Ya. Yusupov (Bukhara). Application of topological methods to the study of certain questions in the qualitative theory of differential equations.

A. Dragilev (Tartu). On one theorem of the qualitative theory of differential equations.

M. E. Drakhlin (Perm). On the behavior of the solution of the Riccati equation.

L. Aryushenko (Frunze). On the theory of periodic and almost periodic solutions of differential and integrodifferential equations.

Second section. A. D. Myshkis (Kharkov). Nonformal theory of the Pfaff equation.

E. L. Reizin (Riga). On systems of differential equations satisfying Smale' s conditions.

P. L. Khaimov (Dushanbe). Qualitative theory of surfaces defined by a Pfaff equation.

N. N. Vinogradov (Mogilev). Conditions for the existence of a periodic solution of one system of three differential equations.

L. P. Shilnikov (Gorky). On one case of the existence of a countable set of periodic solutions of saddle type.

A. I. Yablonskii (Minsk). On algebraic cycles of a differential equation.

A. M. Molchanov (Moscow). Uniform asymptotics of linear systems with a small parameter at the derivative.

A. M. Zverkin (Moscow). Qualitative investigation as a whole of first-order equations with delay depending on the unknown function.

Z. S. Batalova (Gorky). Numerical investigation of certain dynamical systems.

I. Z. Manevich (Ryazan). Behavior of a system of differential equations close to a homogeneous one.

M. G. Khudoi-Verenov (Ashkhabad). On algebraic solutions and limit cycles of one differential equation.

Kh. R. Latypov (Samarkand). Qualitative investigation of one system of three differential equations as a whole.

R. I. Sorokina (Dushanbe). Some questions of qualitative investigation for Pfaff equations in multidimensional space.

K. S. Sibirsky (Kishinev). On the number of limit cycles arising from a singular point of focus or center type.

D. M. Gruz (Samarkand). On the possibility of extending Frommer' s method in three-dimensional space.

A. R. Artykov (Samarkand). Problems of discrimination for certain systems in three-dimensional space.

Yu. V. Khomchenko (Izhevsk). On the application of Chaplygin' s theorems to a homogeneous equation.

M. V. Konyukhov (Kazan). Solution of a linear system of higher-order differential equations satisfying multipoint boundary conditions.

A. A. Ilyin (Cheboksary). On the limit cycles of one differential equation.

G. M. Latfullin (Kazan). On limit cycles for one equation.

V. P. Zakharov (Cheboksary). On certain conditions for the existence of limit cycles.

N. V. Medvedev (Omsk). On conditions for the uniqueness of existence of a limit cycle.

Sh. R. Sharipov (Samarkand). On limit cycles for one equation.

L. V. Shakhova (Samarkand). Necessary and sufficient conditions for reducing a linear system to block-triangular form.

B. P. Demidovich (Moscow). On a generalization of Lyapunov' s stability criterion.

V. M. Millionshchikov (Moscow). Recurrent limit trajectories of nonautonomous systems of differential equations.

Third section. V. M. Bolshakov, R. M. Mints, N. A. Fufaev (Gorky). On the dynamics of a "self-oscillator–rotator" system.

S. L. Kiryapin (Gorky). On one relay control system with time delay.

N. K. Ibragimova (Moscow). On the stability of certain systems in the presence of resonance.

V. A. Bruslin (Gorky). Qualitative investigation and stability in the large of a tracking system with backlash.

V. P. Rudakov (Zhitomir). On the existence of an interval of stability of motion.

M. P. Berdnikova, I. M. Vlasov, E. L. Tyukalova (Minsk). On the stability of solutions of nonlinear systems of ordinary differential equations.

K. G. Valeev (Leningrad). Stability of periodic solutions of nonlinear differential equations with a lagging argument.

V. V. Nemytskii (Moscow). Generalized Lyapunov function.

Yu. I. Neimark, N. A. Fufaev (Gorky). Stability of nonholonomic systems.

A. Kh. Gelis, O. I. Komarnitskaya (Leningrad). Absolute stability of nonlinear systems with a unique equilibrium position.

L. A. Cherkas (Mogilev). On the perturbation of one differential equation.

M. K. Yakovlev (Ryazan). On one method for constructing a Lyapunov function for linear systems with variable coefficients.

A. M. Zverkin (Moscow). Periodic systems of differential equations with delay.

V. R. Nosov (Moscow). Some comparison theorems for first-order differential equations with a retarded argument.

N. N. Leonov (Gorky). On extremal control systems.

L. A. Sinitskii, Yu. M. Shumkov (Lviv). On convergence phenomena in chain electric circuits.

I. M. Dorfman (Samarkand). Application of qualitative theory to certain questions of forced oscillations.

M. K. Yakovlev (Ryazan). On the theory of Lyapunov' s second method.

I. Z. Manevich (Ryazan). Some questions of stability for systems of homogeneous differential equations.

Yu. S. Bogdanov (Minsk). Asymptotic characteristics of nonlinear systems.

M. D. Kocheva (Sverdlovsk). On oscillations of the double pendulum.

K. V. Zadiraka (Kiev). Investigation of solutions of an irregularly perturbed autonomous system in a neighborhood of an equilibrium point.

R. E. Vinograd (Moscow). A model of satellite motion taking tidal friction into account.

D. M. Grobman (Moscow). Asymptotics of solutions of almost linear systems.

At the symposium there met representatives of various groups conducting research on the qualitative theory of differential equations and its applications. Some of these groups, such as, for example, the Ryazan, Gorky, Moscow, Kazan, Samarkand, and Dushanbe groups, working continuously in contact, had often met at various conferences and symposia and regularly exchanged scientific works. The above-mentioned group of collectives was considerably less closely connected with the Leningrad, Belorussian, Sverdlovsk, Kharkov, and Kiev subject groups. The symposium showed that different groups are simultaneously engaged with certain questions and topics. Thus, for example, the qualitative study of the equation

$$\frac{dy}{dx} = \frac{Q(x, y)}{P(x, y)}$$

(where $Q(x, y)$ and $P(x, y)$ are polynomials of the second degree) on the Poincaré sphere was being pursued simultaneously by I. S. Kukles, Kh. R. Latipov, M. Khasanova (Samarkand), A. N. Berlinskii, P. T. Cherevichnyi (Odessa), K. S. Sibirskii (Kishinev), N. A. Lukashevich, A. P. Vorob' ev (Minsk), and some results of these works overlapped. In exactly the same way, the problem of isochronicity was studied in Samarkand by I. S. Kukles, M. R. Rakhmatov, N. A. Abdullaev, and in Minsk by N. A. Lukashevich and A. P. Vorob'ev. The behavior of characteristics in a three-dimensional space of homogeneity was studied by D. M. Gruz, A. R. Agrykov (Samarkand), D. A. Shestakov (Moscow), and L.

E. Reizin (Riga). All the groups were engaged with limit cycles, sometimes for one and the same equations (for example, A. A. Il' in (Cheboksary) and L. V. Shakhova (Samarkand)).

The symposium made it possible not only to become acquainted with the results of the works, but also to coordinate their topics and further direction.

It should be noted that, in addition to the official reports, spontaneously arising group seminars were very useful.

The participants of the symposium were warmly received by the people of Samarkand. At the concluding plenary session a resolution was adopted that all-Union conferences on the qualitative theory of differential equations and its applications should become traditional in our country and should be repeated at least once every two years.

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Note: Figure translations are in progress. See original paper for figures.