

**INTERNATIONAL CONFERENCE
ON
INTERVAL AND STOCHASTIC METHODS
IN SCIENCE AND ENGINEERING
"INTERVAL-92"**

On September 22-26, 1992, The International conference on interval and stochastic methods in science and engineering ("INTERVAL-92") was held in Kaliningrag (Moscow region). The idea of this conference appeared in December, 1991, at seminar on interval methods held in Moscow Power Engineering Institute (MPEI), where collaborators of the Laboratory of Modelling and Optimization of MPEI (Moscow), members of the editorial board of the International Journal "Interval Computations" and of the journal "Industrial Laboratory" (Russia), and scientists from Germany took part.

Intensive discussing the idea via electronic mail showed that many well-known scientists support the idea of organizing the conference in Russia and agree to participate in its work. This made possible, on short notice, to form an international program committee of the conference and to obtain the agreement from the following organizations that took the part of founders:

- Moscow Power Engineering Institute
- The Editorial Board of the International Journal "Interval Computations"
- Institute for Applied Mathematics of Karlsruhe University
- Russian Department of the Intercultural Open University
- Center of Statistical Methods and Informatics (Russia)
- Russian Association on Statistical Method's
- The Editorial Board of the Journal "Industrial Laboratory"
- Polytechnic Institute (Tula, Russia)
- President State Committee of Civil Defence, Emergency Situations and National Calamities.

The following scientists were members of the international program committee:

Co-Chairmen: A.P.Voshchinin (Russia), J. Wolff von Gudenberg (Germany);

Scientific Secretary: A.N.Ryukin (Russia)

K.Amborsky (Poland)	S.M.Markov (Bulgaria)
Yu.K.Belyaev (Russia)	E.A.Musaev (Russia)
A.F.Bochkov (Russia)	M.Nakao (Japan)
N.I.Burdakov (Russia)	V.M.Nesterov (Russia)
B.Dobronets (Russia)	A.I.Orlov (Russia)
D.Claudio (Brazil)	H.Ratschek (Germany)
V.A.Fatuev (Russia)	S.Rump (Germany)
R.Gnadadesikan (USA)	N.V.Skibitsky (Russia)
E.Hansen (USA)	G.Sotirov (Bulgaria)
R.B.Kearfott (USA)	C.Ullrich (Switzerland)
U.Kulisch (Germany)	V.Vesely (Czecho-Slovakia)
E.K.Letsky (Russia)	A.G.Yakovlev (Russia)
K.Madsen (Denmark)	V.S.Zyuzin (Russia)

When determining the Conference aims the committee took into account the following considerations.

Nowadays, impressive results are achieved in the field of INTERVAL MATHEMATICS, corresponding program tools are developed such that PASCAL-XSC, ACRITH-XSC, ABACUS, CALCULUS, TPX, processors for interval computations (including those compatible with ANSI/IEEE Standard 754) and so on, which allow the user on each step of a computation to obtain the result in the interval form, that is, to receive complete information about its accuracy.

No less interesting are the research works in the area of so-called INTERVAL STATISTICS in which strict classical assumptions of mathematical statistics about additivity and normal distribution of a random error. In the frameworks of this approach, the problems of data analysis and data fitting are investigated in the following cases: bounded, but not random errors, random errors with finite distribution, and combined error model. In particular, interval versions of regression analysis are developed.

The scope of applications of interval methods becomes wider; first of all, these methods are applied in analysis and synthesis of control systems.

Furthermore, it should be stated that contacts and exchange of results between representatives of the different scientific branches are inadequate, the practical and applied workers become aware, with a large delay, of

new approaches and conceptions developed by mathematicians.

Taking into account the above considerations, the Organizing Committee put forward the following main goals of the International Conference "INTERVAL-92":

- to reflect the latest results in interval mathematics, interval statistics and stochastic modelling;
- to give the opportunity for international and interdisciplinary communications and contacts between the representatives of different scientific domains;
- to present the applications of proposed methods and to acquaint practical workers with them.

In line with proclaimed aims, the selection of reports was made, the program of the conference was formed, and the list of participants including both the representatives of different scientific direction and practical workers.

On the first stage of the work the Organizing Committee had doubts as to the possibility to form sufficiently representative membership, taking into account that the situation in the former USSR was quite complicate. However, after the reports were chosen, it turned out there are 106 reports included, from the scientists of 17 countries.

The work of the conference was held in two parallel sections, the reports were submitted in Russian and in English. The participants were given two volumes of proceedings, published in Russian and in English respectively. Each volume contained information on all the reports in the form of complete exposition or of abstract, in the corresponding language.

Analyzing the reports submitted to the conference, the number of directions could be distinguished, which are the most intensively investigated in the area of interval analysis.

The problems of INTERVAL EXTENSIONS OF CLASSICAL MATHEMATICS were considered in the reports by D. M. Claudio and B. T. Franciosi, Brazil (A Domain Approach to Interval Mathematics), by V. M. Nesterov, Russia (Computing of Interval Generalizations of Functions Using Extended Interval Arithmetics), by Fr. Blomquist, Germany (Interval-Inclusions for Dawsons Integral), by S. M. Markov, Bulgaria (On the Presentation of Ranges of Monotone Functions using Interval Arithmetic; Some Interpolation, Identification and Estimation Problems Involving Interval Data), by I. E. Shvetsov and V. V. Telerman, Russia (Intervals and Multi-Intervals in Incompletely Defined Computational Mod-

els), by V. S. Zyuzin, Russia (An Extension of Concept of Freshet Derivation in Interval-Segment Analysis), and by N. M. Glazunov, Ukraine (Interval Extensions for Computer Algebra Systems: Investigations and Applications).

In the context of the development of interval mathematics, particular attention has been given to the problem of VERIFICATION OF THE RESULTS AND ESTIMATION OF ERRORS: M. T. Nakao, Japan (Numerical Verification of Solutions for Nonlinear Elliptic Problems in Non-convex Domains), B. S. Dobronets, Russia (Interval Methods via a Posteriori Error Estimates), A. F. Filippov, Russia (Ellipsoidal Error Estimates for Adams Method).

There is a constant interest of investigators to the problem of SOLVING INTERVAL ALGEBRAIC AND DIFFERENTIAL EQUATIONS. The following reports show it: O. B. Ermakov, Russia (Two-Sided Method for Solving System of Ordinary Differential Equations with Automatic Determination of Guaranteed Estimations), G. G. Menshikov, Russia (Interval Co-Integration of Differential Equations Connected by a Substitution of The Variable), V. S. Zyuzin and L.V.Kupriyanova, Russia (A Method for Location of the Interval with the Zeroes of Non-Linear Equations), P. S. Senio and P. S. Vengersky, Ukraine (Application of Interval Iterative Methods for Special Kind of Systems of Non-Linear Equations), A. B. Lakeev and S. I. Noskov, Russia (Representation of the Set of Solutions of a Linear Interval Equation in Ordered Vector Space), T. Yuping, China (On Robust Stability of Interval Matrices), and I. V. Dugarova, Russia (An Algorithm for Testing the Asymptotic Stability of Interval Matrices).

New axiomatic and approaches based on interval paradigm that form so-called INTERVAL STATISTICS, presented in the reports: A. I. Orlov, Russia (Interval Statistics), V.P.Kuznetsov, Russia (Axiomatic of interval means), D. A. Molodtsov, Russia (The Law of Large Numbers for Interval Probability), V.A.Voznesensky and T.V.Lyashenko, Odessa (Considering the Interval Symmetry in Composition-Technological Decision Making Using Experimental- Statistical Models), G. I. Ivchenko and S. A. Khonov, Russia (On Asymptotic Confidence Estimation for Finite Populations), V. V. Levin, Russia (Statistical Tests for Grouped Observations), L. A. Leifer, Russia (Models of Information Transfer, Based on Interval Mathematics), and G. F. Filaretov, Russia (Autoregression Models under White Noise Bounded on a Finite Interval).

The problem of development of methods of EXPERIMENT IDENTIFICATION AND PLANNING UNDER INTERVAL UNCERTAINTY is closely associated with the preceding direction. The following reports are dedicated to this problem: A. P. Voshchinin, Russia (Some Questions of Application of Interval Mathematics in Parameter Estimation and Decision Making), G. R. Sotirov, Bulgaria (Robust Interval Parameter Estimation of ARMAX Models in the Bounded Noise Case), S. M. Markov, Bulgaria (Some Interpolation, Identification and Estimation Problems Involving Interval Data), A. F. Bochkov, Russia and N. V. Zung, Vietnam (Identification of Nonlinear Dynamic Systems Using Wiener Model and Interval Experimental Data), N. P. Dyvak, Ukraine (Design of Saturated Experiment in Interval Model Building), J. A. Sosulin, Russia (A Method for Describing Objects by Structural Interval Models).

The problem of OPTIMIZATION UNDER INTERVAL UNCERTAINTY have been the subject of a discussion, initiated by the reports: T. Henriksen and K. Madsen, Denmark (Combined Real and Interval Methods for Parallel Global Optimization), R. B. Kearfott and K. Du, USA (The Cluster Problem in Global Optimization), A. F. Bochkov and L. A. Yakovleva, Russia (Algorithm for Experimental Zero-Order Optimization Under Bounded Errors), T. V. Evtushenko, Russia (Optimization in Static under Interval Uncertainty), K. G. Pkhir, North Korea (Optimal Resource Distribution under Interval Uncertainty), A. N. Ryukin and M. Yu. Papin, Russia (Interval Linear Programming).

All participants stressed that the DEVELOPMENT OF THE SOFTWARE FOR INTERVAL COMPUTATIONS AND PROGRAMMING SC-LANGUAGES is very important; therefore, the following reports have attracted a legitimate interest: J. Wolff von Gudenberg, Germany (Programming Language Support for Scientific Computation), R. B. Kearfott, USA (INTLIB: A Reasonably Portable Interval Elementary Function Library), D. V. Shiriaev, Germany (PASCAL-XSC: A Portable Programming System for Scientific Computations), A. Davidenkoff, Germany (Parallel Programming in PASCAL-XSC on a Transputer System), A. G. Yakovlev, Russia (Possibilities for Further Development of SC-Languages), E. A. Musaev, Russia (Wave Computations), A. B. Babichev, O. B. Kadyrova, T. P. Kashevarova, and A. L. Semyonov, Russia (Uni-Calc - Software Tool for Calculus of Inexact and Incompletely Defined Data), V. N. Krishchuk, N. M. Vasilega, and G. L. Kozina, Ukraine (Interval Mathematics Library for FORTRAN 77 Programmers).

A great deal of the reports is closely connected with the problems of ANALYSIS AND SYNTHESIS OF CONTROL SYSTEMS UNDER INTERVAL UNCERTAINTY: N. A. Khlebalin, Russia (Theory of Interval Automatic Systems: Backgrounds, Computer Realization and Practical Applications), E. K. Letsky, Russia (Interval Models in Preproject Analysis of Operational Quality of Automatic Systems), I. G. Ten, Kyrgyzstan (Synthesis of Optimal Control under Interval Uncertainty), V. N. Chestnov, Russia (Robust Stability Analysis of Linear Multivariable Systems in the Case of Finite Variations of Parameters), A. Akunova, T. A. Akunov, and A. V. Ushakov, Russia (Design of the Comparison System for the Multi-Dimensional Control Model with Interval Parameters), V. G. Krymsky, Russia (On Design of Fault-Tolerant Algorithms for Dynamic Plants with Interval Parameters), V. A. Mzhelskaya, V. I. Yas'kiv, and L. L. Hruslov, Russia (Robust Analysis of Pulse Voltage Magnetic-Switch Stabilizer under Interval Uncertainty in Magnetic-Switch Parameters), N. V. Skibitsky, Russia and T. Yuping, People's Republic of China (Control of Linear Dynamical Systems Under Interval Uncertainty: Determination of The Set of Admissible Inputs For Guaranteed Control Accuracy).

The reports connected with the APPLICATIONS OF INTERVAL METHODS in expert systems have aroused interest of the participants: A. S. Narin'yani, Russia (UNCERTAINTY-Factors and Computations: What do Intervals Model?), A. N. Ryukin, Russia, Ts. H. Minkov, and N. Ch. Minkov, Bulgaria (Fuzzy IF-THEN Rules Interpolation: An Application to Production and Operational Management in Power Plant), S. J. Simov, Bulgaria (Interval Approximate Reasoning For Expert Systems), B. V. Palukh, Russia (Technical Diagnostics of Production Using Interval Methods), and E. E. Il'yasov and A. Z. Zaynalov, Russia (Application of Interval Methods in The Design of Radio-Electronic Circuits).

A fruitful exchange of ideas and discussions that were held allow us to state that the goals, set before the conference were attained. The conference contributed to the development of interval analysis methods and to their implementation to the science and technology. In this connection, it was decided to hold in 1994 the next international conference "INTERVAL-94" in Russia.

Co-Chairman of the Program Committee
Prof. A.P.Voshchinin