**UNIVERSITY OF NIŠ**
The scientific journal **FACTA UNIVERSITATIS**
*Series*: **Mechanics, Automatic Control and Robotics** Vol.2, No 10, 2000 pp. 1433 - 1444
*Editor of series: Katica (Stevanovi}) Hedrih, e-mail: katica@masfak.masfak.ni.ac.yu*
Address: Univerzitetski trg 2, 18000 Niš, YU, Tel: +381 18 547-095, Fax: +381 18 547-950
http:// ni.ac.yu/Facta

# Review of the international scientific conference: THE SECOND INTERNATIONAL CONFERENCE CONTROL OF OSCILLATIONS AND CHAOS COC 2000

**July 5-7,2000, Saint-Petersburg, Russia**

*UDC 534.01(045)*

**Katica (Stevanović) Hedrih**

Faculty of Mechanical Engineering, University of Niš
Beogradska 14, 18000 Niš, Yugoslavia
e-mail: katica@masfak.masfak.ni.ac.yu, katicav@junis.ni.ac.yu

***Second International Conference "Control of Oscillations and Chaos" - COC 2000, July 5-7,2000, Saint-Petersburg, Russia*** was held from 5 to 7 June 2000 at House of Scientists (dvorcovaya Naberehnaya 26, St. Petersburg, phone 315-5959, e-mail: coc2000@ccs.ipme.ru). Organizers of the conference were: Institute of Mechanical Engineering of Russian Academy of Science, State University of Saint Petersburg, Society of Information Systems and Control of Saint Petersburg and Saint Petersburg Educational and Research Center: Problems of machines and buildings, mechanics and process control. The sponsors and cosponsors of the conference were: The Russian Academy of Sciences (RAS), Russian Fundamental Research Fund, The IEEE Circuits and System Society and The International Union of Theoretical and Applied Mechanics.

The president of the scientific committee was one of the worlds leading scientists in the field of robotics, RAS academician ***Feliks Chernousko***, while the president of the organizing board was professor *A. L. Fradkov* from the Saint Petersburg Institute for Problems of Mechanical Engineering (61 Bolshoy ave V.O., 1999178, St. Peterburg Russia, http://www.ipme.ru/coc2000.html). Scientific board was formed of thirty scientists from the whole world (Russia, USA, Sweden, Netherlands, Italy, Switzerland, Austria, Poland, Germany, Ukraine, Japan and China) in the field of control and robotics.

Many visitors came to the conference and during the conference 7 plenary and 9 semiplenary invited lectures were presented, as well as 116 short scientific contributed lectures classified into 11 sessions; 51 contributed lectures were presented at the poster presentations and total number of authors and co-authors from 24 countries was around 360.

Received August 1, 2000

The following plenary and semi plenary invited lectures were presented:

***I.I. Blekhman*** (Institute for Problems of Mechanical Engineering, RAS, St. Petersburg, Russia) and ***K.A. Lurie*** (Worchester Polytechnic Inst. USA):

*Creating Dynamical Materials as a Problem of Control (Oppening Plenary Lecture).*

***F. L. Chernousko*** (Institute for Problems in Mechanics, RAS, Moscow, Russia):

*Snake-like Motions of Multibody Systems over a Rought Plane.*

***M. Dimentberg, D. Iourtchenko*** (Worchester Polytechnic Inst. USA) and ***A. Bratus'*** (Moscow State University, Russia):

*Optimal Bounded Control of Random Vibration and Hybrid Solutions to dynamic Programming Equations*

***A.S. Dmitriev, A. I . Panas and S. O. Starkov*** (Institute of Radio Engineering and Electronics, RAS, Moscow, Russia):

*Multiple Access Communication Based on Control of Special Chaotic Trajectories.*

***R. J.P. de Figueiredo*** (University of California, Irwine, USA):

*A reproducing Kernel Hilbert Space (RKHS) Approach to the Optimal Modeling, Identification, and Design of Nonlinear Adaptive Systems* (*IEEE Distinguished Lecture) – (Closing Plenary Lecture*)

***K.S. Hedrih*** (University of Nis, Yugoslavia):

*Nonlinear Dynamics of a Gyrorotor, and Sensitive Dependence on the Initial Conditions of the Forced Vibrations of a Heavy Gyrorotor*.

***E. Kreuzer, M. Wendt*** (Technical University Hamburg, Germany)

*Nonlinear Dynamics of Ship Oscilations.*

***V. F. Lazutkin*** (St. Petersburg State University, Russia):

*Exponentially Small Separatrix Spliting*.

***E. Mosekilde*** (Technical University of Denmark, Lyngby, Denmark):

*Chaotic Synchronization in Living Systems*.

***P. C. Miller*** (Technical University of Wupertal, Germany):

*Nonlinearity Estimation and Compensation by Linear Observers: Theory and Applications*.

***F. Pfeiffer, Th. Rossmann, K. Loffler*** (Technical University of Muenchen, germany):

*Control of a Tube Crawling Machine.*

***W. Schiehlen*** (University of Stuttgart, Germany):

*Motion Control of Vehicles in Convoy.*

***A. N. Sharkovsky, S. A. Berezovsky*** (Institute of Mathematics, Kiev, Ukraine):

*Transitions of "Correct-Incorrect" Numerical Calculations for Solutions of Some Problems "Phase Transitions" in Computer tubulence*.

***F. E. Udwadia*** (University of Southern California, Los Angeles, USA):

*New developements in Dynamics of Constrained Systems with Applications to Tracking Control*.

***N. Van Dao*** (Vietnam National University, Hanoi, Vietnam):

*Delay Control in Nonlinear Oscillating Systems.*

***N. van de Wouw*** (Eindhoven University of technology, The Netherlands***), H. Nijmeijer*** (University of Twente, Enschede, The Netherlands) and ***D. H. van Campen*** (Eindhoven University of technology, The Netherlands):

*Statistical Bilinearization in Stochastic Nonlinear Dynamics.*

***O. M. Belotserkovsky, Yu. D. Shevelov*** (Institute for Computer Aided Design, RAS, Moscow, Russia) ***F. A. Maksimov*** (Instrument Design Bureau, Tula, Russia):

*A Flow about Delta Wings at Various Reynold Numbers.*

The first plenary lecture at the opening of the conference was presented by academician ***I.I. Blekhmana*** (Institute for Problems of Mechanical Engineering, RAS, St. Petersburg, Russia) and his co-author ***K.A. Lurie*** (Worchester Polytechnic Inst. USA): *Creating Dynamical Materials as a Problem of Control*. This lecture is an important contribution to knowledge and creation about dynamic active materials. It was also one of the invited lectures at Yugoslav Congress on Theoretical and Applied Mechanics 1997 in Vrnjačka Banja.

It should also be mentioned that a group of five leading scientists in the field of *mechanics, robotics and control* from Germany presented invited lectures. They are: ***F. Pfeiffer*** (Technical University of Munich, Germany), ***W. Schiehlen*** (University of Stuttgart, Germany), ***E. Kreuzer*** (Technical University Hamburg, Germany) and ***P. C. Miller*** (Technical University of Wupertal, Germany). They presented top realizations of scientific results in the field of control through review of concrete models and prototypes. As at ***ENOC 1999*** in Kopenhagen, professor ***F. Pfeiffer*** showed a certain interest for conditions under which the research work in Yugoslavia is undertaken.

The plenary lecture of ***E. Mosekilde*** (Technical University of Denmark, Lyngby, Denmark): *Chaotic Synchronization in Living Systems* was also interesting, who, regrettably did not print his paper in these proceedings. Professor ***E. Mosekilde***, also, showed interest for cooperation with Yugoslav scientists.

Extremely interesting semi plenary lecture of 40 min duration was presented by the president of the conference scientific board, academician ***L. Chernousko*** (Institute for Problems in Mechanics, RAS, Moscow, Russia). In his lecture *Snake-like Motions of Multibody Systems over a Rought Plane* he presented how motion of a being (snake on a rough surface) was used to design control algorithms and numerical simulations for robot motion. At this point I would remind readers that the academician ***F. L. Chernousko*** contributed an invited plenary lecture at Yugoslav Congress of Theoretical and Applied Mechanics held in 1995 at the Faculty of Mechanical Engineering in Niš.

The plenary lecture presented by IEEE president, professor ***R. J.P. de Figueiredo*** (University of California, Irwine, USA) should also be mentioned as distinguished lecture at the closing of the conference. The title of his contribution is *A reproducing Kernel Hilbert Space (RKHS) Approach to the Optimal Modelling, Identification, and Design of Nonlinear Adaptive Systems*.

Among the authors of the contributed lectures there were authots who presented a number of papers as coauthors, so there are multiple papers of those authors in the proceedings.

One of these authors is prof. ***J. M. Baltezar*** (Departamento de Estatistica, Matematica aplicada e Computacional, UNESP-Rio Claro, Brazil) from Brazil who has 4 coauthored papers published in this proceedings. The idea about the content of these papers can be obtained from the following titles: *Nonlinear Oscillations of a Porlat Frame Structure excited by a nonideal motor* (coauthors: Reyollando M.L., and Brasil R.F.), ***Bifurcational Phenomena in a Nonideal System*** (coauthors: D. Belato, H. I. Weber and J. M. Rosario), *Nonlinear Stieltjes Equations and Proximity of Solutions* (coauthors: L. Barbanti and J.C. Prandini) and *A Note of the Use of Melnikov's Chaos Prediction Criterion: Results of a Friction-Driven Self-Excited Vibrating System* (coauthors: B.R. Pontes and V.A. Oliveira).

One of these authros is also ***F. L. Chernousko*** (Institute for Problems in Mechanics, RAS, Moscow, Russia) with the paper named: *Control Algorithm for a Linear Dynamic*

*system subjected to Complex Constraints*; (the first coauthor A. S. Smyshlyaev):,

The abstract of this paper is: A linear dynamical controlled system is considered with complex constraints imposed on the control variable and state coordinates. A control algorithm is constructed which satisfies all constraints and drives the system to a prescribed terminal state in a finite time. It is shown that this algorithm can be used for a feedbak control of the system subjected to perturbations. The operation of this algorithm is illustrated by an example of the control process of an electrically driven system.

In the work of the conference from Yugoslavia participated:

* one professor in the field of mechanical engineering with semi plenary invited contribution in the field of nonlinear dynamics: *Nonlinear Dynamics of a Gyrorotor, and Sensitive Dependence on the Initial Conditions of the Forced Vibrations of a Heavy Gyrorotor*
* one professor with coauthor in the field of electronic engineering with poster presentation and one teaching assistant B. Veselić who had oral presentation with coauthor; both contributions show the research results in the field of sliding linear harmonic oscillators or their synchronization.

The participants were first delivered ***Preliminary Program and Call for Participation***, page 28, and at the registration desk following publications were delivered: ***Final Program - Control of Oscillations and Chaos (COC 2000)***, page 40 and three books of Proceedings - 2000 2nd ***Second International Conference, Control of Oscillations and Chaos COC 2000, July 5-7,2000, Saint-Petersburg, Russia- Proceedings, Edited by F.L. Chernousko and A. I. Fradkov***, page 584**.**

Information on *Second International Conference Control of Oscillations and Chaos COC 2000, Saint-Petersburg, Russia* can be found at web site http://www.ipmme.ru/coc2000.html.

The organizers invited participants who needed financial aid for participation at the conference to submit application for aid, which would have been considered by the **IUTAM** chairmanship during the conference.

* * *

Review of the Proceedings of ***The Second International Conference Control of Oscillations and Chaos COC 2000, Eited by F. I. Chernousko and A.L. Fradkov, July 5-7,2000, Saint-Petersburg, Russia, volume 1, XXIII, pp. 1-204; volume 2, XXII, pp. 205-293, volume 3, XXII, pp.394-593.***

The three books - proceedings - named 2nd ***Second International Conference, Control Oscillations and Chaos COC 2000, July 5-7,2000, Saint-Petersburg, Russia-Proceedings, Edited by F.L. Chernousko and A. I. Fradkov.str. 583,*** contain published plenary and semiplenary lectures and short presentations presented at the international conference of the same name. In fact, between 5th and 7th July 2000 at the House of scientists (House of Scientists, dvorcovaya Naberehnaya 26, St. Petersburg, phone 315-5959, e-mail: coc2000@ccs.ipme.ru) in St.P the second international conference *Second International Conference "Control Oscillations and Chaos" - COC 2000, July 5-7,2000, Saint-Petersburg, Russia*, was held. The organizers of the conference were: The Mechanical Engineering Institute of the Russian Academy of Science, The St.P State University, St.P Society for Informatics and Control and St.P educational and research

centre The problems of maschines and buildings, mechanics and process control. The sponsors and cosponsors of the conference were: The Russian Academy of Sciences, Russian Fundamental Research Fund, The IEEE Circuits and System Society and The International Union of Theoretical and Applied Mechanics.

The editors of this three-volume publication are the Chairman of the conference scientific committee, one of the greatest scientists in the area of robotics in the world, The RAS academician ***Felix Chernousko*** **(Institute for Problems in Mechanics**, Russian Academy of Scineces, pr. Vernadskogo 101-1, Moscow 117526, Russia, e-mail: chern@impnet.ru) and the chairman of the conference organizing committee prof. dr *A. L. Fradkov*, who is with the Insitute Problems of Mechnaical Engineering from St. Petersburg. The scientific committee consisted of thirty scinetists in the area of robotics and control from all over the world (Russia, USA, Sweden, Holland, Italy, Switzerland, Australia, Poland, Germany, Japan and China).

The publication contains published papers which correspond to the contents of 7 plenary and 9 semiplenary organizer invited lectures, to the contents of 116 short scientific contributed lectures in 11 sections, and to the poster presentations of the 51st contributed lecture, from around 360 authors and coauthors form more than 30 countries.

The three-volume proceedings contains published invited lectures from the category of plenary and semiplenary lectures.

***I.I. Blekhman*** (Institute for Problems of Mechanical Engineering, RAS, St. Petersburg, Russia) and ***K.A. Lurie*** (Worchester Polytechnic Inst. USA***):***

*Creating Dynamical Materials as a Problem of Control (Oppening Plenary Lecture).*

The abstract of this paper is: The idea of creating dynamical materials is pointed out. Dynamical materials are created as the media whose material parameters (density, elastic, disipative and electromagnetic characteristics) change both in space and in time.When those changes take place in microscales one can speaks of dynamics composites. The appearence of time as an additional variable makes it possible to obtain the media with unusual properies and very important in practice. Problem of control arising in this connection are also described here.

***F. L. Chernousko*** (Institute for Problems in Mechanics, RAS, Moscow, Russia):

*Snake-like Motions of Multibody Systems over a Rought Plane.*

The abstract of this paper is: Motions of multibody systems over a rough horizontal plane are investigated The multibody system is a linkage consisting of the several rigid bodies connected by revolute joints with vertical axes. The control torques are created by using actuators installed at the joints. Dry friction forces between the linkage and the plane act upon the system. It is shown that the multibody system can move in an arbitrary direction: lengthwise, sideways, and rotate. Different modes of motion of two-link, three-link, and multilinks systems are numerically and experimentaly investigated and simulated.

The displacenets and speed of the motions are estimated, and optimal parameters are obtained which maximize the average speed.

The obtained results are discussed with respect to motions of snakes and other animals, as well as to possible applications to mobile robots.

***M. Dimentberg, D. Iourtchenko*** (Worchester Polytechnic Inst. USA) and ***A. Bratus'*** (Moscow State University, Russia):

*Optimal Bounded Control of Random Vibration and Hybrid Solutions to dynamic Programming Equations*

The abstract of this paper is: A possible aproach to optimal bounded control for

randomly vibrating systems is based on Dynamic Programing and the Hamilton-Jacobi-Bellmann (or HJB) partial diferential equations. Exact solutions are obtained for certain auter domains and used to obtain matching baundary conditions for the (bounded in velocity) inner domains, wheree the basic PDE is solved numerically.

***A.S. Dmitriev, A. I. Panas and S. O. Starkov*** (Institute of Radio Engineering and Electronics, RAS, Moscow, Russia):

*Multiple Access Communication Based on Control of Special Chaotic Trajectories.*

The abstract of this paper is: There is a number of ideas for haotic signal application in multiple access systems, but as a rule, chaotic sygnals are used there only as efficient and versatile means of quasi-noise signal formulation. In such applications , important and attractive features, such as multitude of chaotic modes, flexible control of their dynamics, chaotic delf-synchronization phenomena, and potential communication confidence due to the very dynamic properties of chaotic nonlinear systems, are neglected.

Here authors discuss another principle of multiple access, based on the structure of chaotic attractor, using control of special chaotic trajectories and also demonstrate the experimental verification of the proposed approach for asynchronous packet date transmission.

***R. J.P. de Figueiredo*** (University of California, Irwine, USA):

*A reproducing Kernel Hilbert Space (RKHS) Approach to the Optimal Modeling, Identification, and Design of Nonlinear Adaptive Systems* (IEEE Distinguished Lecture) – (Closing Plenary Lecture)

The abstract of this paper is: This paper-abstract addressed the following question: "Can the Orthogonal Projection Theorem, with - based on the pioneering cointributions of Kilmogorov, Wiener and Kalman - played such a prominet role in the modelling, identification, and design of LINERA adaplive systems in the $20^{th}$ century, provide similar elegant solutions to the corresponding NONLINEAR problems?". The answer is in the affirmative, and the proposed solutions can be achieved via the Reproducing Kernel Hilbert Space (RKHS) of nonlinear analytic functionals(abstract Volterra functionals) introduced in 1980 by de Figueiredo and Dwyer (IEEETans. on Circuits and Systems, vol. CAS-27, no. 11, pp. 1005-1014, Nov. 1980).

It invariably and naturally appears in the form of an appropriate artificial neural network or a fuzzy logic network, depending on whether the uncertainty is modeled probabilistically or based on approximation theory in the sense of Kolmagorov, Vitushkin and Zadeh. The underlying structure-depending process can be interpreted not only as ADAPTIVE but also EVOLUTIONARY.

The abstract was conclude with examples from applications to diagnosis of brain function and lesion, and detection, classification, and interpretation of events present in signals, images, and other data types.

***K.S. Hedrih*** (University of Nis, Yugoslavia):

*Nonlinear Dynamics of a Gyrorotor, and Sensitive Dependence on the Initial Conditions of the Forced Vibrations of a Heavy Gyrorotor.*

The abstract of this paper is: Sensitive dependence on initial conditions of the forced vibration/rotation motion of a heavy gyro-rotor around the two axes in the field with damping is studied in the light of some new knowledge in area of nonlinear mechanics, theory of chaos and dynamical systems.

In this paper, by using, in the previous author's papers derived vectorial equations of the

forced motion/rotation/oscillation of a heavy gyro-rotor around two axes in the field with damping, the nonlinear dynamics of the gyro-rotor is analysed in the light of the sensitive dependence on initial conditions of the forced vibrations. Using new knowledge in nonlinear mechanics, theory of chaos and dynamical systems published in References the sensitive dependence of the initial conditions and of the forced motion - oscillation/ rotation/stochasticlike-chaoticlike motion of the heavy gyro-rotor in the "vicinity" of the homoclinic point and orbit are analysed. Author followed the ideas of Holmes Ph. on the example pendulum excited by one frequency force, and why showed us that Poincaré maps contain the Smale horseshoe map as well as global analysis processes of the dynamical systems which posses homoclinic orbit for applying for study of the gyrorotor dynamic. By using ideas of Holmes Ph. it is easy to prove that forced dynamic of the heavy gyrorotor have in the vicinity of homoclinic point sensitive dependence of initial conditions.

In this article the author introduces the ideas and notation from the global theory of dynamical systems following ideas of Holmes Ph., as a Poincare map, Smale's horseshoe map. This article presents such a study of an engineering system with sensitive dependence on initial condition. The kinetic parameters of gyro-rotor are studied.

***E. Kreuzer, M. Wendt*** (Technical University Hamburg, Germany)

*Nonlinear Dynamics of Ship Oscilations.*

The abstract of this paper is: the authors analyze the stability of ship motions using a hydrodynamic model accounting for all the rigid body motions of a ship, as well as memory of effects in the fluid. The analysis of a particular ship shows that ship's dynamics depends strongly on the nonlinearities of the ship-fluid-system. Before the ship capsizes, a bifurcationwhen wave heights increase is indicated.

***V. F. Lazutkin*** (St. Petersburg State University, Russia):

*Exponentially Small Separatrix Spliting*.

The abstract of this paper is: The author describes the main mathematical difficulties and the ways of their overcoming. The reader can find a more detailed exposition of the material of the generalizations in a survey by V.G. Gelfreich and the author which is in preparation.

***E. Mosekilde*** (Technical University of Denmark, Lyngby, Denmark):

*Chaotic Synchronization in Living Systems*.

The abstract of this paper is: By using mathematical model, the chaotic synchronization in living systems is studied.

***P. C. Miller*** (Technical University of Wupertal, Germany):

*Nonlinearity Estimation and Compensation by Linear Observers: Theory and Applications*.

The abstract of this paper is: Based on a fictitious model of the time behaviour of the nonlinearities a linear state observer of an extended dynamical system is designed resulting in estimates of the nonlinear effects. In case of control design the disturbance rejection control method is applied to counteract the nonlinearities by the estimated signals. Some sufficient criteria for the asymptotic stability of the estimation error are given.

Some applications are presented in the fields of high accurate position control of robots and of fault detection of cracks in turborotors.

***F. Pfeiffer, Th. Rossmann, K. Loffler*** (Technical University of Muenchen, germany):

*Control of a Tube Crawling Machine.*

The abstract of this paper is: In this papaer, the project of an eight legged pipe

crawling robot is presented. First the mechanical design is described with practical emphasis on the sensors and actuators of robot, which provide the input to the nonlinear controller is organized hierarchically. According to the mechanical structure of the eight legged pipe crawling robot, the control task is distributed to a control level, controlling the overall system behaviour and a decentral level, corresponding to the individual legs. The control system covers coordinative tasks, concerning the sequence of phases in the gait pattern and operative tasks, concerning the control of the forces during each phase of the gait.

***W. Schiehlen*** (University of Stuttgart, Germany):

*Motion Control of Vehicles in Convoy.*

Abstract of this paper is: For the dynamical analysis of highway automation requires inteligent vehicle controls in lateral and longitudinal direction a convoy of two paassenger cars is used. The paper-abstract presents the modeling of both vehicles using the method of multibody systems.

On the basis these models different control concepts are introduced for the lateral control including PID control, state feedback and $H_\infty$ control. For the longitudinal control, a nonlinear controller with exact state linearization is presented, using the flatness of the vehicle system.

***A. N. Sharkovsky, S. A. Berezovsky*** (Institute of Mathematics, Kiev, Ukraine):

*Transitions of "Correct-Incorrect" Numerical Calculations for Solutions of Some Problems "Phase Transitions" in Computer tubulence*.

The abstract of this paper is: Many effects that generally characterise the phenomenon of tubulence, in particular, the emergence of structures (including the cascade process of birth of coherent structures of dewacrising scales) and self-stochasticity observed in "simple " examples of dynamical systems which and generated by one - and two dimensional boundary value problems (BVP) consisting of linear partial differential equation and nonlinear boundary conditions are study by mathematical models and by dynamic of numerical processes. Results obtained by numerical investigations of these models are dicussed and one of the conclusions is that these models are probably more close (in some sense) to the reality than exact solutions not in spite but owing to "incorect" calculations.

***F. E. Udwadia*** (University of Southern California, Los Angeles, USA):

*New developements in Dynamics of Constrained Systems with Applications to Tracking Control*.

The abstract of this paper is: This paper contains some results in area of the development of the explicit equations of motion for nonlinear mechanical and structural systems, which are holonomically and/or nonholonomically constrained. Based on these new results from analytical dynamics, a develop a class of tracking controllers for controling general, nonlinear, mechanical systems is presented.

***N. Van Dao*** (Vietnam National University, Hanoi, Vietnam):

*Delay Control in Nonlinear Oscillating Systems.*

The abstract of this paper is: Oscillations and stability of nonlinear oscillators with time delay aare studied by means of the asymptotic method of nonlinear mechanics. Harmonic, superharmonic, subharmonic and parametric resonances of a Duffing's oscillator are analyzed. The analytical method and numerical method with a computer are used.

***N. van de Wouw*** (Eindhoven University of technology, The Netherlands***), H. Nijmeijer*** (University of Twente, Enschede, The Netherlands) and ***D. H. van Campen*** (Eindhoven University of technology, The Netherlands):

*Statistical Bilinearization in Stochastic Nonlinear Dynamics.*

The abstract of this paper is: A response approximation method for stochastically excited, nonlinear, dynamic systems is presented. The output of the nonlinear system is approximated by a finite-order Volterra series. The original nonlinear system is replaced by a bilinear system in order to determine the kernels of this Volterraseries. Application to a piece-wise linear system illustrates the effectivnes of this approach in approximating truly nonlinear stochastic response phenomena in both the statistical moments and the power spectral density of the response of this system in case of a white moise excitation.

***O. M. Belotserkovsky, Yu. D. Shevelov*** (Institute for Computer Aided Design, RAS, Moscow, Russia) ***F. A. Maksimov*** (Instrument Design Bureau, Tula, Russia):

*A Flow about Delta Wings at Various Reynold Numbers.*

The abstract of this paper is: The decisions of the Navier-Stocks equations in approximation of a thin layer describing a flow of the delta wing with sharp edges are received at various Reynolds numbers Re. The flow is characterised by the large variety of possible pictures of flow on upper surface.

* * *

On 22 pages at the beginning of every volume a review of the conference program is given with the sections marked. The names of those sections are:

*Control Oscillations*,
*Control of Chaos*,
*Control of Mechanical Systems*,
*Mathematics of Stability and Instability*,
*Identification and Reconstruction of Parameters*,
*Synchronization*,
*Nonlinear Dynamics and Chaos in Physical Systems*,
*Nonlinear Dynamics and Chaos in Mechanical Systems*,
*Nonlinear Dynamics and Chaos in Electronics, Communications and Power Systems*,
*Nonlinear Dynamics and Chaos in Biomedical, Ecological and Neural Systems*,
*Methods of System Analysis*.

* * *

**The evaluation of the conference:**

If I would have to evaluate the program of this international scientific conference, then, if I would compare it with the others I participated in so far, and which were in the area of theoretical and applied mechanics, nonlinear mechanics and nonlinear oscillations, I would have to say that this one differs in topics and in the way the papers were presented, because of its interdisciplinary character and because it contains lectures ranging from purely theoretical, mathematical accomplishments, and accomplishments in the areas of fundamental scientific areas of engineering such as: mechanics, fluid mechanics, electronics, biomechanics, various computer methods, to those which presented only the realizations of the well-known scientific ideas, through engineering contributions, but finalized to models, patented and which can be produced. Of course the professional results are with the leading and united areas, which deserve respect and

which put their authors to the top of the scientific creativity.

As I concluded in the presentations of scientific conferences in the past decade, I can repeat here, the scientists from western countries show final results of research in the form of patented models, but with little explanations on fundamental results, in the form " I show that I projected and constructed a model which works", while the scientists from the Eastern and former and present socialist countries like Russia, Ukraine, China present theoretical, analytical results of the highest level that can be imagined at this moment by the modern civilization of the human mind. But ideas and knowledge can not be protected by a patent nor can they yield profit. Profit is made by those who materialize the ideas in the form of products for the real market.

*Benefits of participating in the scientific conference:*

If I would ask a question: *What is the benefit of participating in this scientific conference?*

The answer could develop in two directions.

1. One of the answers is personal and it results in participant's advanced training through getting new knowledge in the fields of nonlinear dynamics, oscillation and chaos control, knowledge about new control prototypes of mechanical, building constructions, electro energetic and economic systems and *inspiration* for new research and meeting colleagues who perform research in the same fields. Then, confirmation of attitudes which I presented several times at the Faculty and University in the form of written suggestions to the Ministry of Science and Technology of Republic Serbia about real need to form the center for nonlinear dynamics in order to integrate scientific knowledge based on mathematics phenomenology and concentrate equipment for scientific research or at least make a list of equipment and in order to form a critical mass of scientists for experimental realization of the ideas through the laboratory for experimental investigation of nonlinear process dynamics in disparate dynamic systems, as well as through the workshops for prototypes. Gathering of critical mass of scientists would provide a POSITIVE competition and scientific and professional criticism with the aim of pushing the results of scientific research to higher levels with optimization and rationalization of their financing at the same time.

2. Presentation of some parts of scientific results of investigating nonlinear dynamic processes and their control, which were achieved through working on projects of the Ministry of Science and Technology. The results would be presented to the scientific competent audience from all around the world. Another contribution would be affirmation of scientific results of Yugoslav and Serbian scientists and sending a message to the world that despite blockades we manage to maintain scientific knowledge and be scientifically competent and keep up with the scientists who do the research under much, much better financial and information conditions.

**Suggestions for possible improvement of scientific research:**

1. Considering the results of our scientists achieved in the field of subject conference presented at scientific meetings in Yugoslavia and reported by the Ministry of Science and Technology (according to my knowledge), I can say that in the field of theoretical mechanics and nonlinear dynamics the results achieved by some researchers are not behind those achieved in the world. This should be specially emphasized, because the results are achieved under conditions of lack of latest scientific journals and world production monographs in our libraries, so the

scientists are trying to manage using personal contacts and professional attention of their foreign colleagues.

2. However, in the field of electronics, as I know, only a few scientists are involved in research of nonlinear dynamics; they are, primarly, linear models. However, in the world the first results about nonlinear phenomena usually come from this field of science. I think that in this field young people should be encouraged, provided leading mentors from the country and abroad (inviting them to be guests in our country) and be directed wards to the investigation of nonlinear dynamics. In this field it would be easier to provide conditions for experimental research. Maybe that is the reason why a great number of young and talented researches in those fields found their research interests in foreign research institutions. Perhaps this measure could be realized through a part of the research program at strategic project "Internet in Serbia" and young people brought back to Yugoslavia.
3. Founding Yugoslav center for nonlinear dynamics with three divisions: A. division for mathematical phenomenology of nonlinear dynamics, B. laboratory division for experimental research of nonlinear dynamics and C. division for models with basic workshops in military industry and big state companies of machinery building and electro industry. Such center would gather all competent researchers in the field of nonlinear dynamics from different disparate fields in engineering, medicine, bio–agricultural science, economics social sciences, which meet the models of nonlinear dynamic processes and phenomena. This center would also create conditions for more rational financing of scientific researches and integration of scientific knowledge from disparate fields of science. Such center would also enable to create a basic new university textbooks and monographs of new concepts and new minimal optimal essence of fundamental sciences which students of the universities should learn and know as future professionals on which the country should count when opening perspective of survival and planned standard of life and work of people in harmony with nature in this region. Such center could perform researches on strategic project "Internet in Serbia".
4. Acquisition of fundamental science monographs from different disparate scientific fields, as well as scientific journals in the fields of nonlinear dynamics and chaos published in the last decade, ever since different blockades were imposed on Yugoslavia; that material should be placed in one of national libraries or in the library at the center for nonlinear mechanics in order to be available to all interested researchers.
5. If this is not done fast I fear that people who understand those phenomena and can transmit their knowledge to young generations will disappear from this region, as well as "literacy" in these fields. And that "literacy" to read latest scientific achievements is very important for future scientific research.
6. For that reason providing conditions for work of one permanent *"international seminar-type school of science"* in the field of nonlinear dynamics and control is also necessary, with pretension to form, besides Center for nonlinear dynamics, *International Study Research Congress and Communication Center* for gathering scientists from the whole world and from different disparate fields of theory and applications.

   I am aware that we can not develop and finance all fields of science, but we can

form a center for international communications through scientific school for seminars and through international meetings, which would provide latest original scientific knowledge from the whole world at first with minimal investment and later even for free, because the center would finance itself from the participants' fees from the whole world if it acquired reputation of prestige and useful meeting. It would provide meeting at our regions of information courses from the latest scientific achievements. And our region also has geographic advantage for realization of such an idea.

**Possible practical solutions for basic knowledge in nonlinear dynamics and control or nonlinear dynamics systems:**

Creating technology and products based on nonlinear dynamics, processes and phenomena and their control on the basis of fast and slow oscillations and separation and joining of certain dynamics. Design of active constructions and active dynamic materials under control. Designing new kinds of dynamic active materials, which should be of interest for military industry. That is the reason why technology projects should be supported, through which elaborate schemes and technological documentation and models for application and production would be created. Constructions for oscillation control, which could be finalized as product series of vibration machines for mining, civil engineering, process technology in food production and agriculture.

* * *

With permission of the organizers our scientific University Journal *Facta Universitatis*, with its 13 series of the last year University production, was presented at a special desk as a part of the exhibition of latest monograph issues of leading Russian and world publishers. Publications of the University of Niš and Mathematical Institute of the Serbian Academy of Science and Art: *University of Niš at the Threshold of New Millennium, Niš 2000, Mathematical Institute SANU , Belgrade 1998 and Rheonomic Dynamics and The Topics from Mathematics and Mechanics, Belgrade 1999* were presented there and afterwards left to the organizers' University Library as a present from Yugoslav scientists.