Research and Authentic Author Scientific Results

Katica R. (Stevanović) Hedrih

in the period longer than half a century (from 1963-2019)

Foreword

The first research of Katica Stevanović originated from gymnasiums, under the supervision of **Draginja Nikolić**, a brilliant professor of mathematics at the then "Stevan Sremac" Gymnasium in Nis. Professor Draginja Nikolić studied at the lectures by Mihailo Petrovic, the Founding father of the Serbian School of Mathematics, who was also one of the three doctoral students of Henry Julius Poincaré. She has also learned from the famous Serbian scientist Militin Milanković, author of the Canon of Sun Insulation. She har listened to his inspiring lectures or/in celestial mechanics.

Thanks to the outstanding pedagogue, professor Draginja Nikolić, who was excellent in the methodology of mathematics, gymnasist Katica Stevanović, has participated at all levels of competition of young mathematicians, from school, through regional, republican and federal, where she has won awards for four years. **In 1963 she took part in the first Yugoslav, seven-member team at the Fifth International Mathematical Olympiad in Wroclaw, Poland**. The team won the team's fourth place in the great competition of teams from countries that had a tradition of mathematics gymnasiums, while in Yugoslavia at that time there were no such specialized mathematics gymnasiums.

At that time, **professor Draginja Nikolić**, gymnasist Katica, entrusted the teaching of mathematics classes, when she called the director's duties, the function she performed at that time. More serious research begins with original research of graphic elements of elementary and rational functions, from which the original graphs of functions with different types of asymptotes and singularities follow. Part of the research is finalized through the graduation work in gimnasium, which she defened with excellent grades, in June 1963.

Next, the research of student of the mechanical engineer Katica Stevanović, is focused on the study of nonlinear mechanics and nonlinear systems of automatic control, as well as the study of nonlinear phenomena and the stability of mechanical systems. This research was directed by the then professor of all fields of mechanics, from statics, kinematics, dynamics, theory of oscillations, strength of materials and elasticity theory, broadly educated and multi-talented and creative, and scientist and engineer and mathematician, **professor of science, engineer and graduated mathematician, Danilo P. Rašković,** from whom she acquired knowledge in all fields of mechanics and mathematics. These studies from student days are finalized in the diploma work (corresponding to today's degree of master thesis), which under the title **"Non-linear oscillations and applications to non-linear automatic control systems" (page 500)**, she defended with excellent grade, September 30, 1967 , before the beginning of the absolvent period of the generation, and the first in the generation and as **a best graduate student at University of Niš in generation 1966/67**. This is achieved by the degree of "graduate mechanical engineer" (corresponding to the current title of master of mechanical engineering).

This diploma work was **awarded with the award of the Electronic Industry of Niš,** in the category of the best graduate work done at the technical and natural-technical faculties in Yugoslavia. This decision was made by a multi-member commission consisting of professor from all the technical and natural mathematical faculties in Yugoslavia, formed by the then director Vladimir Jasić.

In the course of mechanical engineering studies, Katica Stevanović enjoyed the lectures of professor from all areas of mechanics, Danilo Rašković, whose thoughts she could guess in advance for the lectures, and she was also thrilled with the lectures of academics **Nikola Obradović and Vojislav Đurić**, who taught courses in hydro and thermoenergetics, as well as Professor **Jurij Korobov**, who

taught automatic control, followed by **Victor Salnikov**, who taught fluid mechanics and **Petar Miljanic**, who later became an academician of SASA, who taught electrical machines. Among these great scientists - Legends of the Faculty of Mechanical Engineering in Niš, are considered lecturers, engineers and engineers from MIN **Vojislav Birviš**, a brilliant professor of design and construction of railway vehicles. She enjoyed the benevolence of her professors, and she was the only girl-student between one handred of boy-students in her generation of mechanical engineering from the second year to the end of the studies.

Beograd, 20.X.1984.

Draga Katice,

ime. Priznajem da sam Vas mnogo nagnjavio sa ovim poslovima, ali šta ćete , Vi ste mi jedina uzdanica i pomoć.Još jednom veliko Vam hvala.

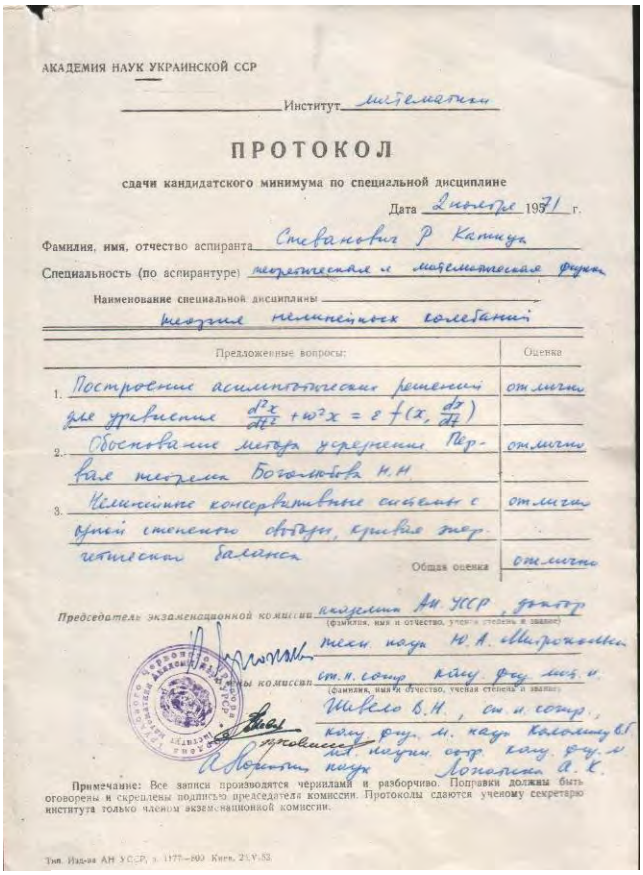
Uz zahvalnost ,mnogo, mnogo toplih pozdrava

Vaš

prof. Kaškovic

ICNO International Conference on Nonlinear Oscillations
Kiev 1969 (Yugoslavia, Netherlands and Ukraine)

Further direction in scientific research of Katica Stevanović, arises in the field of nonlinear mechanics (nonlinear oscillations and nonlinear dynamics) under the mentorship of Professor Dr Ing Dipl Math. Danilo P. Rašković, who represents academician of the National Academy of Sciences of Ukraine and the USSR, academician **Juri Alekseevič Mitropolsky**, participated in the International Conference on Non-Linear Oscillations (ICNO Kiev 1969) in Kiev in 1969. Katica Stevanović, then resides 11 months at the Institute of Mathematics NANU, in Kiev, in 1970/71, as a scholarship holder with a six-month scholarship from the Federal Government of Yugoslavia (SFRY). There she studies the asymptotic methods of nonlinear mechanics, the well-known and famous scientific schools Krilov-Bogoljub-Mitropolyski. The level of achieved scientific knowledge for a period of 11 months, staying at the Institute of Mathematics NANU, under the mentorship of the Academician Mitropolyski, was verified by passing the aptitude aspirant exam, with an excellent grade, from the specialty**: "Theoretical and Mathematical Physics"**, the candidate minimum program, before Defense Candidate Dissertations, in addition to exams in foreign language and philosophy. In the monograph NANU, dedicated to marking the jubilee 90 years of the life of academician Yuri Alekseevich Mitropolysky, Katica Stevanović is mentioned among the aspirants of this famous scientist and the **Scientific school of asymptotic methods of nonlinear mechanics Krilov-Bogolyubov-Mitropolyski.**



АКАДЕМИЯ НАУК УКРАИНСКОЙ ССР

Институт математики

ПРОТОКОЛ

сдачи кандидатского минимума по специальной дисциплине

Дата 2 ноября 1971 г.

Фамилия, имя, отчество аспиранта Стеванович Р Катица

Специальность (по аспирантуре) теоретическая и математическая физика

Наименование специальной дисциплины теория нелинейных колебаний

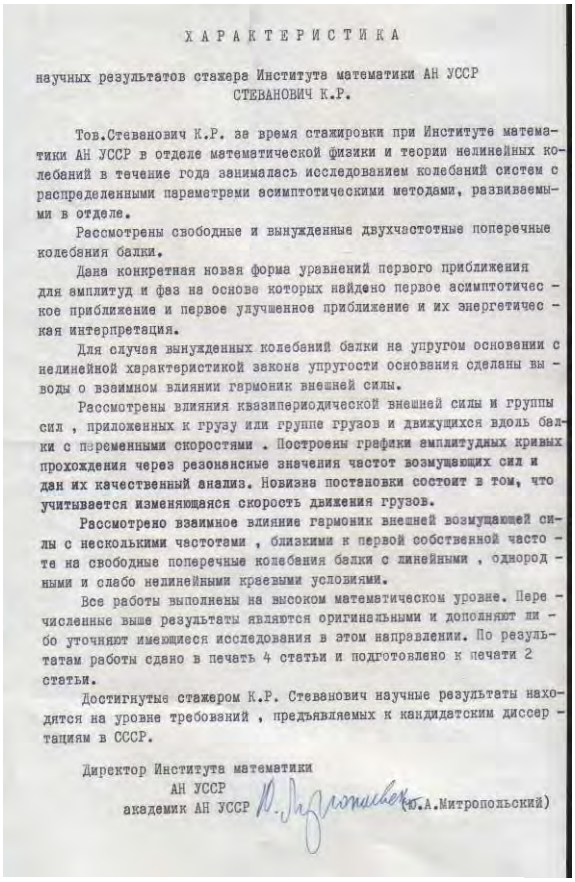
Предложенные вопросы:	Оценка
1. Построение асимптотических решений для уравнения $\frac{d^2x}{dt^2}+\omega^2x=\varepsilon f(x,\frac{dx}{dt})$	отлично
2. Обоснование метода усреднения. Первая теорема Боголюбова Н.Н.	отлично
3. Нелинейные консервативные системы с одной степенью свободы, кривая энергетического баланса	отлично
Общая оценка	отлично

Председатель экзаменационной комиссии академик АН УССР, доктор (фамилия, имя и отчество, ученая степень и звание) техн. наук Ю.А. Митропольский

Члены комиссии ст.н. сотр. кац. физ. мат. н. (фамилия, имя и отчество, ученая степень и звание) Шевело В.Н., ст.н. сотр., кац. физ. м. наук Коломиец В.Г., мл. научн. сотр. кац. физ. м. Лопатина А.К.

Примечание: Все записи производятся чернилами и разборчиво. Поправки должны быть оговорены и скреплены подписью председателя комиссии. Протоколы сдаются ученому секретарю института только членом экзаменационной комиссии.

Тип. Изд-ва АН УССР, з. 1177—800 Киев, 23.V.53.



ХАРАКТЕРИСТИКА

научных результатов стажера Института математики АН УССР
СТЕВАНОВИЧ К.Р.

Тов.Стеванович К.Р. за время стажировки при Институте математики АН УССР в отделе математической физики и теории нелинейных колебаний в течение года занималась исследованием колебаний систем с распределенными параметрами асимптотическими методами, развиваемыми в отделе.

Рассмотрены свободные и вынужденные двухчастотные поперечные колебания балки.

Дана конкретная новая форма уравнений первого приближения для амплитуд и фаз на основе которых найдено первое асимптотическое приближение и первое улучшенное приближение и их энергетическая интерпретация.

Для случая вынужденных колебаний балки на упругом основании с нелинейной характеристикой закона упругости основания сделаны выводы о взаимном влиянии гармоник внешней силы.

Рассмотрены влияния квазипериодической внешней силы и группы сил, приложенных к грузу или группе грузов и движущихся вдоль балки с переменными скоростями. Построены графики амплитудных кривых прохождения через резонансные значения частот возмущающих сил и дан их качественный анализ. Новизна постановки состоит в том, что учитывается изменяющаяся скорость движения грузов.

Рассмотрено взаимное влияние гармоник внешней возмущающей силы с несколькими частотами, близкими к первой собственной частоте на свободные поперечные колебания балки с линейными, однородными и слабо нелинейными краевыми условиями.

Все работы выполнены на высоком математическом уровне. Перечисленные выше результаты являются оригинальными и дополняют либо уточняют имеющиеся исследования в этом направлении. По результатам работы сдано в печать 4 статьи и подготовлено к печати 2 статьи.

Достигнутые стажером К.Р. Стеванович научные результаты находятся на уровне требований, предъявляемых к кандидатским диссертациям в СССР.

Директор Института математики
АН УССР
академик АН УССР (Ю.А.Митропольский)

Асимптотичний метод Крилова-Боголюбова-Митропольського

Ю́рій Олексі́йович Митропо́льський

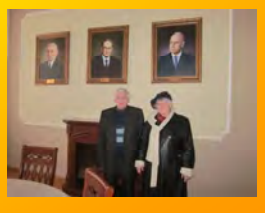
(21 грудня 1916 (3 січня 1917), Шишаки — †14 червня 2008[1],[2] Київ)

Боголюбов Микола Миколайович (старший)

(8 (21) серпня 1909, Нижній Новгород, Російська імперія — 13 лютого 1992, Москва, Росія)

Крилов Микола Митрофанович

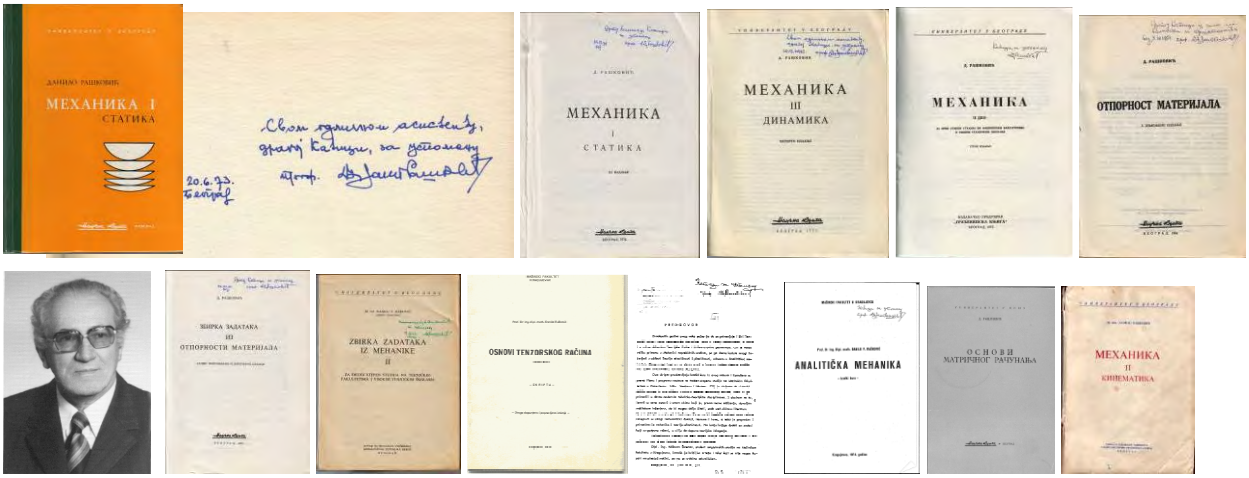
(рос. *Николай Митрофанович Крылов*; 17 (29) листопада 1879, Петербург, Російська імперія — 11 травня 1955, Москва, СРСР)

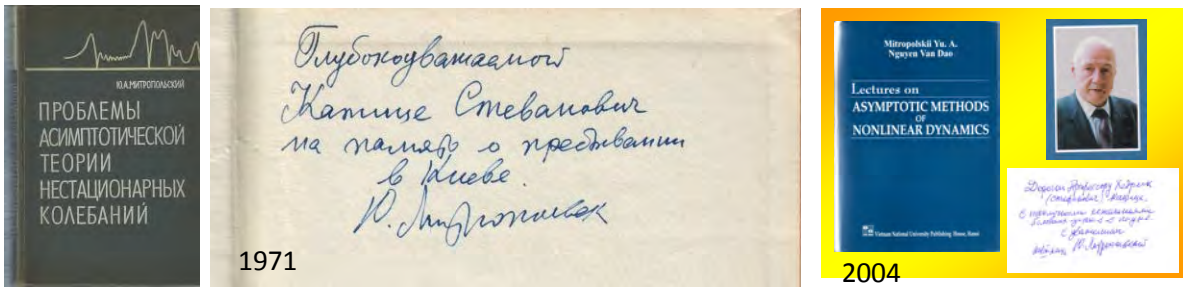


After her return to the country, during 1971/72, she passed all exams in postgraduate studies (magister science studies). In the postgraduate studies, exceptional scientific influence and support, besides Professor Danilo Rašković in all fields of mechanics, as well as mathematics, were done by academician Tatomir Anđelić in the field of analytical mechanics and tensor calculation and professor Dragoslav Mitrinović, from whom she gained knowledge in various fields of mathematics.

In November 1972, she defended her magister of science thesis (dissertation) titled: "**Solving the equation of transversal oscillations of a single-span beam by asymptotic methods of nonlinear mechanics and based on this study of the transversal oscillations of the beam**" and obtained the scientific degree of a magister of science in the field of technical mechanics.

Doctoral Dissertation titled: **"Application of the energy interpretation of asymptotic methods to the study of nonlinear oscillations of elastic bodies - Energy analysis of oscillatory motion of elastic bodies"**, p. 330, Nis 1975, defended on December 10, 1975, and thus obtained the degree of doctor of technical sciences, the field of technical mechanics.





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Realized Authentic Author Scientific Results

Katica R. (Stevanović) Hedrih

in the period longer than half a century (from 1963-2019)

1* The first published works half a century ago (50 years old), whose contents are still current, event today in 2019:

Stevanović R. Katica *(later merried family name Hedrih)*, Ubrzanje drugog reda (trzaj ili džerk) materijalne tačke koja se kreće konstantnom sektorskom brzinom (Acceleration of second order of a material particle moving with constant sectorial velocity , Naučni podmladak, 1967, str. 69-70.

In this paper, in the case of the motion of a kinematic point, in the plane with a constant sectoral velocity, $r^2\dot{} = C = 2S$, **the components of its second order acceleration of the radial and circular direction, as well as its angular acceleration of the second order** of rotation around the center of attraction, have been derived. The following theorem has been proved:

The circular component of the vector of the acceleration of the second order of the kinematic point, which is considered constant at the sectoral velocity, is equal to the product of the double sectoral velocity (constants $C = 2S$), the square of the reciprocal value of the radius, and the radial component of the acceleration vector of the kinematic point.

Rašković P. Danilo and Stevanović R. Katica *(later merried family name Hedrih)*, Ubrzanje drugog reda (trzaj ili džerk) krutog tela pri obrtanju oko nepomične tačke (Acceleration of second order of a rigid body rotates around fixed point), Zbornik radova Tehničkog fakulteta Univerziteta u Nuišu, 1966/1967, стр. 93-100.

In this paper, **the acceleration of the second order (truncation, Ruch, Rucken, Jerk, pulse) of some point of a rigid body, as well as its angular acceleration of the second order**, is determined by its rotation around a fixed point. First author, Rašković P. Danilo, by the matrix method, determined the acceleration of the second order of a point in a rigid body, as well as its angular acceleration of the second order, in its rotation around a fixed point. The second author, Stevanović R. Katica, using the vector method, has determined, in the natural coordinate system, the normal, tangential and complementary additional components of the second-order acceleration vector of a certain point of the rigid body, as well as its angular acceleration of the second order, in its rotation around a fixed point in the case of a regular progressive precession.

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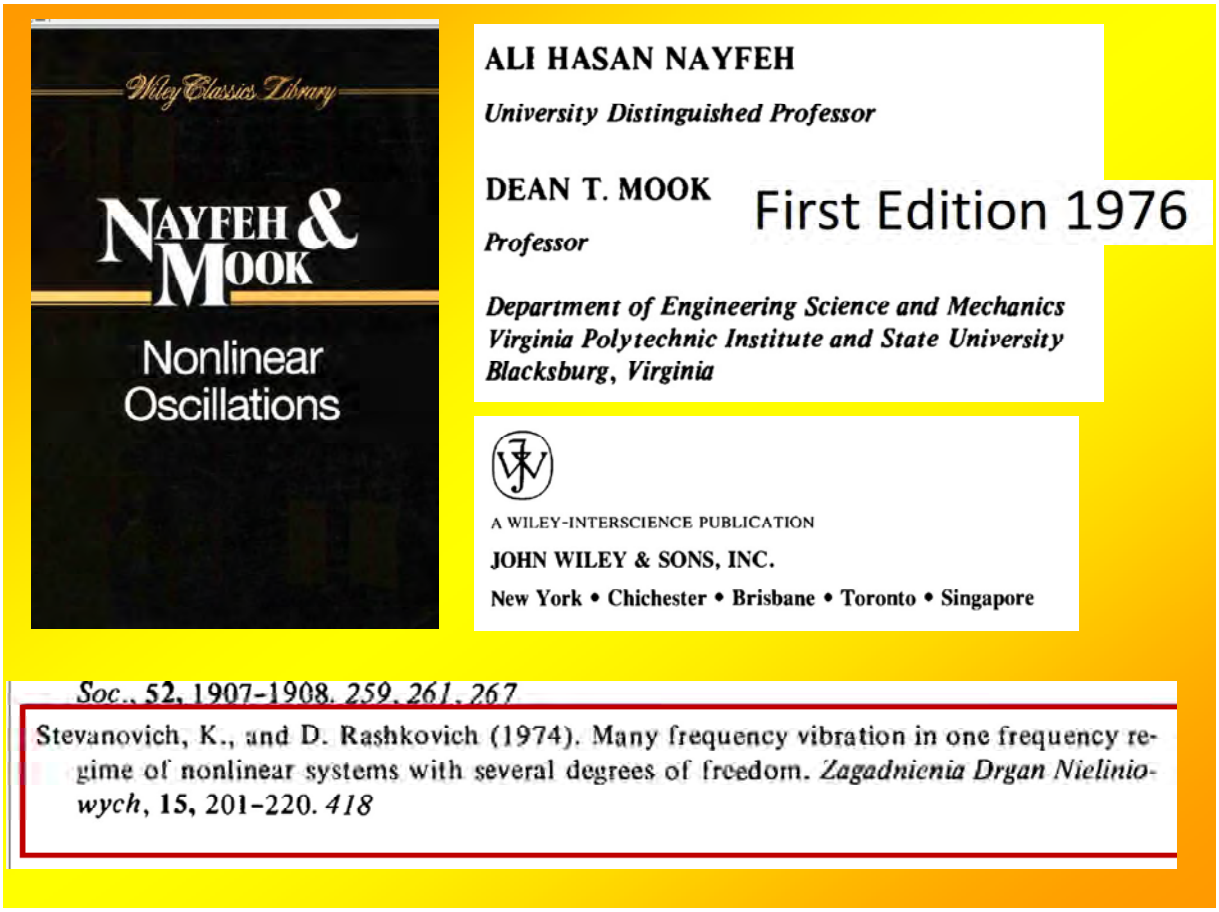
2 * First quoted papers 46 years ago in world leading monographs, asymptotic solutions of partial differential equations on nonlinear oscillations, and contents are still today, 2019, current:

Paper

Stevanovich, K. *(later merried family name Hedrih)* and Raskovich D., (1974), Many frequency vibration in one frequency regime of nonlinear systems with several degrees of freedom, Zagadnienia Drgan Neiliniowych, 15201-220,418., is cited in the list of the references of this important monograph. I learn about this four decades late.

quoted in the international monograph

Aly Nayfeh, Dean T. Mook, (1976), Nonlinear oscillations, John Wiley and Sons, 1976, New York.



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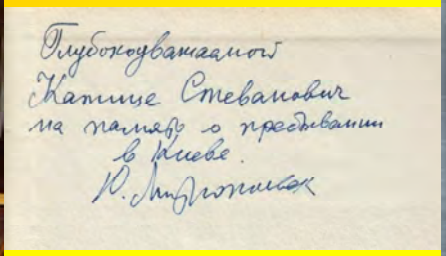
Papers

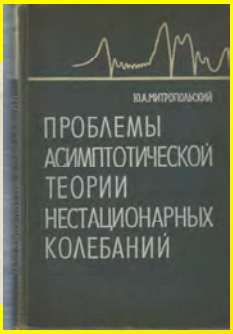
Katica Stevanovich *(later merried family name Hedrih)* m **(1972),** Two-frequency no stationary forced vibrationsof beam, **Marhematical Physics,** Kiev, Vol. 12, 1972, pp. 127-140. (in Russian language)

Katica Stevanovich *(later merried family name Hedrih)*, (1971), Transversal vibrations of a beam loaded by system, moving along beam with chengeable velocity, containing mass particles each excited by corresponding single frequency force, Edition **Assymptotic and qualitative methods in theory of nonlineat vibradisons**, **Editor Yu.A. Mitropolyski**, Institute of Mathematics Academy of Sciences of NANU, UKRAINE,USSR , Kiev, 1971, pages 15. (in Russian language).

quoted in the international monograph

Yu.A. Mitropolyski and B.I. Moseenkov: **Asymptotic solutions of partial differential equations,** Institute of Mathematics Academy of Sciences of NANU, UKRAINE, Kiev, 1976 (in Russian language).





List of Some Citations (List of Quotations) of Some Books and Papers written by Katica Stevanović (Hedrih) or Katica (Stevanović) Hedrih (January 2003)

1. * * Katica Stevanović (Hedrih), *О поперечних колебания балки под воздействием системи масс и приложених к ним пулсирующих сил, двигающимися с переменой скоростю*, Ед. Аналитические и качественне метод• в теории нелинейних колебаний, Редактор Ю. А. Митрополский, Институт Математики АН УССР, Киев, 1971, стр. 15.

Paaper cited (quoted) in Monograph: ***Yu.A.Mitropolskiy and B.I.Moseenkov:*** *Asimptotičeskie rešenia uravneniy v časnih proizvodnih*, Kiev 1976, (Listed under No. 138).

2. * * Katica Stevanović (Hedrih), *Двухчастотние нестационарние вынуждение колебания балки, Математическая физика*, вип. 12, Киев, 1972, стр. 127-140.

Paaper cited (quoted) in Monograph: ***Yu.A.Mitropolskiy and B.I.Moseenkov:*** *Asimptotičeskie rešenia uravneniy v časnih proizvodnih*, Kiev 1976, (Listed under No. 139).

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Realized Authentic Author Scientific Results

Katica R. (Stevanović) Hedrih

in the period longer than half a century (from 1963-2019)

1* Scientific contribution to asymptotic methods of nonlinear mechanics Krilov-Bogolyubov-Mitropolyski and application to energy analysis of non-linear oscillatory systems and the dynamics of deformable non-linear elastic bodies. She introduced a system of ordinary differential equations of the first approximation for the amplitudes and phases of the two-frequency regime of nonlinear oscillations of deformable bodies (beams and plates) and expressed them by means of the energy and operation of nonlinear forces. This contribution was recognized by the defense of the Magister of sciences and Doctoral Dissertation, and the contributions are quoted in the monographs of Ju.A. Mitropolysky in Ukraine (1976) and Ali Najfeh from Virginia in America (1976).

On the basis of these results, by their application, and under the mentorship of Katica (Stevanović) Hedrih, five magister of sciences theses were successfully defended (P. Kozić, R. Pavlović, Sl. Mitic, J. Simonovic, and G. Janevski under the formal mentorship of R. Pavlovic, a doctorante of Katica (Stevanović) Hedrih), and two doctoral dissertations (J. Simonović, R. Knežević).

A series of single-author or bi-authors papers (with J. Simonović) were published in domestic and foreign journals, including **Marhematical Physics** (1972, Ukraine), **Zagadnienia Drgan Neiliniowych** (1974, Poland), then several in **Springer**'s leading journal **Nonlinear Dynamics,** in the **International Journal of Bifurcation and Chaos** (2011, World Scientific Publishing Company), **International Journal Mathematical Problems in Engineering** (Hindawi Publishing Corporation), **Facta Universitastis Seried Mechanics, Automatic Control and Robotics** (University of Niš), as well as SANU publication, and others. One larger number of research results was announced at international scientific meetings in the country and abroad and published, in whole or in derivatives, in Proceedings of Works.

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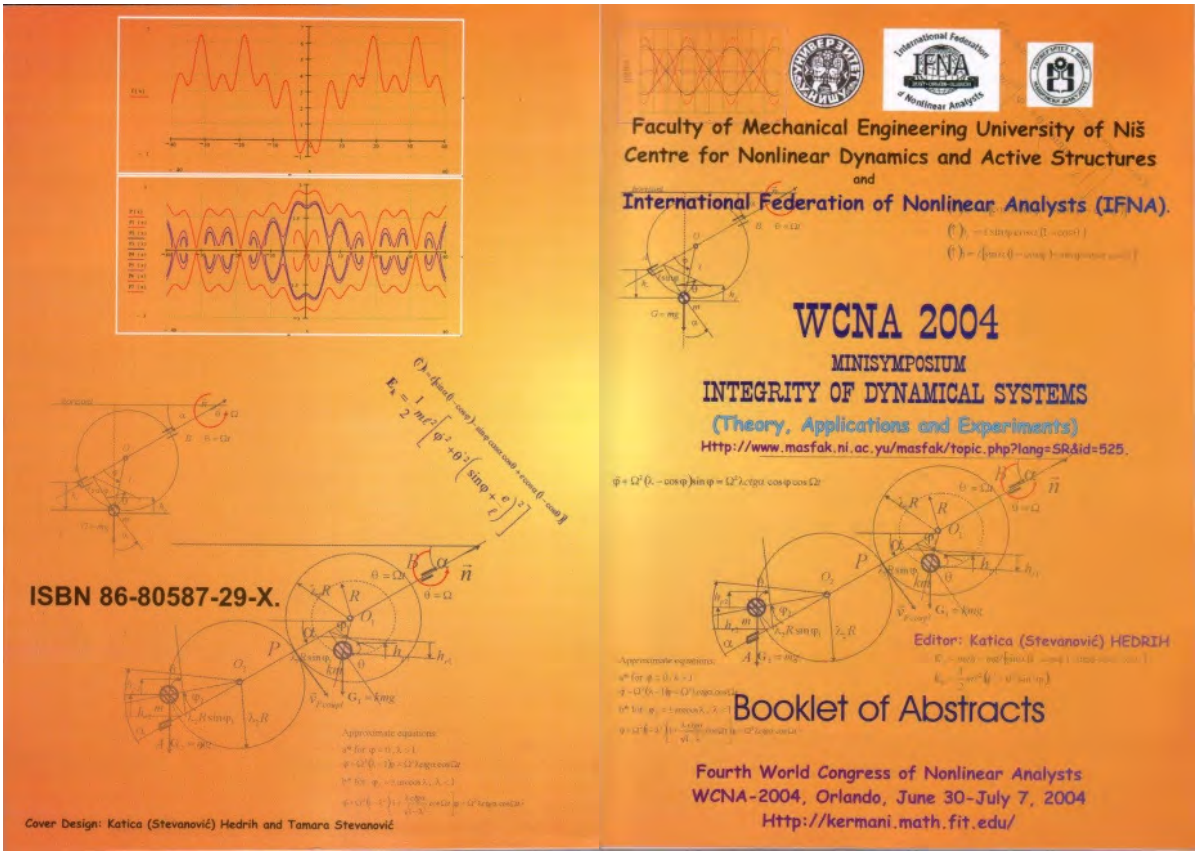
2 * ***Non-linear and random oscillations:*** Contributed to energy analysis and performed systems of ordinary differential equations of the first approximation for amplitudes and phases of single-frequency and multifrequency regimes of non-linear oscillations of deformable bodies (beams, plates and shells) for testing their own and forced stationary and non-stationary oscillations and contributed to the detection of new knowledge of the interaction of nonlinear modes and the transfer of energy from modes of one to the modes of other frequency. She defined and proved Theorem about the trigger of coupled singularities, the conditions of the existence and non-existence of homoclinic orbits in the form of eight numbers; She has contributed to the knowledge about the properties of disintegration of homoclinic orbits and the management of nonlinear dynamical systems with applications in engineering.

She has introduced the term tensor state of random processes and defined Lyapunev's exponents for examining the stochastic stability of defromable forms and multifrequency random processes of transverse oscillations of elastic beams, beams with hereditary properties and beams from materials with creep properties.

Under her mentorship, two doctoral dissertations from stochastic oscillations and stochastic stability (P. Kozić and R. Pavlović) were defended and one dissertation from the nonlinear dynamics of the girp-rotor (Lj. Veljović) was defended.

A number of results were published at scientific conferences and journals, such as: **Elsevier**'s leading mathematical Journal **Nonlimar Analysis**, **Kluwer**'s leading journal **Meccanica**, the **Italian Society of Mechanics**, and **Springer's** leading journal **Nonlinear Dynamics** and the Russian journal **Nonlinear Analysis** (IFNA) and journal **Non-Linear Sciences and Numerical Symunlance** (Friend Publishing House) and others, which refer to the **Web of Sciences**, and are visible in Serbian **KOBSON**.

Under the title "**Integrity of Dynamical Systems**" in 2004, focusing on non-linear dynamic systems and the criteria for their stability and integrity and stability, and at the invitation of Professor **V.** Lakshmikantham, **President of IFNA** - **International Federation of Nonlinear Analyzists**, successfully organized this mini-symposium within the **World Congress of Nonlinear Analysts** - IFNA World Congress of Nonlinear Analysts - **WCNA Orlando 2014**.



IUTAM SYMPOSIUM Non-linearity and Chaos in Engineering Dynamics
UCL 1993 London UK

May 12-14, 2010,
Shao Yifu Science Museum & Y.C. Tang's Student Center,
Zhejiang University,
Hangzhou 310027, China

Participants of ICDVC-2010-
The Third International Conference on Dynamics, Vibration and Control,
12-14 May 2010, Hangzhou, China, Chinese Society of Theoretical and Applied Mechanics
http://saa.zju.edu.cn/icdvc2010

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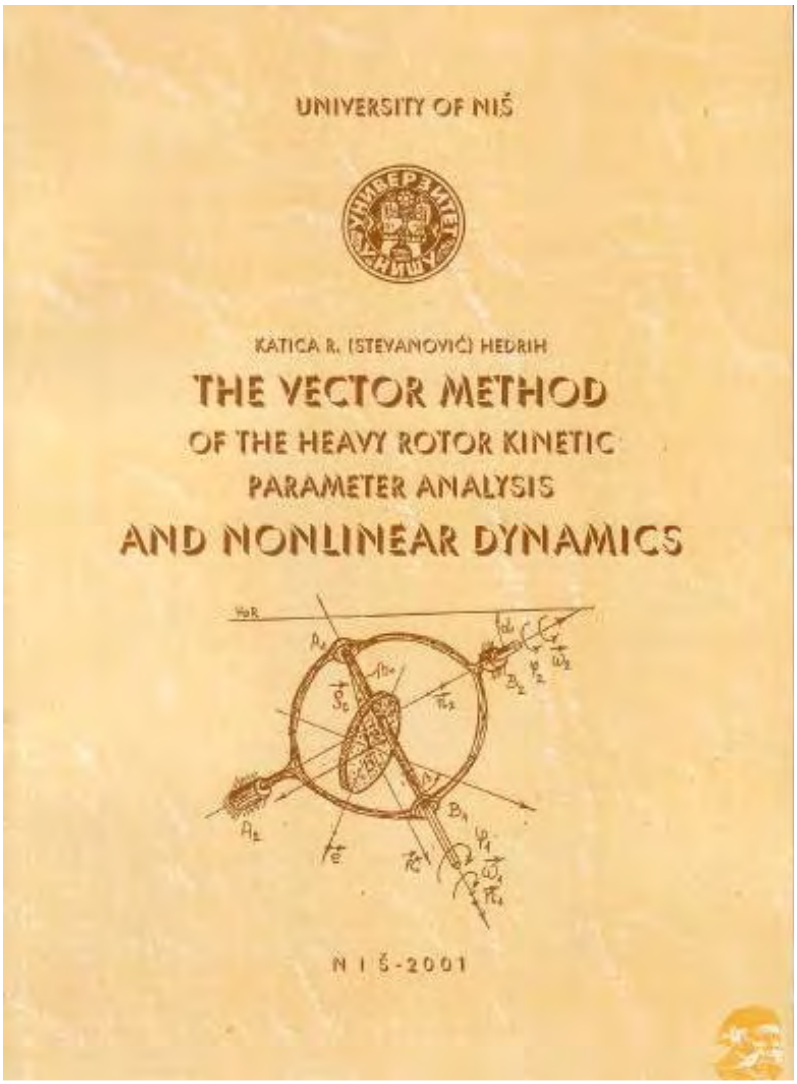
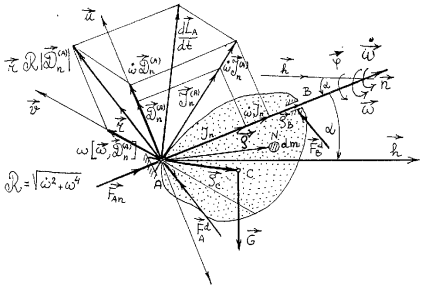
3 * She introduced and defined the moment vector vectors and the rotator axes related to the pole and axis, and proved their properties. **She formulated several theorems**. She founded **the vector method of their application to the dynamics of the rotor and the gyrorotor**. She showed how they can **express kinetic pressure on the rotor bearigs and determine their angular velocoties and acceleration for individual rotors**.



$$\vec{\mathfrak{I}}_{\vec{n}}^{(O)} \overset{def}{=} \iiint_V [\vec{\rho},[\vec{n},\vec{\rho}]]dm$$

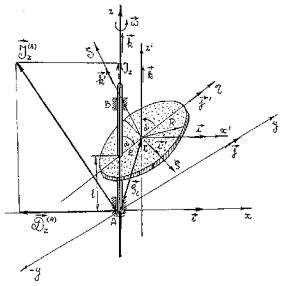
$$\vec{\mathfrak{I}}_{\vec{n}}^{(O)} = \vec{\mathfrak{I}}_{\vec{n}}^{(C)} + [\vec{\rho}_C,[\vec{n},\vec{\rho}_C]]\mathrm{M}$$



$$\frac{d\vec{\mathfrak{K}}}{dt} = \vec{\mathfrak{R}}_1 \left|\vec{\mathfrak{S}}_{\vec{n}}^{(A)}\right| = \sum_{k=1}^{k=N} \vec{\mathrm{F}}_k + \vec{\mathrm{F}}_A + \vec{\mathrm{F}}_B$$

$$\frac{d\vec{\mathfrak{L}}_A}{dt} = \dot{\Omega}\mathfrak{J}_{\vec{n}}^{(A)} + \Omega\vec{\mathfrak{D}}_{\vec{n}}^{(A)} + \Omega[\Omega,\vec{\mathfrak{D}}_{\vec{n}}^{(A)}] =$$

$$= \dot{\Omega}\mathrm{J}_{\vec{n}}^{(A)} + \left|\vec{\mathfrak{D}}_{\vec{n}}^{(A)}\right|\vec{\mathfrak{R}}_2 = \sum_{k=1}^{k=N}[\vec{\rho}_k,\vec{\mathrm{F}}_k] + [\vec{\rho}_B,\vec{\mathrm{F}}_B]$$

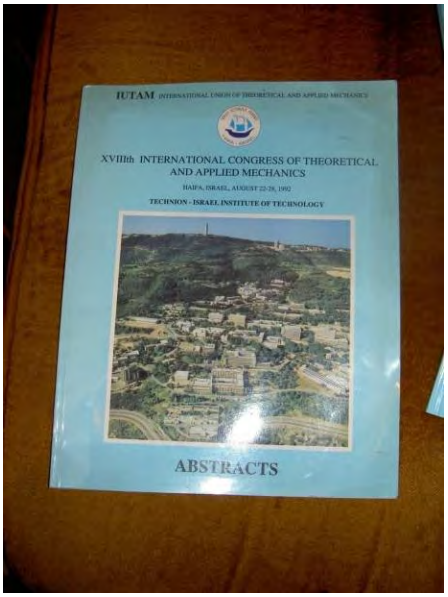


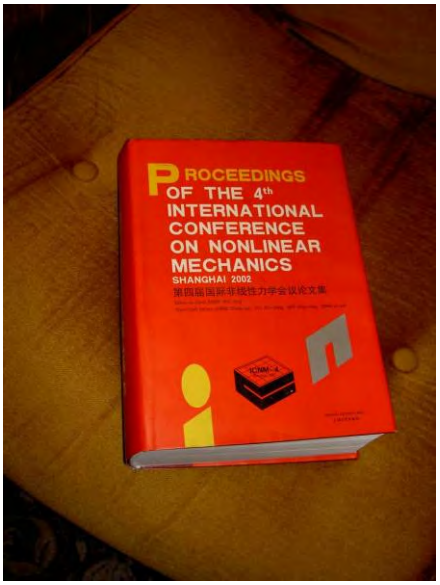
Katica (Stevanović) Hedrih: Vector Method of the Heavy Rotor Kinetic Parameter Analysis and Nonlinear Dynamics, University of Niš 2001,Monograph, p. 252. (in English), (Reviewers: Academician NANU Ju. A. Mitropolskiy, Ukraina, academician ANN Veljko Vujčić, academicina UHEAS Oleg Aleksandrovič Goroshko, Ukraina, and prof. dr Vlatko Brčič), YU ISBN 86-7181-046-1 UDC 531.38:514.742.4

It was based on the vector method of the analysis of the inertial properties of discrete and continuous and rigid material systems based on the introduced mass moment vector vectors related to the point and axis. They showed their effective application to rigid body dynamics when rotating around a fixed axis or around a fixed point. It showed the

relationship of the deviation components of the mass moment vector with kinetic pressures and kinetic impacts to the rotor bearings. These results were published in a **monograph paper** entitled: **Vectors of the Mass Moments** (1998) in the prestigious **Proceedings of the SANU Mathematical Institute** and **a monograph** entitled: **The Vector Method of the Heavy Rotor Kinetic Parameters Analysis and Nonlinear Dynamics** (2001), published at the University of Niš. A number of results in this field were published in a number of articles in scientific journals and press releases published in the country and abroad: **Israel (**first presented in Haifa at the **World Congress of Theoretical and Applied Mechanics** and published in **Proceedings of IUTAM ICTAM 1992)**, **Germany** (**Journal ZAM and Proceeding of ZAMM**), **Japan** (**Tensor Magazine, Tensor Society**), **Serbia** (**TAM** Journal, **FactaUniversitatis Series Mathematics and informatics, Facta Universitatis Series Mechanics, Automatic Control and Robotica**), USA (**International Journal of Structural Stability and Dynamics**, WORLD SCIENTIFIC PUBLISHING COMPANY PTE LTD), **Greece** (Proceedings of HRSTAM), Russia **Journal of Scientific and Technical Development**, National Technological Group), **Ukraine** (Conference-**Provrrdings Nonlinear Dynamics**) and **Semi-Plenary Lectire in China** (**Proceedings of Nonlinear Mechanics**) and others.

Using these results on **the mass moment vectors and vectors of rotors** and their application to gyrotrophores, and proven applicability for the determinant of kinetic presures to the bearings of gyro-rotrors with coupled rotations and incorporated as a new result in the part of **the doctoral dissertation** (Lj. Veljović), realized under the mentorship of Katica (Stevanović) Hedrich and successfully defended.





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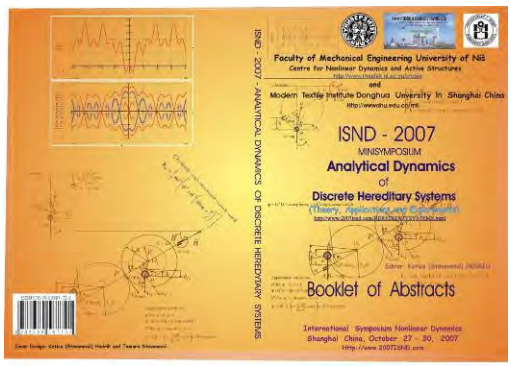
with **Oleg Aleksandrovich Goroshko** from Ukraine. Unfortunately, the monograph was published only in Serbian, but this does not diminish its scientific value. Monograph was quoted and used in numerous doctorates.

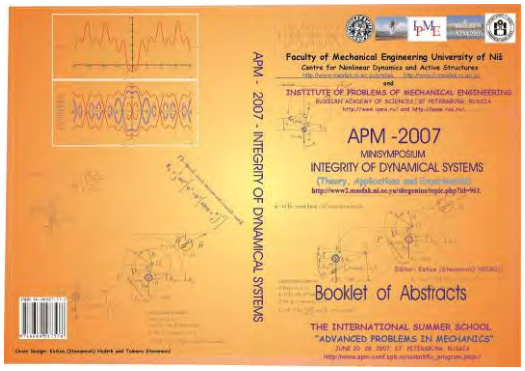
In cooperation with academician O. A. Goroshko, she has contributed to the contribution in the field of **analytical dynamics of discrete hereditary systems**, which are contained in the mentioned monograph.

By introducing a **standard light heritable element O.A.** Gorosko, she carried out a large number of examples of the equations of motion and the characteractic equations of the system with the integro-differential equations, and discovered their properties.

She organized a **mini-symposium** in this area in China at the **International Nonlinear Dynamics Shanghai 2007** and one in Russia, as part of the prestigious school of mechanics **APM St. Petersburg 2007**.

Oleg Aleksandrovič Goroško (Ukrajina) i Katica (Stevanović) Hedrih (Jugoslavija): Analitička dinamika (mehanika) diskretnih naslednih sistema, (Analytical Dynamics (Mechanics) of Discrete Hereditary Systems), University of Niš, 2001, Monograph, p. 426 (in Serbian), YU ISBN 86-7181-054-2. (recenzenti: Veljko A. Vujičić - Srbija, Jeremiah Jaredam Rushickij - Ukrajina, Milivoje Simonović -Srbija) UDC 531.011:531.391


ISND - 2007 - ANALYTICAL DYNAMICS OF DISCRETE HEREDITARY SYSTEMS
Faculty of Mechanical Engineering University of Niš
Centre for Nonlinear Dynamics and Active Structures
and
Modern Textile Institute Donghua University in Shanghai China
ISND - 2007
MINISYMPOSIUM
Analytical Dynamics
of
Discrete Hereditary Systems
Booklet of Abstracts
International Symposium Nonlinear Dynamics
Shanghai China, October 27 - 30, 2007


APM - 2007 - INTEGRITY OF DYNAMICAL SYSTEMS
Faculty of Mechanical Engineering University of Niš
Centre for Nonlinear Dynamics and Active Structures
and
INSTITUTE OF PROBLEMS OF MECHANICAL ENGINEERING
APM -2007
MINISYMPOSIUM
INTEGRITY OF DYNAMICAL SYSTEMS
Booklet of Abstracts
THE INTERNATIONAL SUMMER SCHOOL
"ADVANCED PROBLEMS IN MECHANICS"

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reference journal **Appled Mechanics Reviws, 2010**, published by **International American Socciery of Mechanical Engineers (Int.ASME), USA):**

1. Hedtrih (Stevanović) K., (2008), Dynamics of coupled systems, Journal Nonlinear Analysis: Hybrid Systems, Elsevier, Volume 2, Issue 2, June 2008, Pages 310-334. doi:10.1016/j.nahs.2006.06.003 in line at http://www.sciencedirect.com/science/journal/1751570X

2. Hedrih (Stevanović K., Vibration Modes of a axially moving double belt system with creep layer , Journal of Vibration and Control, SAGE, (2008), 14(10-Sep): 1333-1347. http://nainfo.nbs.bg.ac.yu.nainfo.nbs.bg.ac.yu:2048/Kobson/service/jcr.aspx?ISSN=1077-5463

3. Hedrih (Stevanović), K., (2006), The transversal creeping vibrations of a fractional derivative order constitutive relation of nonhomogeneous beam, Mathematical Problems in Engineering, Special issue : Nonlinear Dynamics and their Applications in engineering sciences, Geust Editor: Jose Manoel Barhesar, Hindawi press, Volume 2006 (2006), Article ID 46236, 18 pages, www.hindawi.com doi:10.1155/MPE/2006/46236, Volume 2006, No. 5, pp. 61-78.

4. Hedrih (Stevanović) K., Filipovski A., (2002), Longitudinal Vibration of a Fractional Derivative Order Rheological Rod with Variable Cross Section, Facta Universitatis, Series Mechanics, Automatic Control and Robotics, Vol. 3 No. 12, 2002. pp.327-350. YU ISSN 0534-2009. http://facta.junis.ni.ac.yu/facta/macar/macar2002/macar2002-02.html

Some of the most important publications since 2010 in this field of **application of the differential fractional order calculus in the mechanics** of discrete and deformable systems are:

1. Hedrih (Stevanović) K. (2011), *Analytical mechanics of fractional order discrete system vibrations*. Chap in Monograph. Advances in nonlinear sciences, Vол. 3, JANN, Belgrade, pp. 101-148, 2011. ISSN: 978-86-905633-3-3.

2. Hedrih (Stevanović) K., (2014), Generalized function of fractional order dissipation of system energy and extended Lagrange differential Lagrange equation in matrix form, *Dedicated to 86th Anniversary of Radu MIRON'S Birth., Tensor*, Vol. 75, No. 1. pp. 35-51. Tensor Society (Tokyo), c/o Kawaguchi Inst. of Math. Soc. , Japan.. ISSN 0040-3604.

3. Hedrih (Stevanović) K., (214), *Multi membrane fractional order system vibrations*, Theoretical and Applied mechanics, Series: Special Issue – Dedicated to memory of Anton D. Bilimovič (1879-1970), Guest Editors: Katica R. (Stevanović) Hedrih and Dragoslav Šumarac, 2014, Vol. 41 (S1), pp. 43-61. DOI : 10.2298/TAM14S1043H . ISSN 1450-5584 http://www.mi.sanu.ac.rs/projects/TAM-SpecialIssue41-2014-BILIMOVIC.pdf,

4. Hedrih (Stevanović) K., (2014), *Elements of mathematical phenomenology in dynamics of multi-body system with fractional order discrete continuum layers*, Dedicated to the 100th Anniversary of the Russian Academician Yury Rabotnov, Dedicated to Centennial Jubilee of Russian Academician Yury N. Rabotnov, Special issue of International Journal of Mechanics, 2014, Vol. 8, pp. 345- 352, ISSN: 1998-4448 . http://www.naun.org/main/NAUN/mechanics/2014/b042003-061.pdf

5. Katica R. (Stevanović) Hedrih, (2018), Analytical Dynamics of Fractional Type Discrete System, Review paper, Advances in Theoretical and Applied Mechanics, Vol. 11, 2018, no. 1, 15 - 47 . https://doi.org/10.12988/atam.2018.883 http://www.m-hikari.com/atam/atam2018/atam1-2018/p/hedrihATAM1-2018.pdf **HIKARI Ltd, www.m-hikari.com, https://doi.org/10.12988/atam.2018.883**

6. K.R. Hedrih (Stevanović), J.M. Tenreiro Machado, (2013), Discrete fractional order system vibrations, *International Journal Non-Linear Mechanics, Elsevier, (January 6, 2014),* Volume 73, July 2015, Pages 2–11, DOI: 10.1016/j.ijnonlinmec.2014.11.009 ; ISSN 0020-7462

http://authors.elsevier.com/authorforms/NLM2407/7c32b6b4f19f2471fb24556142da3cd1

Concluding the results from this field, it should be emphasized that using a fractional order derivative she defined **the light standard element of the fractional type and defined the generalized function of the energy dissipation of the fractional type system,** and for a special class of the dynamics of the fractional type system, performed **a number of theorems** on **the main and independent free and forced modes of the fractional type,** indicating that there are no interactions between these modes of a factional type or the transfer of energy from one mode to another. The series of published papers established the **Analytical Mechanics of Discrete Systems of the Fractional Type**, and obtained a sufficient number of scientific results to formulate a new monograph.

In order to participate in scientific meetings with contents on the theory and the application of the differential calculus of rational order, she received two Placets of the Cankaya University of Ankara, awarded on the proposal of the organizers of these conferences by Professors Tenreiro Machado and Alberto Luo.

Plemaru Levture at Centre of Romanian Academy of Sciences in IASHI 2015 Tensor Society Conference: Chairman Academivian Radu Miron

ÇANKAYA UNIVERSITY
Katica R. HEDRIH
05-07 November, 2008
Prof.Dr. Ziya Burhanettin GÜVENÇ
Rector

ÇANKAYA UNIVERSITY
IFAC
3rd IFAC Workshop on
Fractional Differentiation and Its Applications
Ankara, Turkey, 05 - 07 November, 2008
Attendance Certificate
Katica R. Hedrih
We hereby certify that you have participated in the 3rd IFAC Workshop on Fractional Differentiation and Its Applications, Ankara, TURKEY, 05 - 07 November, 2008
Ziya Burhanettin GÜVENÇ
Rector
TÜBİTAK
Dumitru BALEANU
National Organizing Committee Chair
International Federation of Automatic Control Fractional Differentiation and Applications– IFAC FDA 08
Cankaya University – Diploma followed Cankaya University Placket

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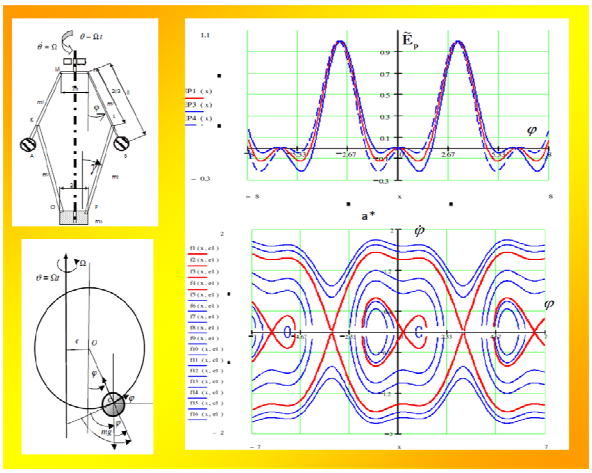

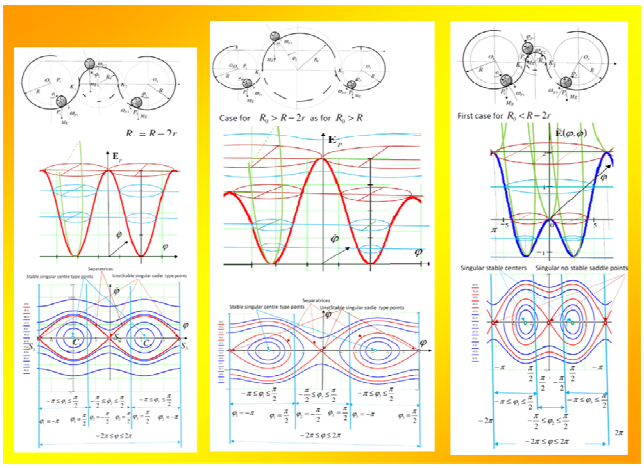

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7* Katica (Stevanović) Hedrich carried out **the differential equation and the equation of the phase trajectories of the motion of a heavy material particle along the rough curved lines with Amontons-Kulomb friction in the general case curves**, as well as for certain cases of the circular line, cycloid, parabola, ellipse. The first of the published one-author papers on this subject is in the journal **Nonlinear Sciences and Numerical Symulations** (Freund Publishing House, Israel), and held a plenary lecture at the international meeting in Brazil, published under the title:

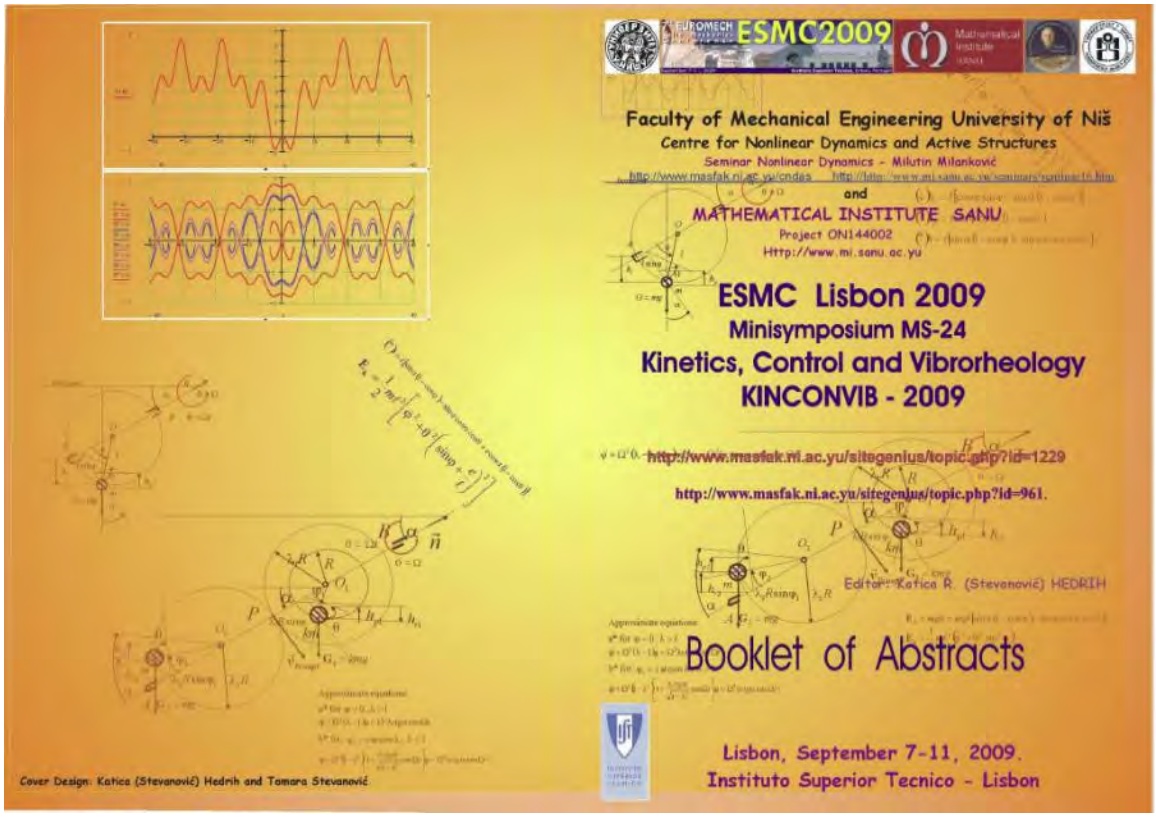
Hedrih (Stevanović) K., (2010), Discontinuity of kinetic parameter properties in nonlinear dynamics of mechanical systems, **Keynote Invited Lecture**, 9th Brazilian Conference on Dynamics, Control and Their Applications - 9º Congresso Temático de Dinâmica, Controle e Aplicaçõesm, June 07-11, 2010. UneSP, Sao Paolo (Serra negra), Brazil, Proceedings of the 9th Brazilian Conference on Dynamics Control and their Applications, Serra Negra, 2010, pp. 8-40. SP - ISSN 2178-3667
http://www.rc.unesp.br/igce/demac/dincon2010/instrucao.php

She published a series of two-authorial, as well as three-authors scientific work in which she is the first and leading author, from the dynamics of vibration systems with successive body collisions in translatory motion on rough tracks with dry friction. Among these works, works were published in leading journals such as **Elsevier's Journal of Communications and Nonlinear Science and Numerical Simulations** (2011), **International Journal of Nonlinear Sciences and Numerical Simulation** (2010, Friend Publishing House), Scientific **Technical Review** Journal of the Army Serbia (2009), and others.

Katica (Stevanović) Hedrich is **a mentor of the study and scientific research of the dynamics of vibro-impact systems of the body in the translator succesive collirions movement**, which were based on these results and which were incorporated into one magister of science's thesis (S. Jović) and two doctoral dissertations (Slavka Mitic and Srdjan Jovic) from dynamics of vibro-impact systems based on collisions of heavy material particles in the succesive collisions in translational movement. Katica (Stevanović) Hedrih encouraged Sl Mitic to publish a monograph on the dynamics of vibro-impact systems (1998) based on the subject

research, under the editorship of the mentor. Katica (Stevanović) Hedrih published a coauthical monograph from the dynamics of vibro-impact systems in co-authoring with two co-authors (S. Jović and V. Raičević), with the author of the first, basic theoretical part of this monograph on the dynamics of vibro-impact systems (2015). Each of the three parts of the monograph belongs to one of three authors

Katica (Stevanović) Hedrich organized a very successful **Minisymposium MS-24-Kinetics, Control and Vibrorheology - KINCONVIB - 2009 at the leading European Solid Mechanics Conference Lisbon 20019 (ESMC), European Society of Mechanics, Instituto Superior Tecnico - Lisbon.**



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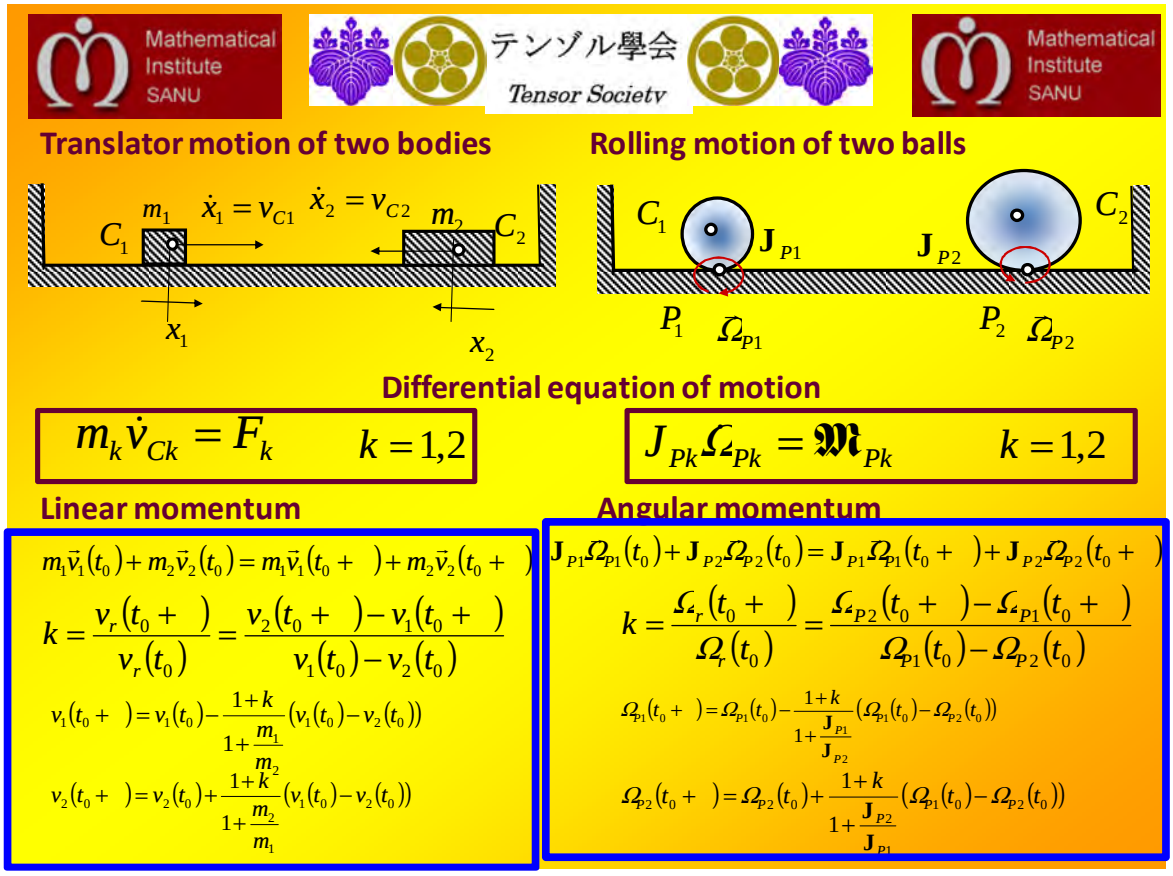
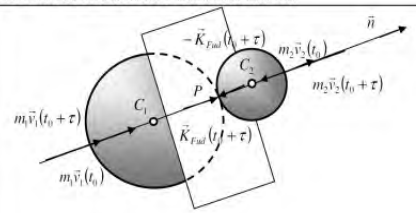
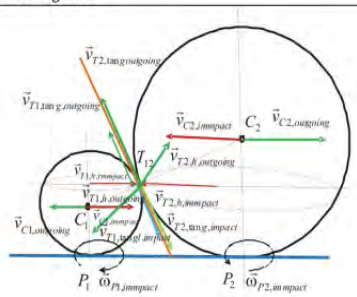
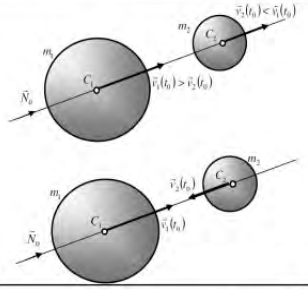
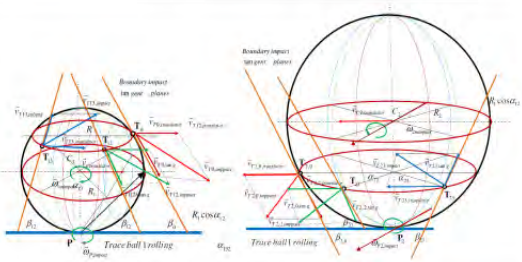
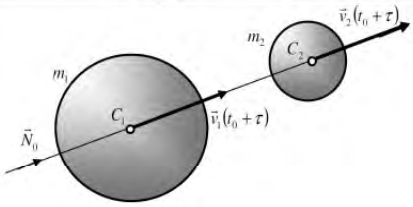
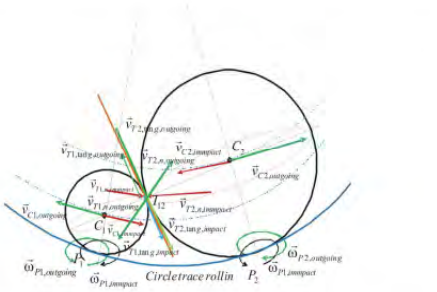
movement. Following this idea of analogy, it was easy to build a new complement theory of the collision between bodies in rollinig motions to the classical theory body collision in the translational movement of the body collision theory before and after the collision, and perform the appropriate analgesic patterns. According to the obtained results, it was easy to perform them by elemental thinking and to prove the accuracy of those obtained with pure mathematical analogy.

By complementing the theory of collision with the theory of collision of the body in rolling, she introduced a hypothesis of conservation of the sum of the angular momentum of the movement of the body in rolling for the current rolling axes after a collision before the collision, as well as a new definition of the body rolling coefficient (restitution) of collision expressed by the current incoming and outgoing angular rolling velocity before and after collision. She took out patterns for the expressios for outgoing angular velocoty of the body in rolling after a collision. The collision kinematics defined, for cases of central and skew collisions, the directions and directions of the rolling track after the collision. She applied this theory to the dynamics of vibro-impact systems with rolling bodies on the curvilinear tracks and practically introduced and formulated the methodology of researching the dynamics of vibro-impact systems.

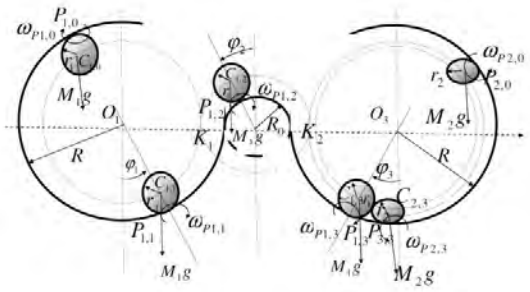


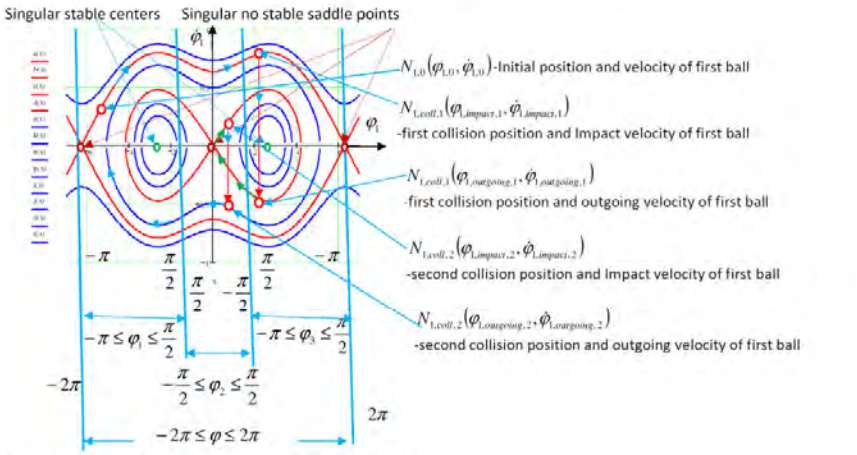
Contribution to classical collision theory, by kinematics and the dynamics of body collision in rolling - Analogies of the elements of the classical theory of body collision in the translational movement (first column) and the newly created theory of rolling body collisions (second column).

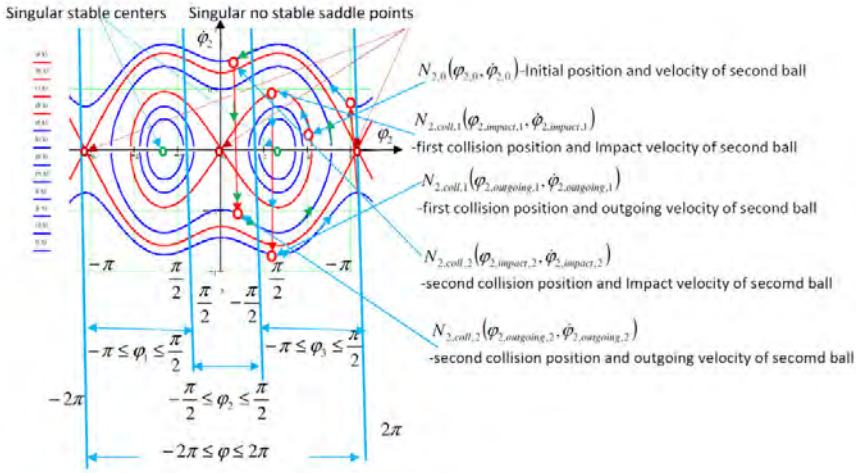
	Collision of two bodies in translator motion	Collision of two rolling balls
Configuration of the systems in collision state and plans f velocities and tanfent plane of bodies collisions		
		
		
Analogous theorms of conservation of linear momentum (impulse) or angular momentum	Theorm of conservation of linear momentum (impulse) in collision of two bodies in translator motion $m_1\vec{v}_1(t_0)+m_2\vec{v}_2(t_0)=m_1\vec{v}_1(t_0+\tau)+m_2\vec{v}_2(t_0+\tau)$	Theorm of conservation of angular momentum (kinetic moment) in collision of two rolling balls $\mathbf{J}_{P1}\vec{\omega}_{P1}(t_0)+\mathbf{J}_{P2}\vec{\omega}_{P2}(t_0)=\mathbf{J}_{P1}\vec{\omega}_{P1}(t_0+\tau)+\mathbf{J}_{P2}\vec{\omega}_{P2}(t_0+\tau)$
Coefficient of the restitution of two body collision	Coefficient of the restitution in collision of two bodies in translator motion $k=\frac{v_r(t_0+\tau)}{v_r(t_0)}=\frac{v_2(t_0+\tau)-v_1(t_0+\tau)}{v_1(t_0)-v_2(t_0)}$	Coefficient of the restitution in collision of two rolling balls $k=\frac{\omega_r(t_0+\tau)}{\omega_r(t_0)}=\frac{\omega_{P2}(t_0+\tau)-\omega_{P1}(t_0+\tau)}{\omega_{P1}(t_0)-\omega_{P2}(t_0)}$
Outgoing velocities of thwo bodies at post-collision moment	Outgoing velocities of the of two bodies in translator motion at post-collision moment $v_1(t_0+\tau)=v_1(t_0)-\frac{1+k}{1+\frac{m_1}{m_2}}(v_1(t_0)-v_2(t_0))$ $v_2(t_0+\tau)=v_2(t_0)+\frac{1+k}{1+\frac{m_1}{m_2}}(v_1(t_0)-v_2(t_0))$	Outgoing angular velocities of the rolling balls at post-collision moment $\omega_{P1}(t_0+\tau)=\omega_{P1}(t_0)-\frac{1+k}{1+\frac{\mathbf{J}_{P1}}{\mathbf{J}_{P2}}}(\omega_{P1}(t_0)-\omega_{P2}(t_0))$ $\omega_{P2}(t_0+\tau)=\omega_{P2}(t_0)+\frac{1+k}{1+\frac{\mathbf{J}_{P1}}{\mathbf{J}_{P2}}}(\omega_{P1}(t_0)-\omega_{P2}(t_0))$
Impuls (linear momentum) of collision	*Impuls (linear momentum) of collision of impact forces* $K_{Fiid}=m_1(v_1(t_0+\tau)-v_1(t_0))=-\frac{m_1m_2}{m_1+m_2}(1+k)(v_1(t_0)-v_2(t_0))$	*Moment of impuls (linear momentum) of collision of impact couple (moment of impact forces)* $\mathfrak{L}_{\mathfrak{M}_1,impact}=\mathbf{J}_{P1}(\omega_{P1}(t_0+\tau)-\omega_{P1}(t_0))=-\frac{\mathbf{J}_{P1}\mathbf{J}_{P2}}{\mathbf{J}_{P1}+\mathbf{J}_{P2}}(1+k)(\omega_{P1}(t_0)-\omega_{P2}(t_0))$
Kinetic energy change fromprecollison to postcollision kinetic state	$\Delta E_{k,plast}=E_k(t_0+\tau)-E_k(t_0)=\frac{m_1m_2}{2(m_1+m_2)}(v_1(t_0)-v_2(t_0))^2$	$\Delta E_k=E_k(t_0+\tau)-E_k(t_0)=\frac{\mathbf{J}_{P1}\mathbf{J}_{P2}}{2(\mathbf{J}_{P1}+\mathbf{J}_{P2})}(1-k^2)(\omega_{P1}(t_0)-\omega_{P2}(t_0))^2$

Contribution to classical collision theory, by kinematics and the dynamics of body collision in rolling - Analogies of the elements of the classical theory of body collision in the translational movement (first column) and the newly created theory of rolling body collisions (second column) in the cirvilinear trace.

Katica R. (Stevanovic) Hedrih published a number of one-author papers in journals of high scientific competence, as well as chapters in Proceedings. Now she is working on the preparation of a monograph on the dynamics of vibro-impact systems with rolling bodies, and on the above stated results.







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https://link.springer.com/article/10.1007/s11071-017-3988-x
ISSN: 0924-090X (print version) ISSN: 1573-269X (electronic version)
http://www.springer.com/engineering/mechanics/journal/11071?detailsPage=pltci_1888917

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Dr I. Atanasovskaya applied the theory of body collision in rolling of K. (Stevanovic) Hedrich and set up a new model of gears of toothed collisions for the analysis of the vibrational dynamics of a single-axis gearing gear. One of the papers in the journal TRANSACTIONS OF FAMENA XLII-2 (2018), https://doi.org/10.21278/TOF.42201 , was published with this content.

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9 * Katica (Stevanović) Hedrich designed a research program entitled "**Dynamics of Hybrid Systems of Complex Structures**", and gathered a team of researchers, in addition to experienced researchers and fifteen young PhD students, with the support of the Mathematical Institute of the SASA, and more 12 institutions from Serbia, the Ministry of Education, Science and Technological Development of the Republic of Serbia accepted the financing of this research program as the ON174001 Project, starting in 2011, which still continues its implementation in 2019.

Katica (Stevanović) Hedrich had already published a number of scientific papers on this subject before starting the realization of this project, on the basis of which she held a two-year course for the introduction of young researchers in scientific research and tried to acquire new knowledge in all areas of mechanics and passed all the exams at doctoral studies and with mentors from relevant doctoral studies, focuses on the formulation and development of doctorates. In the current project cycle, 11 young researchers defended their doctoral dissertations, according to one of the topics from the program of the ON174001 Project. The project team has joined in the last two years five more young PhD students, who are now being introduced into the research. As the project manager, young authors received authorial authenticity, so it does not appear as a co-author of the work of young researchers, except in individual cases.

Katica (Stevanović) Hedrich published a series of one-author and two-author papers (with J.Simonović) on the dynamics of hybrid systems of complex structures, discrete continuous (plates, beams, membranes, axially moving strings), on the basis of which a monograph is being prepared. Under her mentorship, one magister of sciences thesis (J.Simonović) and two doctorates (Lj. Veljović and J. Simonović) were made. Under the mentorships of professors from the University of Belgrade, Faculty of Mechanical Engineering in Belgrade and Niš, as well as the Faculty of Electrical Engineering in Belgrade and the Faculty of Mathematics in Belgrade, five young researchers from the ON174001 project, who served as researchers of pre-students and PhD students, defended their doctoral dissertations (A. Hedrih, D. Karlicic, M. Cajic, Lj. Kevac and M. Mikic).

In the field of **Dynamics of hybrid system**ss, Katica (Stevanović) Hedrih published a number of papers from this new field of dynamics of hybrid systems in the period 2005-2008. Here is a selective choice from these results and radives that are shown at international scientific conferences or published in journals:

Here is **a hybrid frequency equation** for the oscillation of **a continuously-discrete hybrid system:**

$$\left| \overline{\mathbf{C}} - \ {}^{2}u_0\overline{\mathbf{A}} + \left[1 - \frac{}{\Delta(\ )}(\cos \ - \ {}_{P} \ \sin \ ) \right] \mathbf{I}_0 \right| = 0$$

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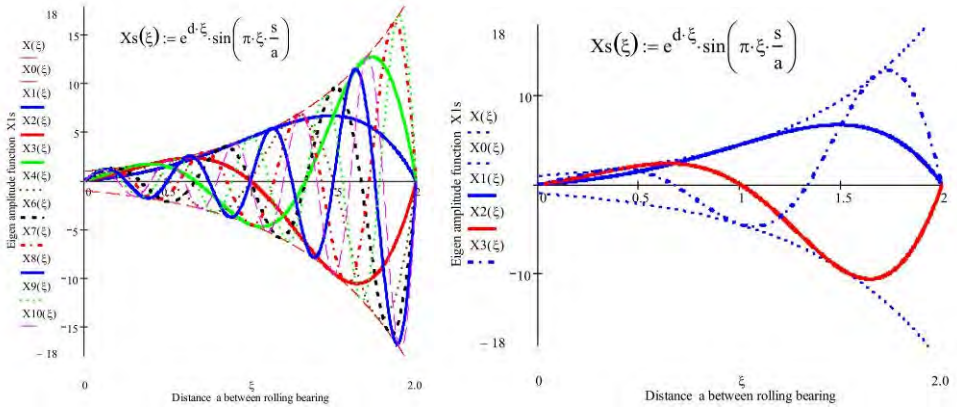


Figure. Eigen amplitude functions $\mathbf{X}_{(i)s}(\ ) = e^{\tilde{\Delta}}\ \sin\frac{s}{\ell}$ for the solution in the , $= \frac{v_0}{c_0^2 - v_0^2}x + t$ coordanetes and for decoupled belts.

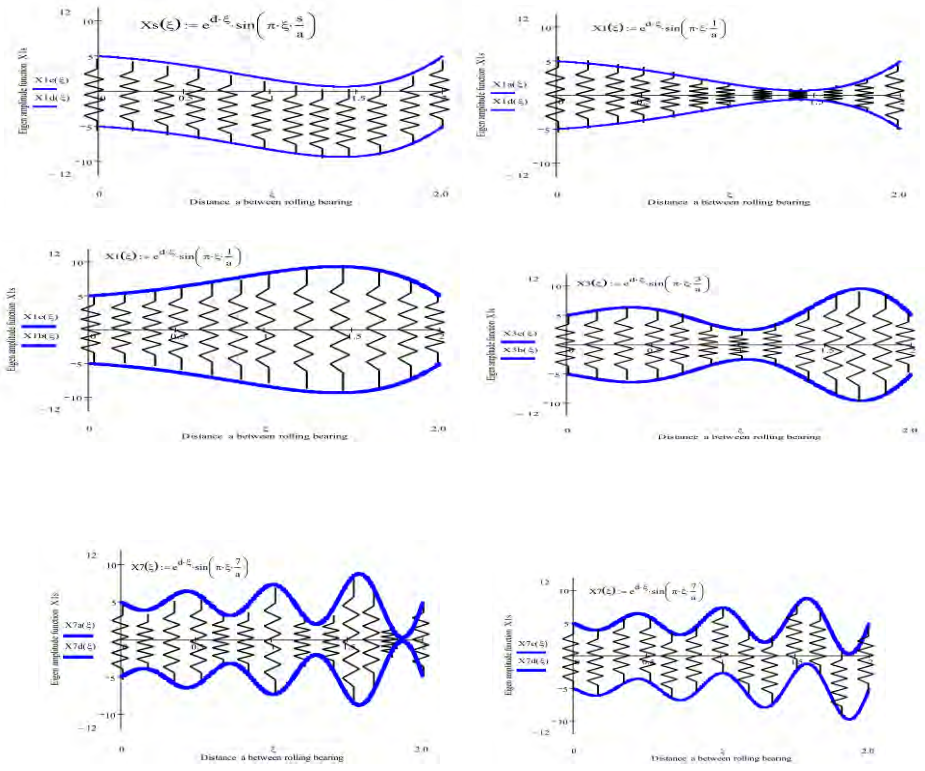
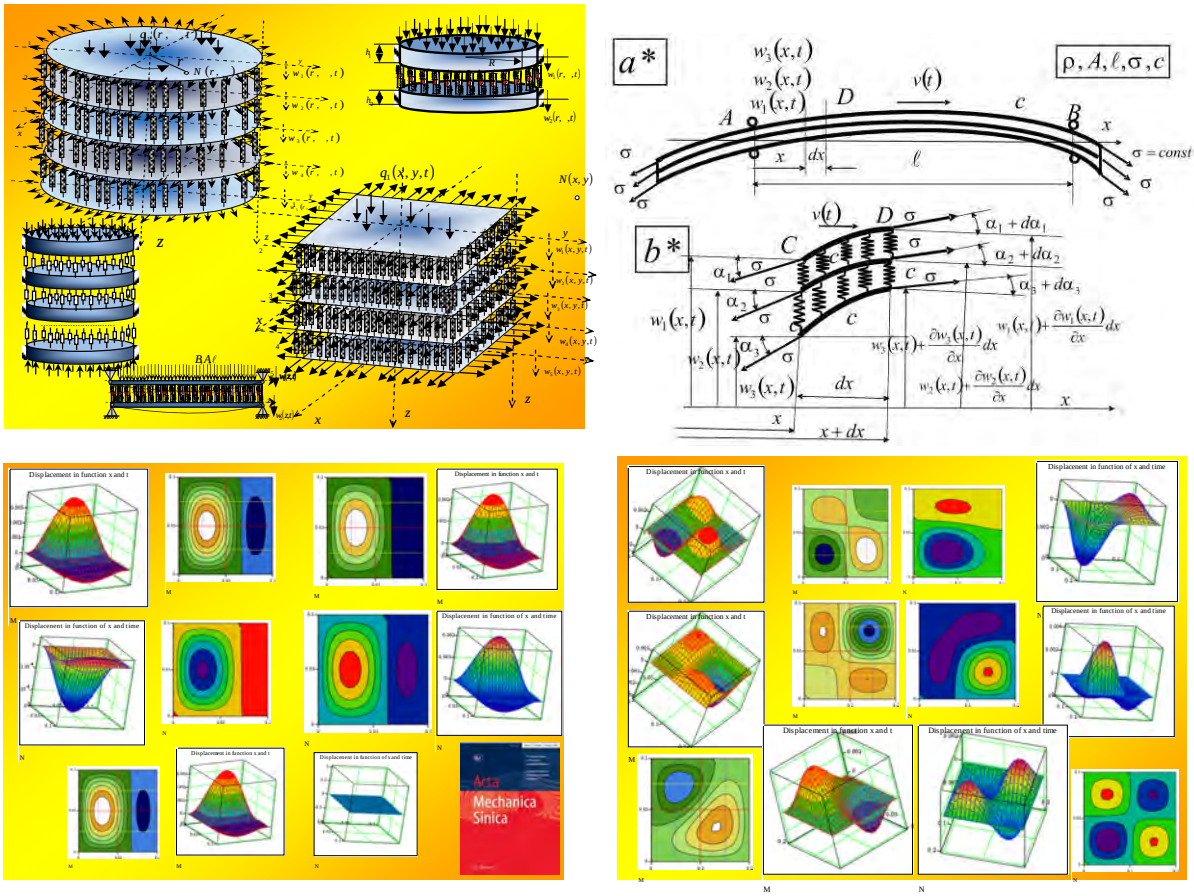


Figure. Sixth cases pf the possible vibrations firms of the double belt system with elastic layer for different eigen amplitude functions

$\mathbf{X}_{(i)s}(\ ) = e^{\tilde{\Delta}}\ \sin\frac{s}{\ell}$ for the solution in the , $= \frac{v_0}{c_0^2 - v_0^2}x + t$ coordinates system,



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From this field, she also held a large number of plenary lectures, lectures by invitation or section introductory, as well as press releases at prestigious international scientific conferences and USA, Poland, China, Ukraine, Greece, Australia, Romania, Japan, India, Russia.

For example, a plenary lecture titled: **LINEAR AND NONLINEAR DYANAMICS OF HYBRID SYSTEM**, held at the Fourth Serbian (29th Yu) Congress on Theoretical and Applied Mechanics, Vrnjačka Banja, Serbia, 4-7 June 2013.

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Hedrih, K. R. (Stevanović) and Paunović, S.: **Photoelaticity and Its Application to Structural Analysis. A Review Based on Professor Vlatko Brčić Achievements**., Journal of the Serbian Society for Computational Mechanics 12 (1), 144-168 (2018). DOI: 10.24874/jsscm.2018.12.01.10
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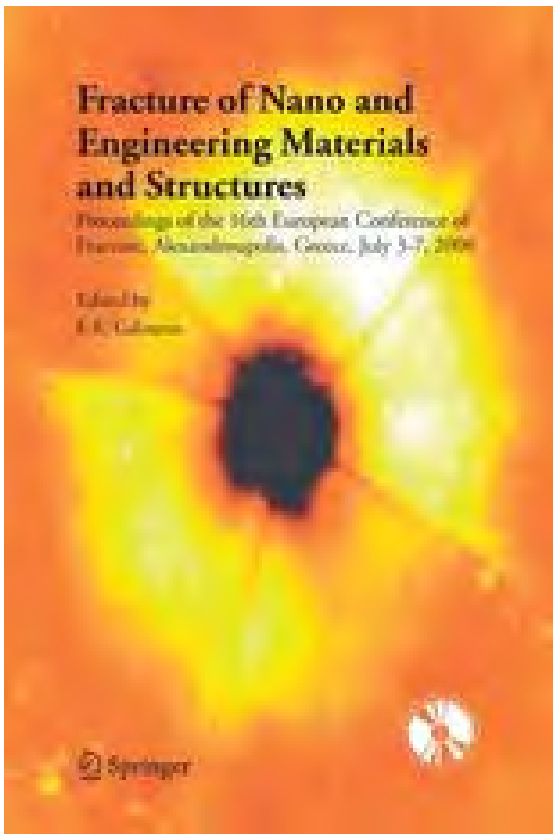

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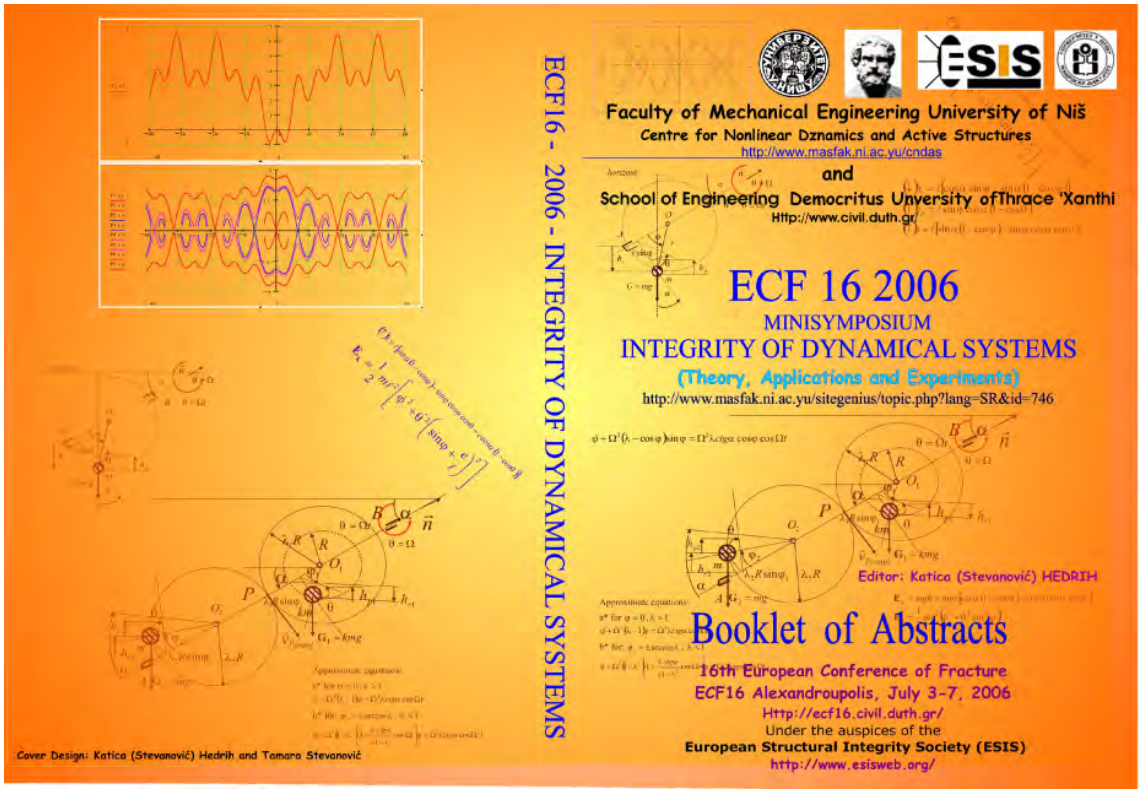
http://springerlink.com/content/lt43852825727u44/?p=af7754855fef4487bf3c169778ad50e0&pi

At the invitation of Professor E. E. Gdoutos, the president of the ESIS, organized a mini-symposium "**Integrity of Dynamical Systems**" with a focus on fracture mechanics and materials, and within the **European Conference on Fracture Mechanics: European Conference on Fracture - ECF 16 2006, Alexandropoulos, Greece.**



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11* Katica (Stevanović) Hedrih has determined **the angular velocities and velocities of the dilation of the base vectors of the tangent space of the vectors of the position of the kinetic material point in the functional space of the curvilinear coordinates**, and made the application of them in 8 specific curvilinear coordinate systems. The results were published with more papers. In the extension, the choice of a number of these radives is:

1. Hedrih (Stevanović) R. Katica , (2010), Visibility or appearance of nonlinearity, Tensor, N.S. Vol. 72, No. 1 (2010), pp. 14-33, #3. Tensor Society, Chigasaki, Japan, ISSN 0040-3504.
2. Hedrih (Stevanović) K., The Dissipation Function of a Nonconservative System of Mass Particles, Tensor, N.S.,Vol.63, No.2(2002), pp.176-186. Tensor Society, Japan.
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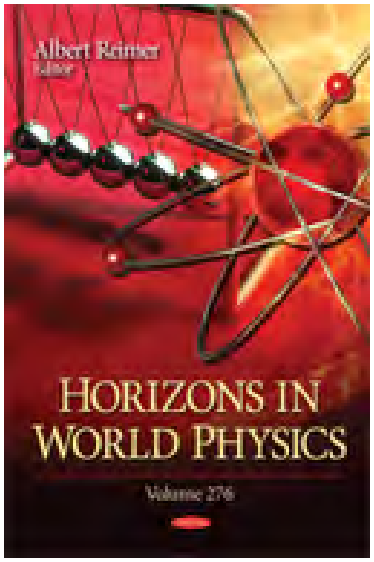

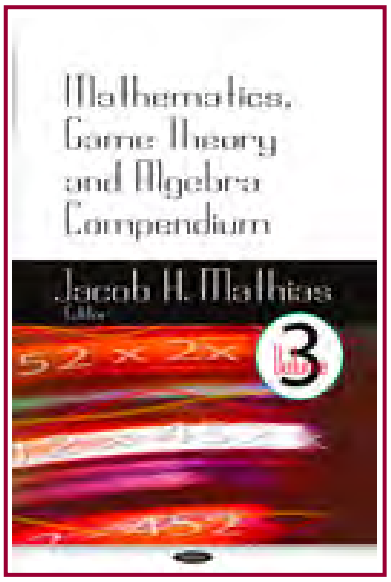

and in edition:

Citech Research IP Pty Ltd., Adelaide, Australia:
***Chapter 6*, Book Title: Mathematics, Game Theory and Algebra Compendium. Volume 3**

Katica (Stevanović) Hedrih, Tijana T. Ivancevic**,** Rigorous Kinetic Analysis of the Racket Flick-Motion in Tennis for Generating Topspin and Backspin, Chapter in Book, Editors: Jacob H. Mathias, Book Title: Mathematics, Game Theory and Algebra Compendium. Volume 3
https://www.novapublishers.com/catalog/product_info.php?products_id=37092&osCsid=02eade36e8eb4bc2195776adb5477c03

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14* Katica (Stevanović) Hedrih took part in research in the field of biomechanics as one of the co-authors in the mathematical description of the dynamics of **biological oscillators**, among them **models of oscillation of DNA helicodyne chains, oscillatory models of the mouse pelucid zone, and models of the mitotic spindle with two recomendation centers** . The main researcher and author of the design of the mechanical oscillatory model of the DNA chain, the mechanical oscillatory model of the mouse pelucid zone before and after fertilization, as a mechanical oscillatory model of the mitotic spindle with elastic, viscoelastic and fractional type properties is Anđelka Hedrih, who published a series of papers with his official mentors of Doctorate. From these research on the subject from the project ON174001, one doctorate (A.Hedrih), successfully defended in 2017, came from. Among these co-author's works, in which Katica (Stevanović) Hedrih, co-author, we quote the following:

Hedrih Andjelka, Hedrih(Stevanovvić) Katica, **Modeling Double DNA Helix Main Chains of the Free and Forced Fractional Order Vibrations**, Chapter in Book Advanced topics on modeling, system stability and control applications of fractional calculus**,** Editor M. Lazarević, **(2013),** pp. 137-175- and Appendix pp. 184-192. WORLD SCIENTIFIC PUBLISHING COMPANY PTE LTD
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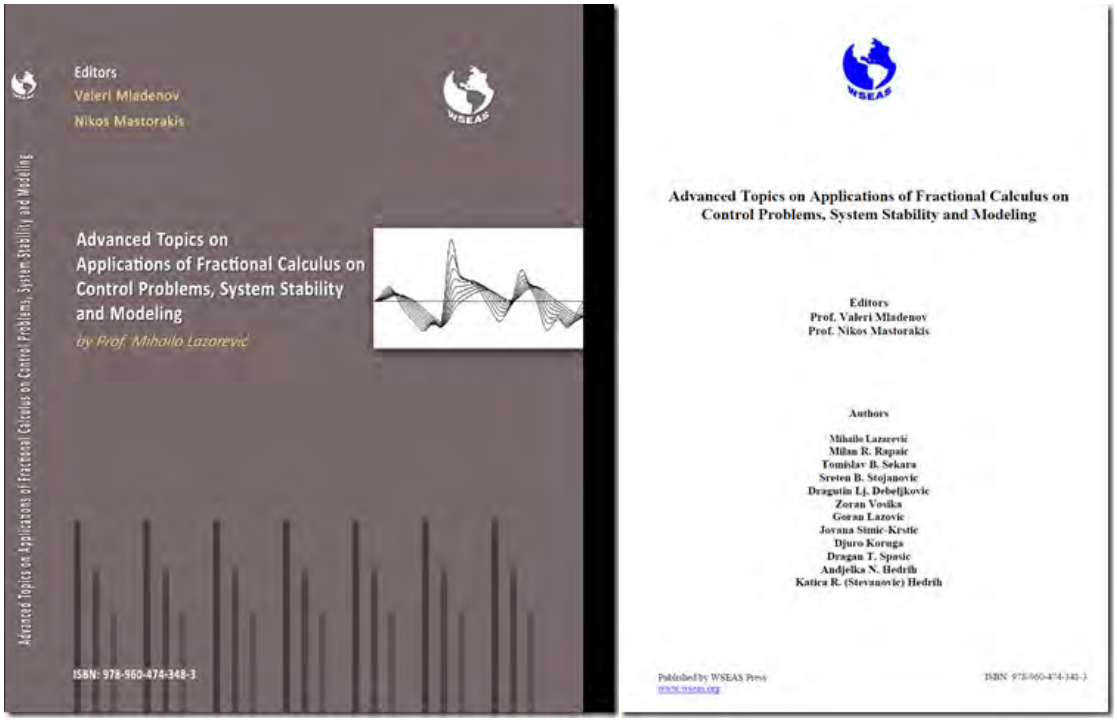

A.Hedrih, K.(Stevanovic) Hedrih, B. Bugarski. **Oscillatory Spherical net model of Mouse Zona Pellucida**. **Journal of Applied Mathematics and bioinformatics**. 2013, vol.3, no.4, 225-268. ISSN: 1792-6602 (print), 1792-6939 (online) Scienpress Ltd, 2013.
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Andjelka Hedrih, Katica (Stevanović) Hedrih1, **KINETIC ENERGY OF DYADS OF SISTER CHROMATIDS IN A BIOMECHANICAL OSCILLATORY MODEL OF THE MITOTIC SPINDLE, RAD Conference Proceedings,** vol. 3, pp. 225–230, 2018; ISSN 2466-4626 (online) | DOI: 10.21175/RadProc.2018.47. www.rad-proceedings.org

Katica (Stevanović) Hedrih1, Andjelka Hedrih, (2010), **Eigen Modes Of The Double Dna Chain Helix Vibrations, JOURNAL OF THEORETICAL AND APPLIED MECHANICS**, (2010), vol. 48 br. 1, str. 219-231; ISSN 1429-2955; http://www.ptmts.org.pl

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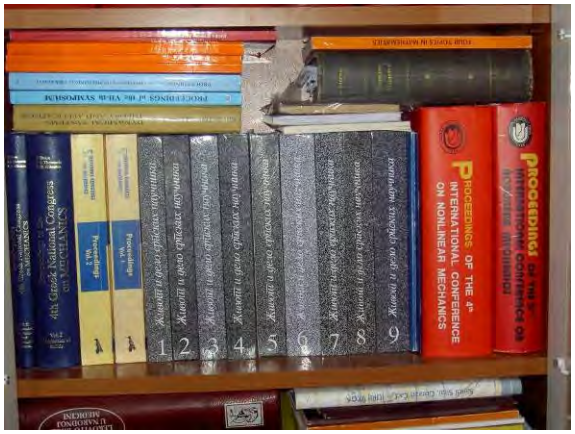


Edition SASA: Lives and Work of Serbian Scientists, Edited by Academician **Miloje Sarić**, Edition of Serbian Academy of Sciences and Arts, Beograd. Biographies and Bibliographies. Committee for the Research into the lives and Vork of the Scientistts of Serbian Origin (In Serbian with Abstract in English).

in Volume I.
* Hedrih (Stevanović), K.
Академик Љубомир Клерић (1844-1910), Биобилиографија, поглавље у књизи: Живот и дело српских научника, уредник академик Милоје Сарић, Српска Академија наука и Уметности, Биографије и библиографије, књига И, , стр. 129-179, Београд 1996. САНУ Београд.
(Academician Ljubomir Klerić (1844-1910), Bio-bibliography, Chapter in book: Lives and work of the Serbian Scientists, Edited by Academician Miloje Sarić, Edition of Serbian Academy of Sciences and Arts, Beograd. Biographies and Bibliographies. Committee for the Research into the lives and Vork of the Scientistts of Serbian Origin. Book I., pp. 129-179, Beograd 1996. (In Serbian with Abstract in English))

in Volume III.
* Hedrih (Stevanović), K.
Ректор Коста Алковић (1836-1909), Биобилиографија, поглавље у књизи: Живот и дело српских научника, уредник академик Милоје Сарић, Српска Академија наука и Уметности, Биографије и библиографије, књига ИИИ, , стр. 33-71, Београд 1998. САНУ Београд.
(Rektor Kosta Alković (1836-1909), Bio-bibliography, Chapter in book: Lives and work of the Serbian Scientists, Edited by Academician Miloje Sarić, Edition of Serbian Academy of Sciences and Arts, Beograd. Biographies and Bibliographies. Committee for the Research into the lives and Work of the Scientistts of Serbian Origin. Book III., pp. 33-71, Beograd 1998. (In Serbian with Abstract in English))

in Volume VI.

* Katica (Stevanović) Hedrih,
Академик Татомир П. Андјелић (1903-1993), Биобилиографија, поглавље у књизи: Живот и дело српских научника, уредник академик Милоје Сарић, Српска Академија наука и Уметности, Биографије и библиографије, књига ВИ, стр. 435-485, Београд 2000.
(Academician Tatomir P. Andjelić (1903-1993), Bio-bibliography, Chapter in book: Lives and work of the Serbian Scientists, Edited by Academician Miloje Sarić, Edition of Serbian Academy of Sciences and Arts, Beograd. Biographies and Bibliographies. Committee for the Research into the lives and Work of the Scientistts of Serbian Origin. Book VI., pp. 435-485, Beograd 2000. (In Serbian with Abstract in English)).

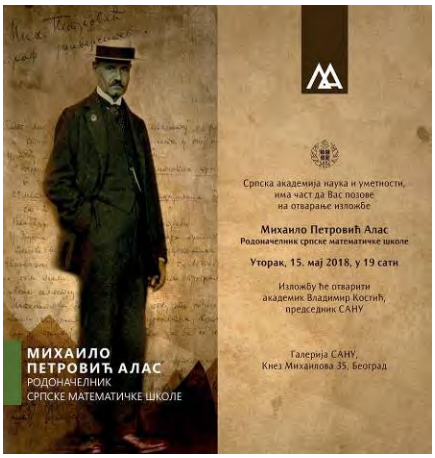
in Volume X.
* Katica (Stevanović) Hedrih i Milovan Studović
Професор Данило П. Рашковић (1910-1985), Биобилиографија, поглавље у књизи: Живот и дело српских научника, уредник академик Милоје Сарић, Српска Академија наука и Уметности, Биографије и

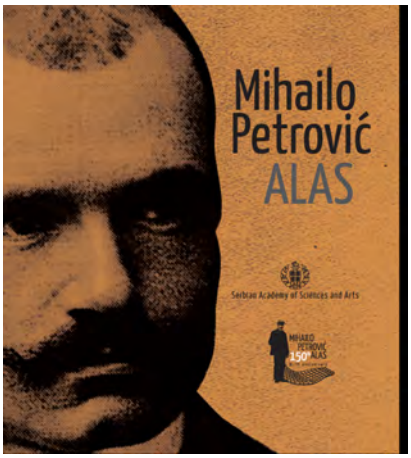
библиографије, књига ИХ, стр., Београд 2003. (то аппеар) (Professor Danilo P. Rašković (1910-1985), Bio-bibliography, Chapter in book: Lives and work of the Serbian Scientists, Edited by Academician Vladan Djordjević, Edition of Serbian Academy of Sciences and Arts, Beograd. Biographies and Bibliographies. Committee for the Research into the lives and Work of the Scientistts of Serbian Origin. Book IX., pp. 239-270, Beograd 2003.-to appear, (In Serbian with Abstract in English)).

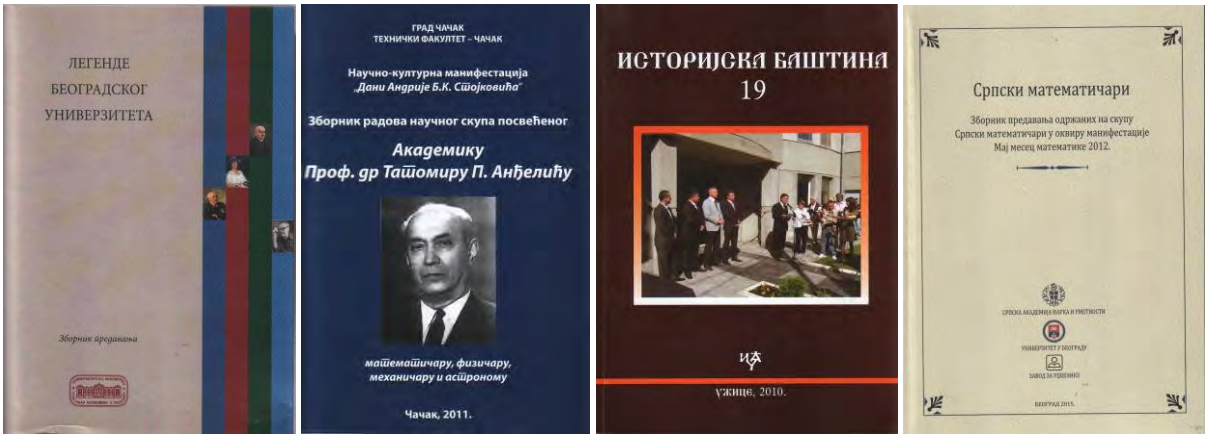
Suplememt Book in English
Lives and Work of the Serbian Scientists, Volume I-X, Book of Abstracts, 2007p. 458,,Edited by Academician Vladan Djordjević, Dragomir Vitorovic and Dragoslav Marinkovic, Edition of Serbian Academy of Sciences and Arts, Beograd. Biographies and Bibliographies. Committee for the Research into the lives and Work of the Scientistts of Serbian Origin:
Hedrih (Stevanović), K., Akademik Ljubomir Klerić (1844-1910), pp. 125-128.
Hedrih (Stevanović), K. , Rektor Kosta Alković (1836-1909), pp.3-4.
Katica (Stevanović) Hedrih, Akademik Tatomir P. Andjelić (1903-1993,),pp.9-12.
Katica (Stevanović) Hedrih i Milovan Studović, Profesor Danilo P. Rašković (1910-1985),pp. 303-306.

Katica (Stevanović) Hedrich published a single address-word about **Mihailo Petrović** in the monograph "**Legends of the Belgrade University**" of the Univesity Library "Svetozar Marković" in Belgrade and one in the publication of the Serbian Academy of Sciences and Rectorate of the University of Belgrade **"Serbian Mathematicians"**. One article about the patents of Mihailo Petrović, mathematician, was written for the Catalog of the exhibition in the Gallery of the Serbian Academy of Sciences and Arts, which is dedicated to the Jubilee for the 150th anniversary of the birth of the founder of the Serbian School of Mathematics Mihailo Petrović. For the monograph on Mihailo Petrovic, published by the Serbian Academy of Sciences and Arts on the occasion of the same anniversary, she wrote an article titled: "**Mechanics and Engineering in Mihailo Petrovic's work**".

She published more than a dozen articles on Serbian and International scientists, such as Euler, Lyapunov, Sofia Kovalyevska, Pushkin and others.



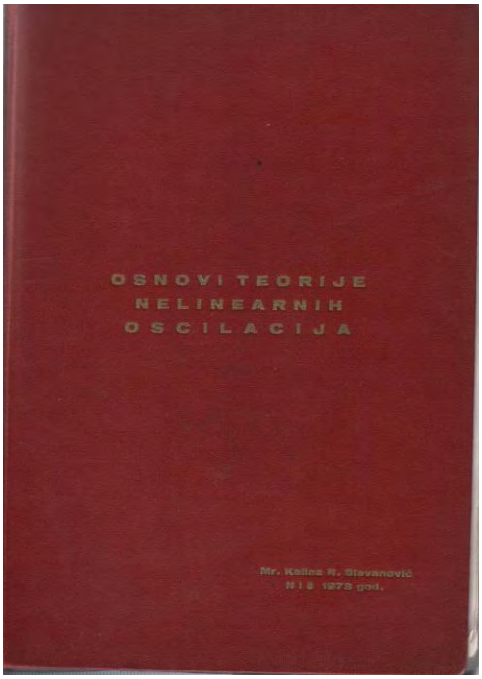


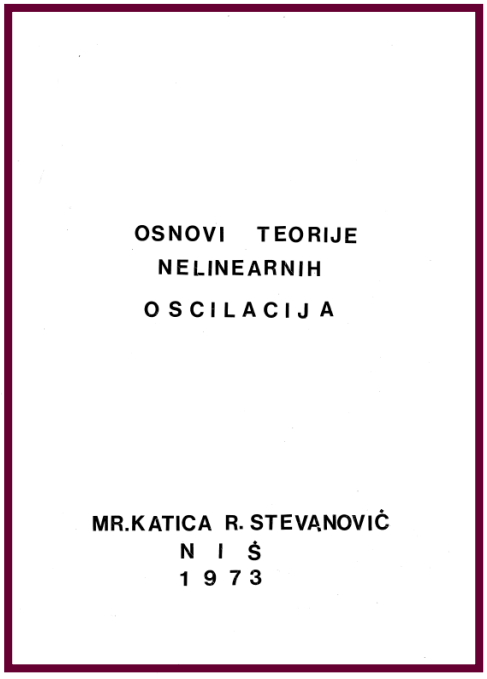


Katica (Stevanović) Hedrich held a large number of studies in history and philosophy of science and thus made a significant contribution not only to the promotion of the edition of SASA **Life and Work of Serbian Scientists**, writing a number of biobibliography for the first published issue of this series on Serbian scientists in the field of mechanics: Lj . Klerić, K.Alković, T. Andjelić, D. Rašković and Vlatko Brčić, but also the promotion of Serbian science through a series of lectures at MI SANU Seminars, SANU Gallery, M3, Ilija Kolarac Foundation etc.

*****

Hedrih (Stevanović) , Katica, IZABRANA POGLAVLJA TEORIJE NELINEARNIH OSCILACIJA, Univerzitet u Nišu, (Niš , 1975) ; http://elibrary.matf.bg.ac.rs/ http://elibrary.matf.bg.ac.rs/handle/123456789/3767



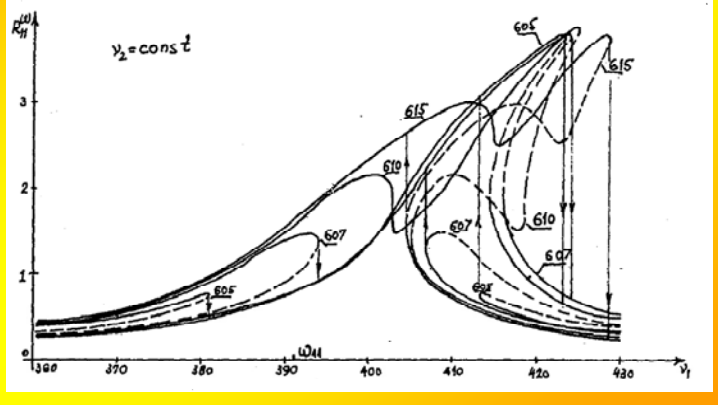


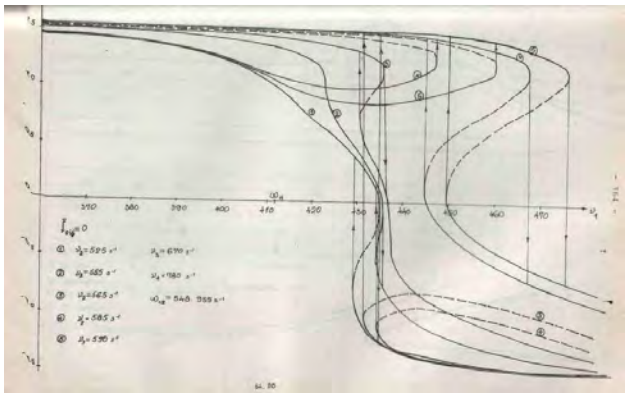
Hedrih (Stevanović) , Katica, OSNOVI TEORIJE NELINEARNIH OSCILACIJA, Preprint 20 primeraka, Niš, 1973. sada dostupno u PDF-u, na linkovima http://elibrary.matf.bg.ac.rs/ http://elibrary.matf.bg.ac.rs/handle/123456789/3768

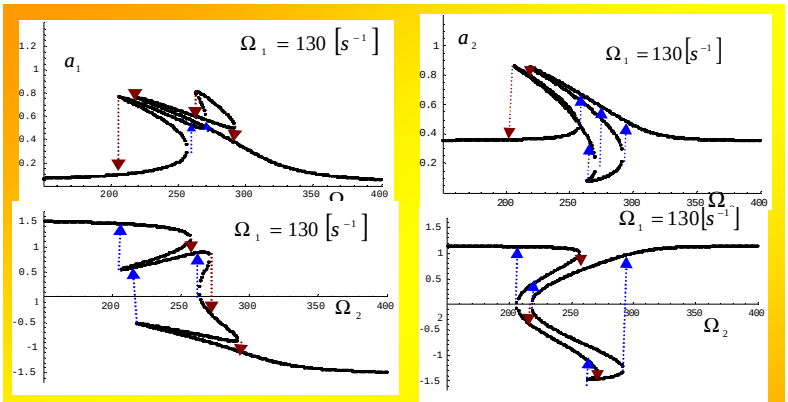
Зборник радова Математичког института, Нова серија, књ. 4 (12). 1984.
Recueil des travaux de l'Institut Mathématique, Nouvelle série, tome 4 (12), 1984.

O UZAJAMNOM UTICAJU HARMONIKA U NELINEARNIM SISTEMIMA SA MALIM PARAMETROM

Katica Hedrih — Predrag Kozić — Ratko Pavlović







Katica (StevanovIć) Hedrih and Julijana Simonović, (2008), Non-linear dynamics of the sandwich double circular plate system, **The Euromech Colloquium 498 Nonlinear Dynamics of Composite and Smart Structure (NDCS) -Nonlinear Dynamics and Chaos of Composite and Smart Structures (NDCS), May 21-23, 2008, Kazimierz Dolny, POLAND. Lublin 2008, pp. 170-175.**

Katica (Stevanović) Hedrih wrote two publications for postgraduate magister of science studies in the field of non-linear oscillations, which were available to the students of all postgraduare studies. **These two publications were the first publications from non-linear oscillations, which were written in Serbian**, intended for students of postgraduate, magister of sciences studies in technical mechanics, as well as other profiles.
Bearing in mind the results of work and management at the postgraduate studies of Katica (Stevanović) Hedrih at the Faculty of Mechanical Engineering in Niš, as well as on the implementation and management of a series of scientific and research projects with teams of young researchers in the period 1976-2009 at the Faculty of mechanical engineering in Niš, as well as the period 1996-2019 at the Mathematical Institute of the Serbian Academy of Sciences and Arts, as well as mentorship of magister of sciences and doctoral dissertations, and also to form the second generation of doctoral students, it is almost impossible to establish at the Faculty of Mechanical Engineering Niš, School of Nonlinear Oscillations and elastodynamics within which the magister of sciences degree and doctorate increasing number of postgraduates graduate and doctoral students in two generations, and after its departure from the MFN her PhD from the continuing education of the new third generation of doctoral students. At the time of departure (2009 year) from the Faculty of Mechanical Engineering in Niš, only on the Chair for Mechanics, there were five members of the Chair, who did their magister of sciences theses, as four of their doctoral dissertations, under the mentorship of Katica (Stevanović) Hedrih, not calculating her mentoring of magister of sciences and PhD students at the Faculty of Mechanical Engineering in Niš.

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18* Katica (Stevanović) Hedrih in her autobiographical review from 2013, entitled:

Katica R. (Stevanovic) Hedrih**,** (2013), **ADVANCES IN CLASSICAL AND ANALYTICAL MECHANICS: A REVIEWS OF AUTHORS RESULTS, Theoret.Appl.Mech. TEOPM7**, Vol.40, No.2, pp.293-383, Belgrade 2013_
http://www.ssm.org.rs/WebTAM/_private/VOL40_2/pdf_format/TAM%2040-2%2019-Katica_H.pdf
doi: 10.2298/TAM1302293H Math.Subj.Class.: 70-02; 70E55; 70F40; 70G10; 70G45; 70J50; 70K50; 70K28; 44A05; 45J05; 45K05; 45L05; 45M05;34A38.
According to: ***Tib Journal Abbreviations (C) Mathematical Reviews***, the abbreviation TEOPM7 stands for TEORIJSKA I PRIMENJENA MEHANIKA.

gave a presentation of a number of their original scientific achievements reached by 2012. In a Plenary lecture held in 2013 at the Congress of Mechanics of the Serbian Society of Mechanics, it supplemented the presentation of new results, under the following Title:

Hedrih (Stevanović) K., (2013), **Linear and nonlinear dynamics of hybrid systems, invited Plenary Lecture**, Proceedings of 4th International Congress of Serbian Society of Mechanics, 4-7th June 2013Vrnjačka Banja, Serbia, Editors: Stevan Maksimović, Tomislav Igić, Nataša Trišović. –Belgrade: Serbian Society of Mechanics, 2013 (Bograd: Beotele Prom), P-04, pp. 43-58. ISBN 978-86-909973-5-0.
http://www.ssm.org.rs/Congress2013/authors.html

For details on the achieved scientific results shown in these overview papers, we direct the reader to the contents of the same.

****

Some achieved professional and scientific results using theoretical knowledge

Katice R. (Stevanovic) Hedrich

This is a supplement with a motive to send information on the results of applying theoretical knowledge of **Theoretical and applied mechanics and nonlinear dynamics** of Katica (Stevanović) Hedrih, prior to her scientific achievements in classical mechanics and nonlinear dynamics, **which are applicable or have already been applied in production**, which, in her half a century of long commitment to scientific work, applied and implemented in the application, in addition to those highly theoretical in classical mechanics and nonlinear dynamics.

Here is a selection of papers from the application of knowledge and results of Katica (Stevanović) Hedrih in industry:

1 * For several years, she worked as an external associate in the program for the design of **piezo-ceramic transducers** (ultra-sound oscillation oscillators) produced by Electronic Industry in Niš. They were used as ultrasonic oscillators for the degreasing of machine parts produced by processing under a jet of oil, then for the homogenization of alloys made up of a number of components in the food industry (wine treated for ten minutes with ultrasound oscillation tastes like a wine of ten years old). She collaborated with two electronics magister of sciences, **mr M. Prokić and mr Dragan Šarković** and with them there are several published works in domestic publications in this field.

From the study and interest in **the properties of piezoceramics**, as well as on the **stress and strain state** under various mechanical or electrical loads, mentoring of magister of sciences and doctoral dissertation, today, **Dr. Ljubiša Perić**, and several published works in domestic and foreign journals.

This scientific competence, Katica (Stevanović) Hedrih, was the motive for being a member of the commission for the defense of the doctoral dissertation, today, **Dr Dragan Mančić**, vice-dean of the Faculty of Electronic Engineering in Niš, who did the doctorate under the mentorship of professor **Milan Radmanović**

Further work in this field leads to the publication of co-authorial **work on ultrasonic fluid dispersion with Dr Dragan Šarković and physicist Professor Vukota Babović** from the Physics at the Faculty of Science in Kragujevac. The paper was published in one of the leading Elsevier journals (categories M21a) and with the following biblical data:

Hedrih (Stevanovic) Katica R Babovic Vukota M Sarkovic Dragan , **An auxiliary size distribution model for the ultrasonically produced water droplets** (Article),

EXPERIMENTAL THERMAL AND FLUID SCIENCE, (2006), vol. 30 br. 6, str. 559-564 (Elsevier, категорија часописа -M21a) http://www.elsevier.com/locate/etfs
ISSN 0894-1777 M21=8 IF= 0.894

Further research, **mr Dragan Šaković**, disserted under the mentorship of Professor Vukota Babović, who defended it in **the field of physics** at the Faculty of Science and Mathematics in Kragujevac, and before the commission where Katica (Stevanović) Hedrih was a **member and the president**.

****

2 * Katica (Stevanović) Hedrih has been **designing, calculating and examining the statics, stability and dynamics of grid pillars of height 16 and 32 met**ers with a group of mechanical engineers in Elektronic industry Niš and assistants of the Department of Mechanics MFN. Pillars were manufactured in EI Niš, **as suports of radio antennas for the Yugoslav embassies in the African countries.**

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3 * As the project leader, Katica (Stevanović) Hedrih together with the researcher, at that time **assistant Miomir Praščević**, today a full professor and the dean of the Faculty of Enviromental Protection at the University of Niš, **experimentally examined the stability and dynamics of the bearings and shafts of the centrifugal pump** in the Factory of pumps Jastrebac, and gave recommendations for achieving the stability of the operation of the tested centrifugal pump, as well as the entire aggregate in which the pump was built. A number of papers on this topic were published.

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4 * **The design and calculation of the bodywork of a special purpose vehicle**, Professor Katica (Stevanović) Hedrih, was realized, co-ordinated with the team of assistant assistants.

****

5 * **Design and budget of the buffers, to the shock effect**, **as well as the experiment itself, to trap the locomotive with the composition**, in the case of an extended stopping road larger than projected at the **Railway Station in Belgrade**, as well as other railway stations, which are not passing, Katica (Stevanovic) Hedrich realized with a group of engineers from the Railway. Theoretical knowledge of Katica (Stevanović) Hedrih from the theory of collision was applied.

Scientific Consulates (Selection)

Katica (Stevanović) Hedrih was **a consultant in the drafting of Doctoral Dissertations, Zoran Mickić and mr. Randjel Bogdanović**, in theoretical and experimental work, from the bottom of the dynamics of railway vehicles, both doctoral theses were defended in front of the commissions she was a member of.

****

Katica (Stevanović) Hedrih were also a consultant, **at the invitation of the mentor professor Milan Nedeljković,** in the preparation of the Doctoral Dissertation from **the dynamics of the toothed power transmissions**, **Vera Nikolić-Stanojević**, later professor of the Faculty of Mechanical Engineering in Kragujevac, and professor emeritus of the State University in Novi Pazar, defended before the commissions whose member shi was a member.

****

Katica (Stevanovic) Hedrih were also **a consultant, at the invitation of the mentor of Professor Dragutin Debeljković,** in the final drafting of the doctoral dissertation**, Mr. Btank Djedović,** from the General Staff of the Army of Serbia, who worked **automatic control of missiles on mobile combat vehicles,** defended before the commissions she was a member of.

****

Katica (Stevanović) Hedrih, as **an young university teacher, was also a consultant, at the invitation of the mentor of Professor Vlatko Brčić**, in the preparation of the doctoral dissertation, **Mr. Novak Spasojević**, later a full professor at the Faculty of Civil Engineering in Niš, who worked in the **field of oscillations and dynamics of bridges.**

and so on, another approximatelly 30.

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IFToMM
2004
The Eleventh World Congress in
Mechanism and Machine Science
Tianjin - China

Fifth EUROMECH
Nonlinear Dynamics Conference
ENOC-2005

The Fourth International
Conference on Nonlinear
Mechanics
and
IUTAM Symposium on
Duality-Complementarity-
Symmetry in Nonlinear
Mechanics
August 13-16,2002,Shanghai,China

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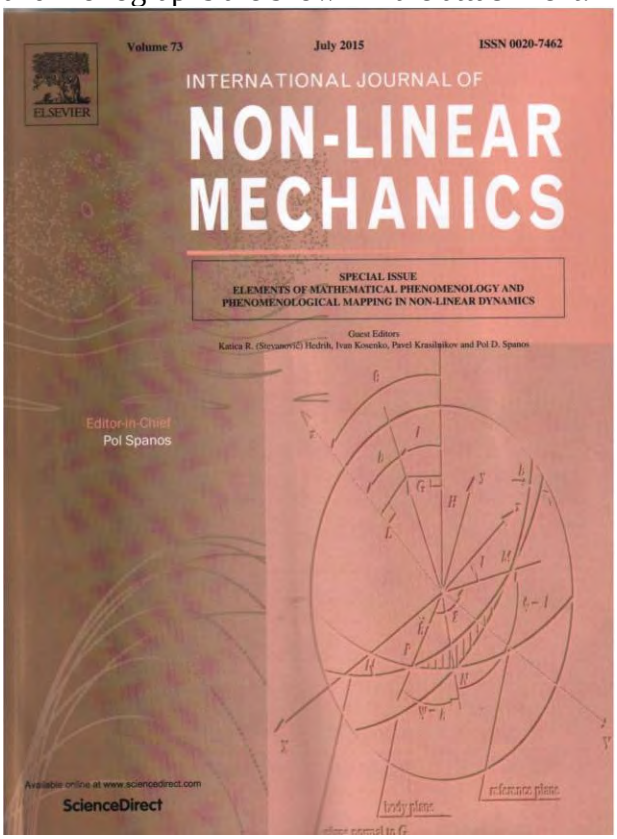
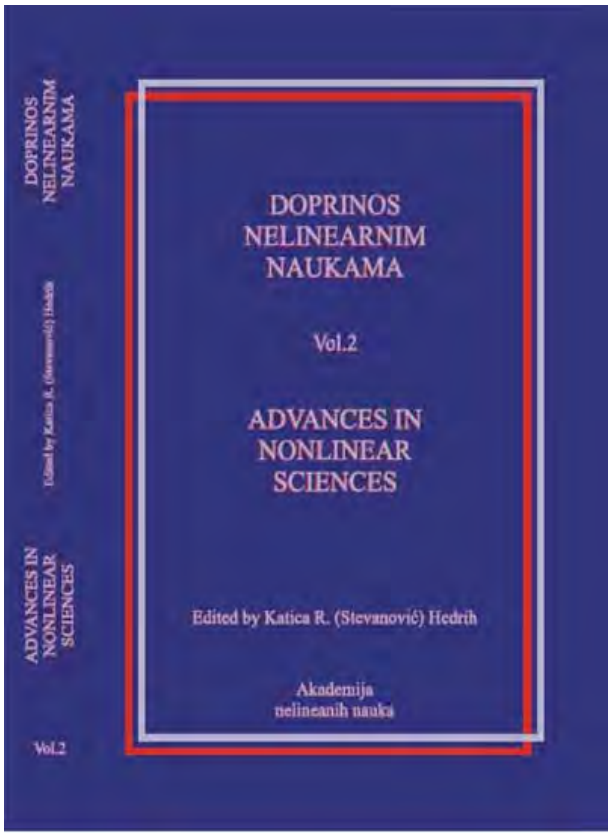
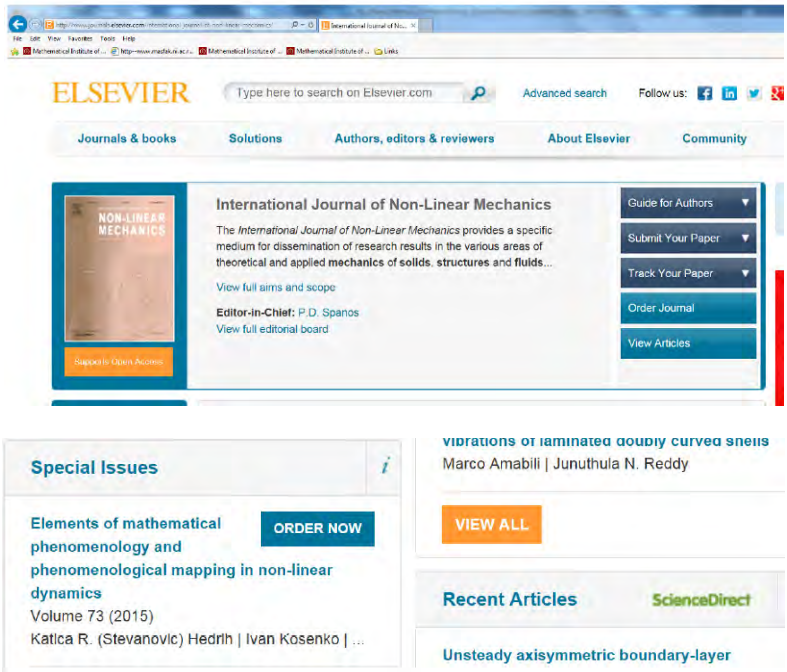
Katica (Stevanović) Hedrih, as a competent scientist, has arranged a number of scientific publications, as a guest editor. The contributions of some of these published scientific journals and monographs are shown in the attachment.







Научно друштво Србије

SCIENTIFIC REVIEW

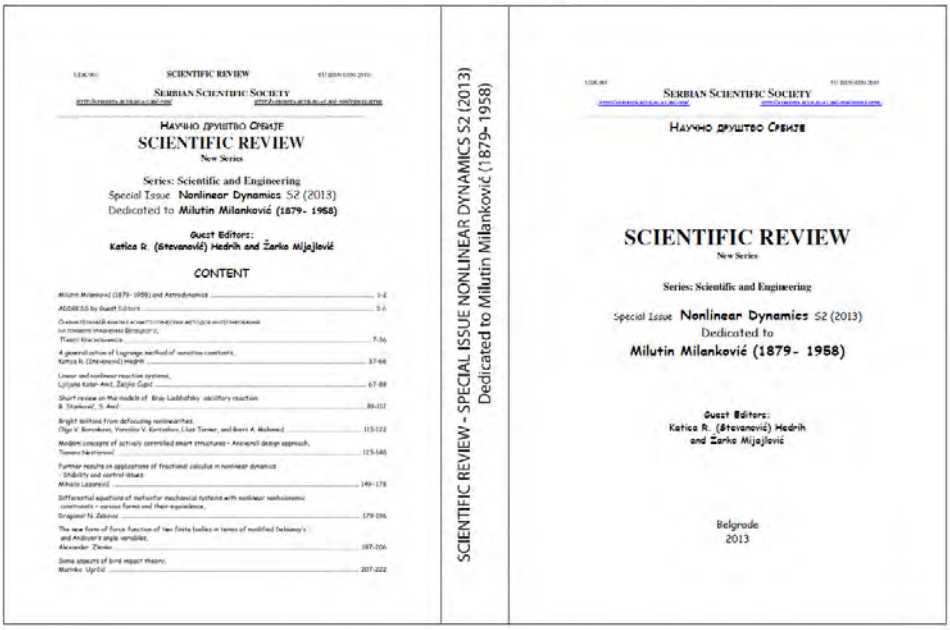
New Series: Series: Scientific and Engineering

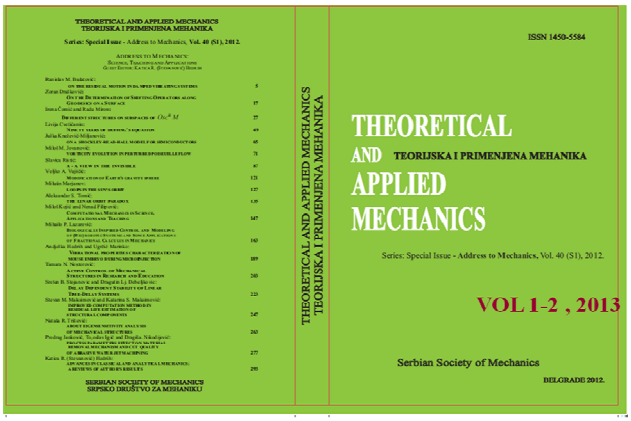
Special Issue **Nonlinear Dynamics** S2 (2013)

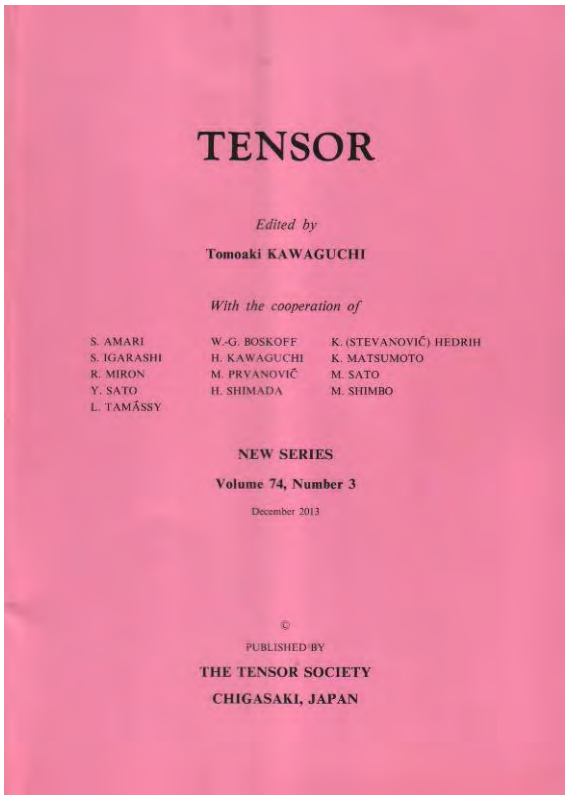
Dedicated to **Milutin Milanković (1879- 1958)**

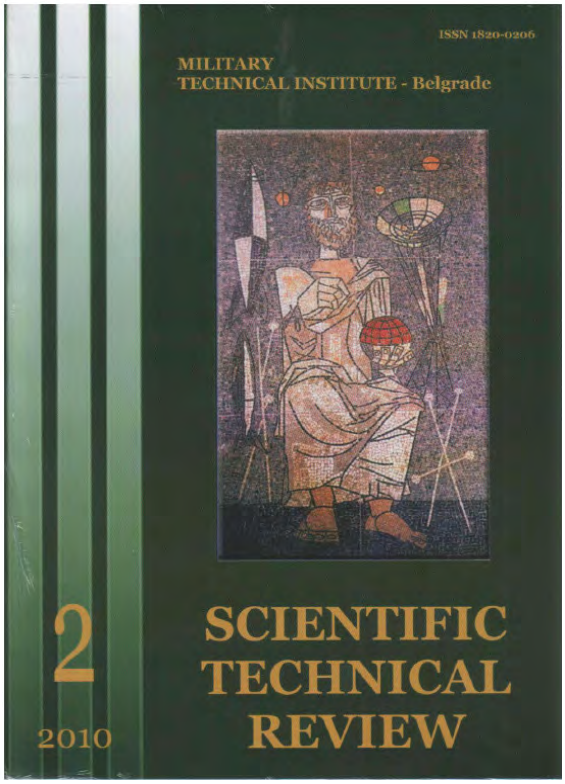
Guest Editors: Katica R. (Stevanović) Hedrih and Žarko Mijajlović

Belgrade, 2013.

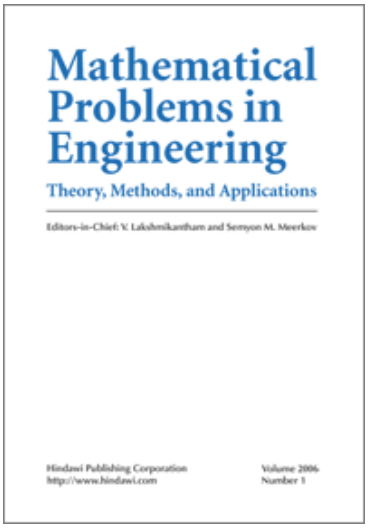








Journal Mathematical Problems in Engineering



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http://www.reference-global.com/toc/ijnsns/11/3

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- Vol. 2, No 10, 2000
- Vol. 3, No 11, 2001
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- Vol. 3, No 13, 2003
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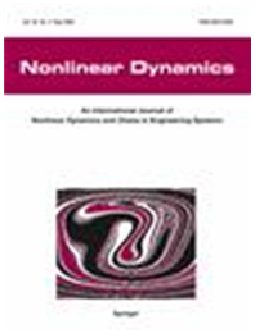

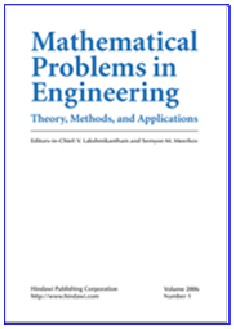

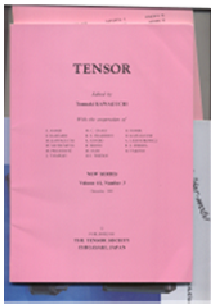

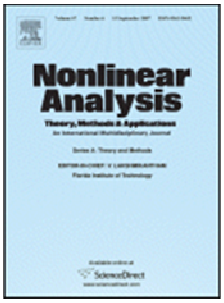

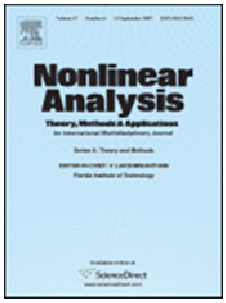

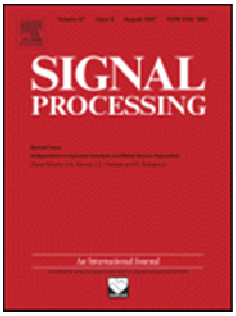

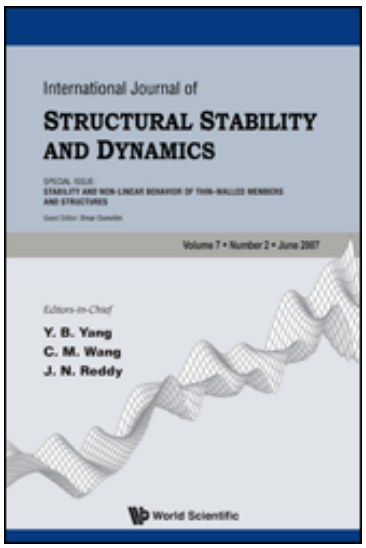

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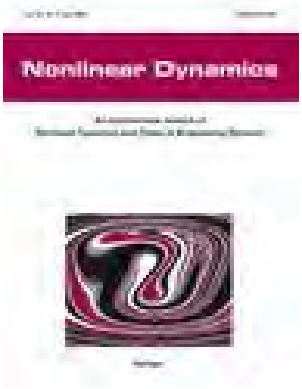
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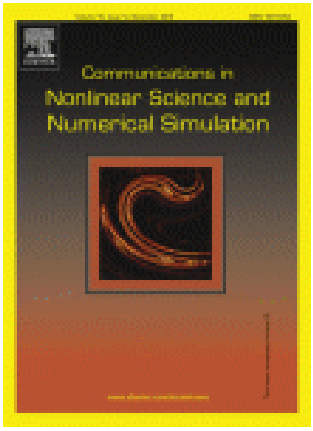
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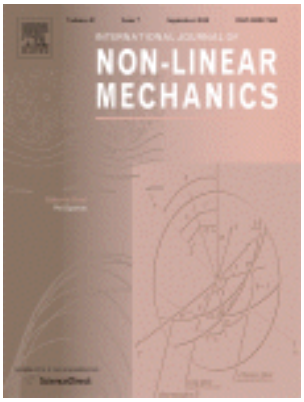
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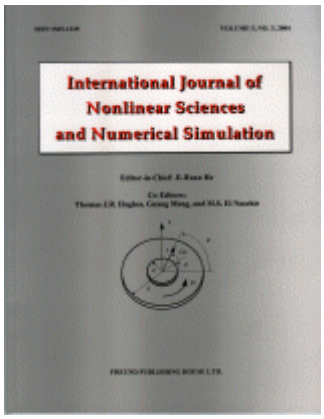
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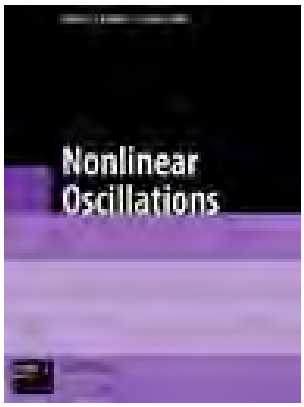
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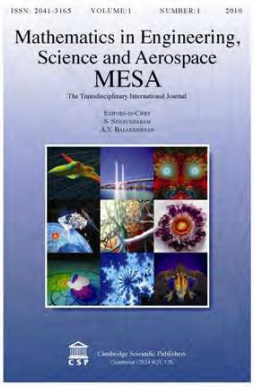
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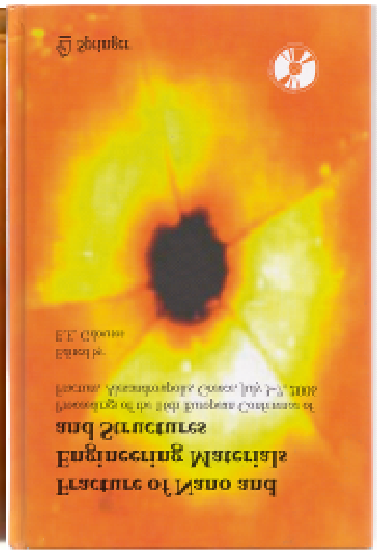

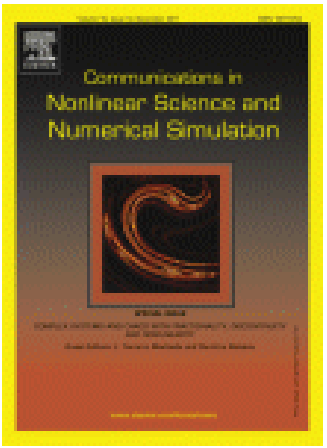
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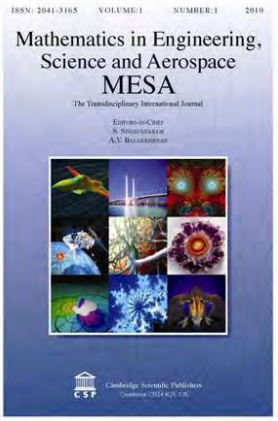
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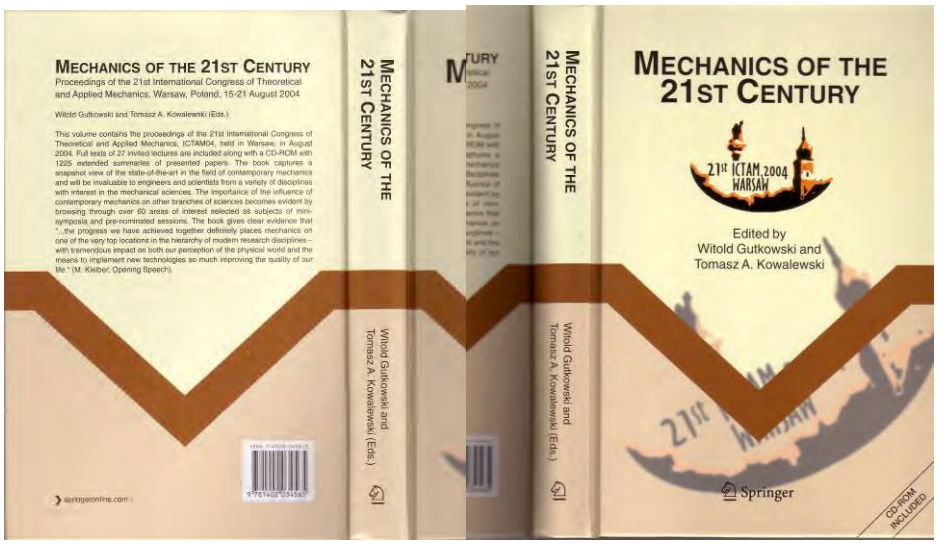
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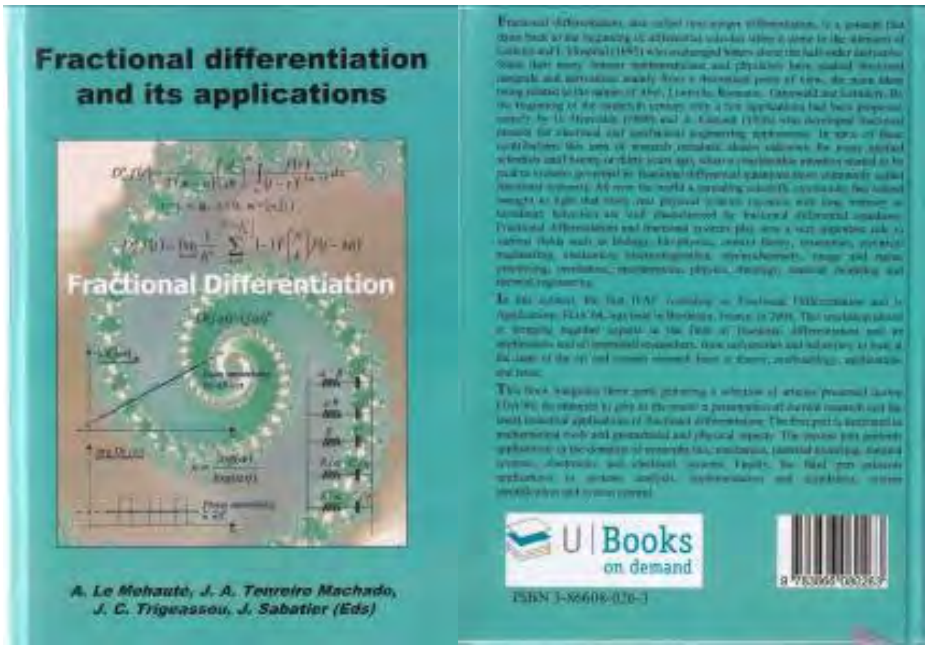
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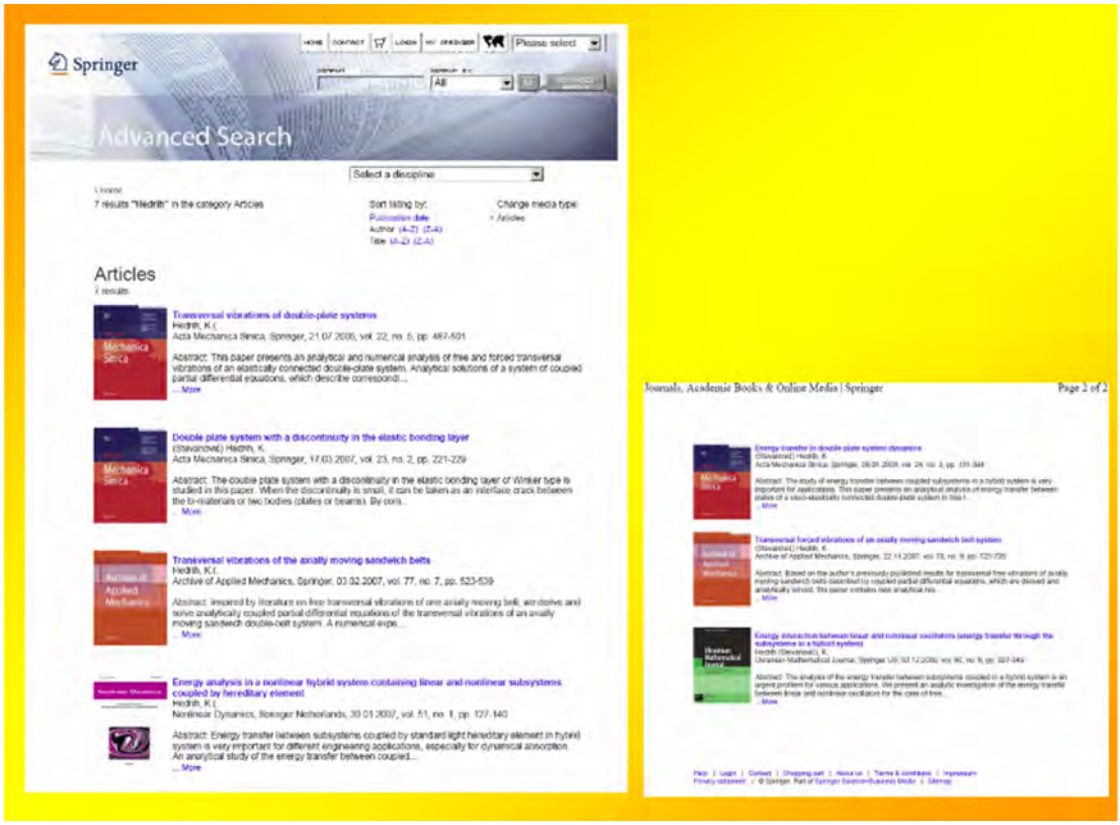

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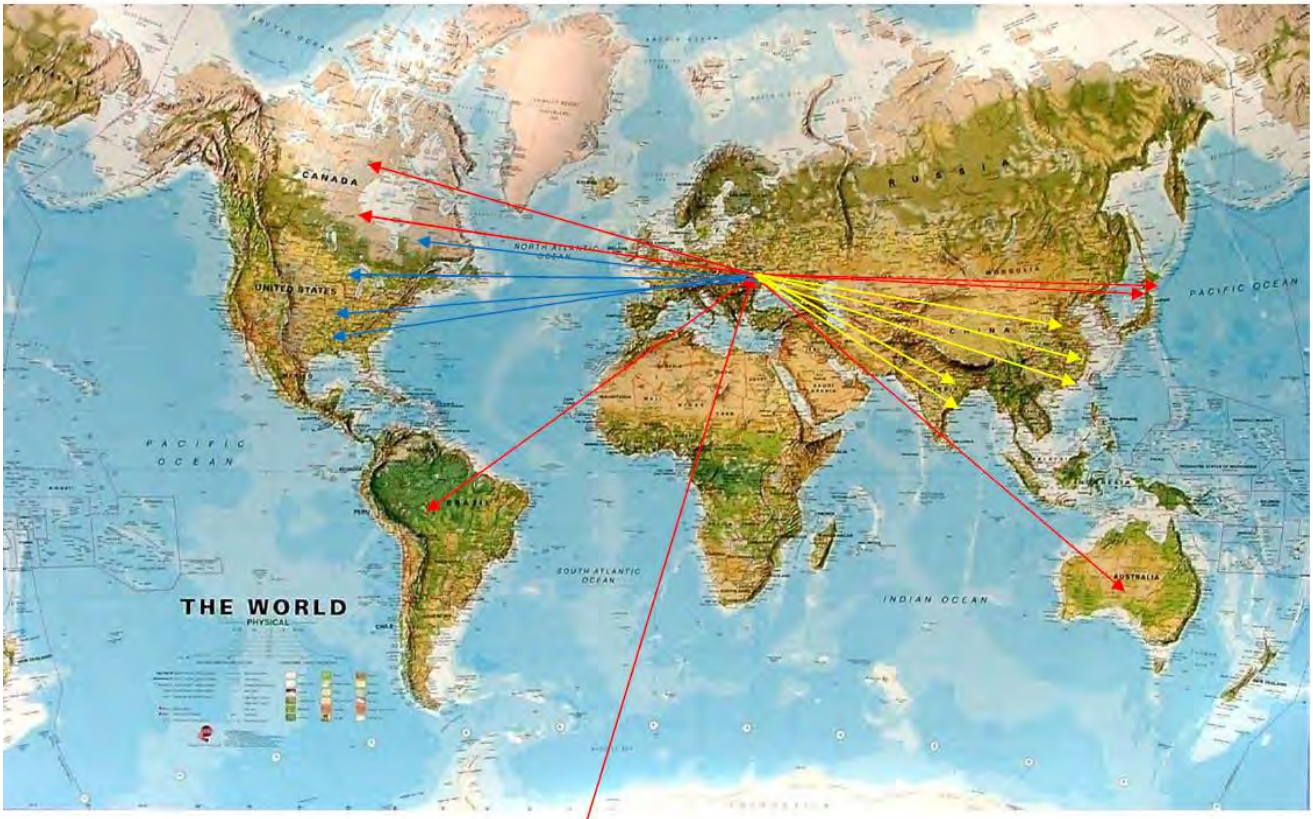

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