Research results in 2011.

ON174001 - Dynamics of hybrid systems with complex structures. Mechanics of materials. (2011-2014)
ON174001 – Dinamika hibridnih sistema složenih struktura. Mehanika materijala . (2011-2014)
Project Leader: *Katica R. (Stevanović) Hedrih*

Abstract: Investigation and research published results of Project OI174001 "Dynamics of hybrid systems with complex structures. Mechanics of materials." in 2011 year are focused to the following themes:

1* Analytical mechanics of discrete fractional order systems. Dynamics of rheonomic and rheological systems as well as systems with noholonomic systems. (see References [1,5, 8,10, 11, 12])

2* Nonlinear and rare phenomena in dynamics of the hybrid system with coupled rigid and deformable bodies. Transfer energy between subsystems and components of system dynamics. (see References [1,2,3,4,5,6,7])

3* Models of biological oscillations and phenomenon on dynamics and transfer signals, information and energy through biological coupled oscillators structures. Mechanics of coupled fields. (see References [13,14])

4* Method of discrete continuum – Theory and applications. Dynamics of homogeneous structures containing elements with constitutive relations describing linear and nonlinear elastic properties as well as viscoelastic and hereditary properties and/or fractional order. (see References [10,13,14])

5* Phenomenon of dynamics of the systems with Coulomb's type friction as well as discontinuity of kinetic parameters. Dynamics of vibroimpact systems. (see References [2,3,4])

6* State of stress and strain and potential energy in material around crack tip. (see References [16,17])

7* Control of dynamics and hybrid systems. (see References [15])

Citations: In 20111 numerous Hedrih's paper was cited and also papers written by other researchers of Project team are cited few times. Main citations of Hedrih's papers are in Applied Mechanics Reviews, American Society of Mechanical Engineers –ASME, JANUAR 2010, Vol. 63/ pp. 010801-1 - 010801-52. Volume published in 2011.

Research results promotion and Awards: Original results are presented at numerous international scientific meeting as is FNOC Roma 2011 in organization of European Society of Mechanics and 7th INTERNATIONAL SYMPOSIUM ON CLASSICAL AND CELESTIAL MECHANICS (CCMECH'2011). Young researcher A. Hedrih is Laureate of Young Scientist Prize Paper, awarded at the 7th European Nonlinear Dynamics Conference held in Rome, Italy, July, 2011 (see Reference [14]). Series of invited lectures as well contributed papers are presenter at international scientific meetings and few researchers was member of scientific comities, as well organizer of mini-symposia or congresses in Mechanics and Nonlinear dynamics..

Young researchers. Sixth young researchers (between 25-28 years) are Ph. D. students with successful results pass necessary exams. Seminar "Mathematical methods of mechanics in applications" for young researchers is organized during 2011 year with more them 200 hours of lectures and research consultation on the doctoral courses level.

Principal References:

1. Hedrih (Stevanović) K R. Optimal control in nonlinear system with no ideal constraints. Commun Nonlinear Sci Numer Simulat (2010), doi:10.1016/j.cnsns.2010.04.053, Journal Comunications in Nonlinear Sciences and Numerical Simulation, 2011 16 (5):2289-2300   **M21=8**

2. Hedrih (Stevanović) K R. and Simonović J., Multi-frequency analysis of the double circular plate system non-linear dynamics", Nonlinear Dynamics: Volume 67, Issue 3 (2012), Page 2299-2315. Nonlinear Dynamics, Springer, NODY1915R2, DOI: 10.1007/s11071-011-0147-7   **M21=8**

3. Hedrih (Stevanović) K R. and Simonović J., (2011), „ *Energies of the dynamics in a double circular plate non-linear system"*, INTERNATIONAL JOURNAL OF BIFURCATION AND CHAOS. vol. 21, No. 10, pp 1-19, 2011. DOI: 10.1142/S0218127411030301   **M21=8**

4. Hedrih (Stevanović) K R., Raičević V. and Jović S., Phase Trajectory Portrait of the Vibro-impact Forced Dynamics of Two Heavy Mass Particles Motions along Rough Circle, Communications in Nonlinear Science and Numerical Simulations, 2011 16 (12)**:4745-4755,** DOI 10.1016/j.cnsns.2011.05.027   **M21=8**

5. 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. (published in 2011).

6. Hedrih (Stevanović) K R. (2012), Energy and Nonlinear Dynamics of Hybrid Systems, Book Chapter, in *Dynamical Systems and Methods, Edited by Albert Luo, Tenreiro Machado and D Baleanu, , 2012, Part 1, Pages 29-83,* 2012, DOI: 10.1007/978-1-4614-0454-5_2 , ISBN 978-1-4614-0453-8. e-ISBN 978-1-4614-0454-5, Springer New York Dordrecht Heidelberg London

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8. Camelia Frigioiu, Katica (Stevanovic) Hedrih, and Iulian Gabriel Bˆırsan, Lagrangian geometrical model of the rheonomic mechanical systems, World Academy of Science, Engineering and Technology 73 2011.

9. Katica R. (Stevanovic) Hedrih and Ljaljana Veljovic, Vector Rotators of a Rigid Body Dynamics with Coupled Rotations around Axes without Intersection, MPE/351269, Hindawi Publishing Corporation, Mathematical Problems in Engineering, Volume 2011, Article ID 351269, 26 pages, doi:10.1155/2011/351269

10. Hedrih K. 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.

11. Dragomir N. Zeković, Dynamics of mechanical systems with nonlinear nonholonomic constraints – I The history of solving the problem of a material realization of a nonlinear nonholonomic constraint, ZAMM · Z. Angew. Math. Mech. 91, No. 11, 883 – 898 (2011) / DOI 10.1002/zamm.201000228 and II Differential equations of motion, ZAMM · Z. Angew. Math. Mech. 91, No. 11, 899 – 922 (2011) / DOI 10.1002/zamm.201000229

12. Dragomir N. Zeković, On the motion of a nonholonomically constrained system in the nonresonance case, Mechanics Research Communications 38 (2011) 330–333

13. Andjelka N. Hedrih. Mechanical models of the double DNA. *International Journal of Medical Engineering and Informatics 2011 - Vol. 3, No.4 pp. 394 - 410.* DOI: 10.1504/IJMEI.2011.044753   ISSN (Online): 1755-0661 - ISSN (Print): 1755-0653.

14. Andjelka Hedrih. Modeling oscillations of zona pelucida before and after fertilization, Young Scientist Prize Paper. EUROMECH Newsletter, 2011, No. 40, pp.6-14. (awarded at the 7th European Nonlinear Dynamics Conference held in Rome, Italy, July, 2011)

15. Stojanovic, S. B., D. Lj. Debeljkovic, "Delay – Dependent Stability Analysis for Discrete – Time Systems with Time Varying State Delay", *CI&CEQ* , Chemical Industry & Chemical Engineering Quarterly, Vol. 17, No. 4 (2011) 497 – 503, ISSN 1451-9372.   M23=3

16. Slobodanka Boljanovic, Stevan Maksimovic, Analysis of the crack growth propagation process under mixed-mode loading, Engineering Fracture Mechanics, Volume 78, Issue 8, May 2011, pages 1565-1576. **M21=8**

17. S. Maksimovic, S. Posavljak, K. Maksimovic, V. Nikolic and V. Djurkovic, Total Fatigue Life Estimation of Notched Structural Components Using Low-Cycle Fatigue Properties, J. Strain, DOI: 10.1111/j.1475-1305.2010.00775.x   **M21=8**