

Директору Математичког института САНУ  
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Научном већу Математичког института САНУ  
академику Драгошу Цветковићу

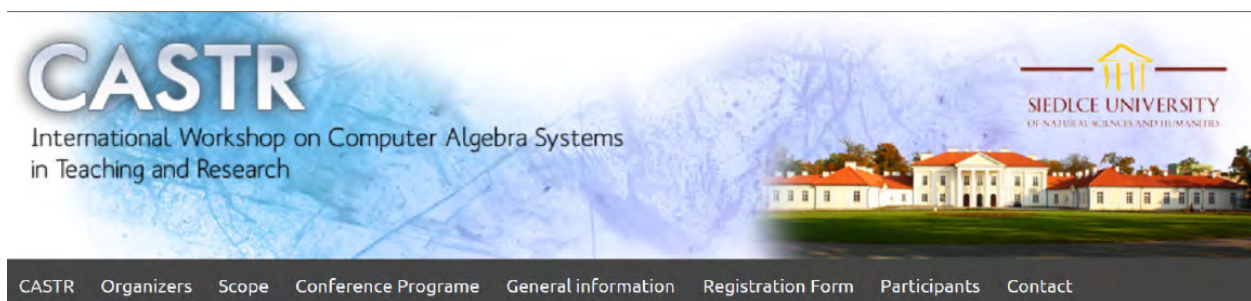
## Стручни извештај о учешћу у научном скупу

**The conference on Computer Algebra Systems in Teaching and Research CASTR'2015 on October 25-29, 2015 (it will be already 8th such conference).**

<http://www.castr.uph.edu.pl/>

и организацији минисимпозијума:

**Mini-symposium on Computational Aspects of Classical and Celestial Mechanics, Stability and Motion Control**



Моје учешће у раду ове традиционалне међународне конференције **CASTR'2015 "О системима компјутерске алгебре – учење и истраживање"** је реализовано на **основу позива организатора** Конференције: *Siedlce University of Natural Sciences and Humanities (Siedlce, Poland), Warsaw University of Life Sciences - SGGW (Warsaw, Poland) и Collegium Mazovia Innovative Higher School (Siedlce, Poland)* да организујем минисимпозијум на тему **"Рачунски аспекти класичне и небеске механике, стабилности и управљања кретањем"**. (**Mini-symposium on Computational Aspects of Classical and Celestial Mechanics, Stability and Motion Control**).

Учешће се огледало у следећим активностима:

\* Чланством у Научном комитету Конференције **CASTR'2015** и рецензирању пристиглих рукописа за програм и штампање у преконференцјском Зборнику радова Конференције;

\* Организацији минисимпозијума **Mini-symposium on Computational Aspects of Classical and Celestial Mechanics, Stability and Motion Control ("Рачунски аспекти класичне и небеске механике, стабилности и управљања кретањем")**;

\* Преседавањем првом пленарном сесијом Минисимпозијума;  
\* Учешћем питањима и коментарима на седницама Конференције;  
\* Одржаним 45-томинутним првим пленарним предавањем по позиву у Минисимпозијуму **Aspects of Classical and Celestial Mechanics, Stability and Motion Control**, под насловом:

Katica R. (Stevanović) Hedrih, Rolling heavy disk along rotating circle with constant angular velocity (најављењо, уже), а одржано у ширем садржају: **Vibro-impact dynamics of two rolling body along rotating circle with constant angular velocity**, Program and Abstracts **CASTR'2015**, p. 26

Због ограничења броја страна штампан је најављени садржај, део одржаног предавања:

Hedrih (Stevanovic) K.R., *Rolling heavy disk along rotating circle with constant angular velocity*, Computer Algebra Systems, in Teaching and Research, **Chapter 2. Problems of Classical Mechanics**, Edited by Alexander N. Prokopenya , Mirosław Jakubiak (Eds.), Volume V, pp. 293-304. Siedlce University of Natural Sciences and Humanities, Siedlce 2015, © Copyright Uniwersytet Przyrodniczo-Humanistyczny w Siedlcach, Siedlce 2015, ISSN 2300-7397; ISBN 978-83-7051-779-3

После одржаног предавања постављена су ми три питања, на која сам са задовољством одговорила. И после предавања у паузама био је већи број младих заинтересованих за научне комуникације са мном, као и за разговоре.

Имајући у виду да сам учествовала у дискусијама по већем броју саопштења, као и давала коментаре и научне информације и инструкције, један број учесника старије генерације, изразио је дивљење ширини мојих знања која сам уложила у научни рад конференције. Коментар је био, и нивоа оцена, да су на конференцијама које су специјализоване веома ретко сретали научнике тако широких знања и видика. Наравно, то је најлепше, што један учесник међународне Конференције, може да доживи од својих савременика, а посебно оних најстаријих. Лепота научних емоција, и сећање на изузетну пажњу коју сам овде доживела и од сасвим младих истраживача, као и оних који су у поодмаклим годинама представља за мене изузетну енергију коју сам са ове конференције донела у Србију, где је тешко добити и најмању похвалу од својих колега и признање за достигнуте стваралачке и научне резултате!

Организација Конференције је била добра, предавања и саопштења на високом научном нивоу. На овој конференцији је било већи број младих учесника него ранијих година, што посебно радује.

НАПОМЕНА: Минималне трошкове пута и учешћа у Конференцији сам покрила сопственим средствима од пензије од које се издржавам.

С поштовањем,

У Београду, 30 октобра 2015.



Katica R. (Stevanović) Hedrih  
Руководилац пројекта OM174001

# I. Mathematical Modeling and Differential Equations

## II. Chapter 2. Problems of Classical Mechanics

### III. Education and Didactics

Mini-symposium on Computational Aspects of Classical and Celestial Mechanics, Stability and Motion Control is planned to be organized in the framework of the workshop.

Organizers:

Pavel S. Krasilnikov (Moscow, Russia),

**Katica R. (Stevanovic) Hedrih (Belgrade, Serbia),**

Alexey A. Tikhonov (St. Petersburg, Russia)

<http://www.castr.uph.edu.pl/>

The screenshot shows the website for the International Workshop on Computer Algebra Systems in Teaching and Research (CASTR). The page is titled "Scope" and lists several topics of interest, including applications of computer algebra systems, modeling of galactic cosmic rays, quantum computation, and optimization problems. A red-bordered box highlights a specific announcement: "Mini-symposium on Computational Aspects of Classical and Celestial Mechanics, Stability and Motion Control is planned to be organized in the framework of the workshop." Below this, the organizers are listed: Pavel S. Krasilnikov (Moscow, Russia), Katica R. (Stevanovic) Hedrih (Belgrade, Serbia), and Alexey A. Tikhonov (St. Petersburg, Russia). A special session for young scientists is also mentioned. The footer of the website provides contact information for the conference place at Siedlca University of Natural Sciences and Humanities.

<http://www.castr.uph.edu.pl/organizers/scientific-committee>

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in Teaching and Research

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**Conference Place**

CASTR  
Siedlce University of Natural Sciences and Humanities  
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**CASTR**

The 8th International Workshop

**Computer Algebra Systems in Teaching and Research (CASTR'2015)**

Siedlce, Poland, October 21 - 25, 2015

Nowadays, such general-purpose computer algebra systems as Mathematica, MatLAB, Maple, and others enable their users to solve the following important tasks within a uniform framework: symbolic manipulation, numerical computation and visualization. As a consequence, these systems are widely used in different branches of science and technology and play an important role in education. A goal of the workshop is to bring together specialists applying the computer algebra systems in research and teaching, to present the latest developments in the respective fields, to exchange experience and to establish opportunities for further collaboration.

Alexander N. Prokopenya  
Mirosław Jakubiak (Eds.)

Alexander N. Prokopenya  
Mirosław Jakubiak (Eds.)



# Computer Algebra Systems in Teaching and Research

Volume V

CASTR  
2015

Uniwersytet Przyrodniczo-Humanistyczny w Siedlcach  
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**Computer Algebra Systems  
in Teaching and Research**

**CASTR'2015**

**Institute of Mathematics and Physics  
Siedlce University of Natural Sciences and Humanities  
Collegium Mazovia Innovative Higher School in Siedlce  
Faculty of Applied Informatics and Mathematics  
Warsaw University of Life Sciences – SGGW**

are organizing

**The 8th International Workshop  
on Computer Algebra Systems  
in Teaching and Research**

October 21 – 25, 2015  
Siedlce, Poland

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### **Organizers of Mini-Symposium on Computational Aspects of Classical and Celestial Mechanics, Stability and Motion Control**

Pavel S. Krasil'nikov, Moscow Aviation Institute, Russia  
Katica R. (Stevanović) Hedrih, Mathematical Institute SANU, Belgrade, Serbia  
Alexey A. Tikhonov, Saint-Petersburg State University, Russia



Alexander Prokopenya<alexander\_prokopenya@sggw.pl>;

-----Original Message-----

From: Alexander Prokopenya

Sent: Wednesday, April 29, 2015 9:32 AM

To: Katica Hedrih

Subject: Re: LIST Of Aggresses Re: CASTR'2015 conference in Siedlce

Dear Professor Katica Hedrih,

As I wrote you we plan to organize a mini-symposium on Computational Aspects of Classical and Celestial Mechanics, Stability and Motion Control during the CASTR'2015 conference. Such an idea appeared due to the fact that it will be not possible to organize the next CCMECH Symposium this year as it was planned two years ago during the CCMECH'8 symposium. I have sent an announcement about the CASTR'2015 conference to many potential participant but I think it would be very good to have a Chair of the local Organizing Committee for this special mini-symposium. We discussed this problem with Prof. Krasil'nikov and agreed that you will be a very good Chair of thei Committee.

Due to this I have a proposition - Could you be a Chair and main organizer of this mini-symposium, please? Of course, you can invite some other people to be your co-organizers.

Please, let me know your opinion and we'll add this information at the conference website.

Best regards,

Alexander

Agnieszka Prusinska<aprus@uph.edu.pl>;

[alexander\\_prokopenya@sggw.pl](mailto:alexander_prokopenya@sggw.pl)<[alexander\\_prokopenya@sggw.pl](mailto:alexander_prokopenya@sggw.pl)>;

-----Original Message-----

From: Katica Hedrih

Sent: Saturday, October 03, 2015 1:30 AM

To: Agnieszka Prusinska

Cc: alexander\_prokopenya@sggw.pl

Subject: Re: Invitation on CASTR 2015

Dear Dr. Agnieszka Prusińska,

I would like to thank You for formal Official Invitation Letter for the 8th International Workshop on Computer Algebra Systems in Teaching and Research (CASTR'2015). Details of my arrival are known to Professotr Prokopenya.

With best regards,

Katica (Stevanovic\_Hedrih

-----Original Message-----

From: Agnieszka Prusinska

Sent: Friday, October 02, 2015 9:37 PM

To: khedrih@eunet.rs

Cc: alexander\_prokopenya@sggw.pl

Subject: Invitation on CASTR 2015

Dear Professor Dr Katica (Stevanović) Hedrih,

On behalf of the Organizing Committee of the 8th International Workshop on Computer Algebra Systems in Teaching and Research (CASTR'2015) to be held in Siedlce, Poland from October 20 till October 25, 2015, we are glad to invite you to participate in the conference and to present your talk "Rolling heavy disk along rotating circle with constant angular velocity".

As an invited speaker you'll have 45 min. for presentation. We also expect that you'll agree to act as a Chairman at the mini-symposium on Classical and Celestial Mechanics.

Please note that the registration fee is 100 Euro. It covers organization expenses, conference materials and refreshment room at the Workshop. It can be paid on site upon arrival. You will be accommodated at the UPH hotel situated opposite to the Faculty of Science building, 3 Maja str. 49, Siedlce, (<http://www.uph.edu.pl/sprawy-studenckie/domy-studenckie>). All the details concerning the workshop you can find on the website <http://www.castr.uph.edu.pl>

We look forward to seeing you in Siedlce.

Best wishes,

Dr. Agnieszka Prusińska

Organizing Committee of CASTR'2015

University of Natural Sciences and Humanities in Siedlce

3 Maja str. 54, 08-110 Siedlce, Poland

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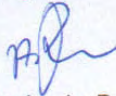
Siedlce, October 1, 2015

**Professor Dr  
Katica R. (Stevanović) Hedrih  
Department of Mechanics  
Mathematical Institute SANU  
Knez Mihailova st. 36/III  
Belgrade, 11009 Serbia  
khedrih@eunet.rs**

Dear Professor Dr Katica (Stevanović) Hedrih,

On behalf of the Organizing Committee of the 8th International Workshop on Computer Algebra Systems in Teaching and Research (CASTR'2015) to be held in Siedlce, Poland, from October 21 till October 25, 2015, we are glad to invite you to be a chair at the mini-symposium on Classical and Celestial Mechanics.

Kind regards,



Dr. Agnieszka Prusińska

Organizing Committee of CASTR'2015  
University of Natural Sciences and Humanities in Siedlce  
3 Maja str. 54, 08-110 Siedlce, Poland  
Tel. +48 25 6431103  
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Siedlce, October 1, 2015

**Professor Dr  
Katica R. (Stevanović) Hedrih  
Department of Mechanics  
Mathematical Institute SANU  
Knez Mihailova st. 36/III  
Belgrade, 11009 Serbia  
[khedrih@eunet.rs](mailto:khedrih@eunet.rs)**

Dear Professor Dr Katica (Stevanović) Hedrih,

On behalf of the Organizing Committee of the 8th International Workshop on Computer Algebra Systems in Teaching and Research (CASTR'2015) to be held in Siedlce, Poland, from October 21 till October 25, 2015, we are glad to invite you to participate in the conference and to present your talk

*Rolling heavy disk along rotating circle with constant angular velocity*

As an invited speaker you will have 45 min. for presentation. We also expect that you will agree to act as a Chairman at the mini-symposium on Classical and Celestial Mechanics.

Please note that the registration fee is 100 Euro. It covers organization expenses, conference materials and refreshment room at the Workshop. It can be paid on site upon arrival. Participants of the workshop CASTR'2015 will be accommodated at the UPH hotel situated opposite to the Faculty of Science building, 3 Maja str. 49, Siedlce, (<http://www.uph.edu.pl/sprawy-studenckie/domy-studenckie>).

We kindly ask you to confirm your participation by October 15, 2015 via e-mail: [castr@uph.edu.pl](mailto:castr@uph.edu.pl) and to let us know some details concerning your arrival and departure (number of train or flight, date and time). All the details concerning the workshop you can find on the website <http://www.castr.uph.edu.pl>.

We look forward to seeing you in Siedlce.

Best wishes



Dr. Agnieszka Prusińska

Organizing Committee of CASTR'2015  
University of Natural Sciences and Humanities in Siedlce  
3 Maja str. 54, 08-110 Siedlce, Poland  
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tel. 25 643 10 66

**Friday, October 23**

**3 Maja st. 54, Faculty of Sciences, 3d floor, Lecture Hall "Aula 303"**

**Mini-Symposium on Computational Aspects of Classical  
and Celestial Mechanics**

**Session Chair: Katica R. Hedrih**

- 09:00 – 09:45 **Katica R. Hedrih**  
Rolling heavy disk along rotating circle with constant  
angular velocity
- 09:45 – 10:15 K.A. Antipov, **Alexey A. Tikhonov**  
On computer algebra systems in the modeling of the Earth's  
magnetic field and satellite dynamics
- 10:15 – 10:45 M.P. Kharlamov, **Pavel E. Ryabov**  
Phase topology of the Kowalevski Komarov Sokolov top
- 10:45 – 11:05 I.I. Kharlamova, **Pavel E. Ryabov**  
An example of the constructor of topological invariants for integrable  
Hamiltonian systems with parameters

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## Chapter 2. Problems of Classical Mechanics

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## III. Education and Didactics



Слика председавајућих (ректора и декана) организатора са отварања Конференције **CASTR 2015** на Универзитета у Седлицама

*Siedlce University of Natural Sciences and Humanities (Siedlce, Poland), Warsaw University of Life Sciences - SGGW (Warsaw, Poland) u Collegium Mazovia Innovative Higher School (Siedlce, Poland)*

## II. Problems of Classical Mechanics

### Rolling Heavy Disk along Rotating Circle with Constant Angular Velocity

Katica R. (Stevanović) Hedrih<sup>1,2)</sup>

<sup>1)</sup>Department for Mechanics, Mathematical Institute SANU Belgrade  
khedrih@eunet.rs

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**Abstract.** *Non-linear differential equation of non-linear dynamics of a rolling heavy disk along rotating circle trace, with constant angular velocity, about central axis in vertical direction is derived. For this case, corresponding equation of phase trajectory portraits depending on kinetic parameters of the system are obtained. Existence of trigger of coupled three singular points and homoclinic orbit in the form of number "eight" depending on system kinetic parameters and appearance of the bifurcation of relative equilibrium positions are investigated. Functional dependence between angle of disk relative arbitrary position on rotating circle trace and time of motion duration is derived. For obtaining this solution, an elliptic integral is derived. For solving elliptic integral, series of transformations are introduced and functions under the elliptic integral are expanded in three series along angle of disk relative arbitrary position on rotate circle trace. By use obtained functional dependence between time of disk rolling and angle of disk relative position, discussion of different period duration of rolling disk oscillations along rotating circle trace about vertical central axis is done depending of initial conditions and constant angular velocity of the circle rotation.*

**Key words:** *Rolling heavy disk, rotating circle, axis of circle rotation, non-linear differential equation, trigger of coupled three singular points, homoclinic orbit in the form of number "eight", elliptic integral, expansion in series, initial conditions, bifurcation, relative equilibrium position .*

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