The 28th International Conference
on Applications of Computer Algebra ACA'2023

PROGRAM & ABSTRACTS

Warsaw University of Life Sciences – SGGW
Institute of Information Technology
July 17 – 21, 2023

WWW: https://aca2023.iit.sggw.pl

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Schedule for Computer Algebra Modeling in Science and Engineering Session

Organized by Alexander Prokopenya, Haiduke Sarafian

Tuesday, July 18

Build. 34, 3d floor, Room 3/40

14:00 – 14:30   **Ryszard Kozera**
                     Fitting sparse reduced data

14:30 – 15:00   **Marcin Choinski**
                     A discrete SIS model built on the strictly positive scheme

15:00 – 15:30   **Marcin Ziółkowski**
                     On applications of computer algebra systems in queueing theory calculations

Wednesday, July 19

Build. 34, 3d floor, Room 3/40

14:00 – 14:30   **Haiduke Sarafian**
                     Analyzing electric circuits with computer algebra

14:30 – 15:00   **Setsuo Takato**, Hideyo Makishita
                     LMS with simple modeling developed by extended CindyJS and Maxima

15:00 – 15:30   Setsuo Takato, **Jose A. Vallejo**
                     Billiards: At the intersection of Math, Physics and Computer Algebra

15:30 – 16:00   Coffee Break

16:00 – 16:30   Tatjana Petek, **Valery G. Romanovski**
                     Computation of normal forms for systems with many parameters

16:30 – 17:00   Alina Ivashkevich, Victor Red'kov, **Alexander Chichurin**
                     Spin 1 particle with anomalous magnetic moment in external uniform electric field: solutions with cylindric symmetry

17:00 – 17:30   **Alexander Prokopenya**
                     On stability of stationary motion of the 3D swinging Atwood machine

17:30 – 18:00   **AmirHosein Sadeghimanesh**, Matthew England
                     Semi-algebraic representations for the multistationarity region of reaction networks

Friday, July 21

Build. 34, 3d floor, Room 3/40

09:30 – 10:00   **Aigerim Ibraimova**, Alexander Prokopenya, Mukhtar Minglibayev
                     Derivation of the evolution equations in the restricted three-body problem with variable masses by using Computer Algebra

Derivation of the evolution equations in the restricted three-body problem with variable masses by using Computer Algebra

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Observational astronomy states that celestial bodies are unsteady, their masses, sizes, shapes and structures change in the process of evolution. Variability in the masses of celestial bodies, especially at the nonstationary stage of the system, significantly affects the further dynamical evolution of this system as a whole [1, 2, 3]. In this connection, we consider the restricted three-body problem with variable mass in the presence of reactive forces. The problem was investigated by methods of perturbation theory, based on the aperiodic motion along a quasi-conic section developed by us [4]. The system of differential equations of perturbed motion in oscillating variables of aperiodic motion along a quasi-conic section in the form of Newton's equation was derived [5]. By using Computer Algebra we obtained the equations of secular perturbation of the restricted three-body problem with variable masses in the presence of reactive forces [6].

Keywords
restricted three-body problem, variable mass, reactive forces, secular perturbations

References
[1] T. OMAROV (ED.), *Non-Stationary Dynamical Problems in Astronomy*. Nova Science Publ., New-York, 2002.
[2] A. PROKOPENYA; M. MINGLIBAYEV; S. SHOMSHEKOVA, Computing Perturbations in the Two-Planetary Three-Body Problem with Masses Varying Non-isotropically at Different Rates. *Mathematics in Computer Science* **14**(2), 241–251 (2020).
[3] EGGLETON P. *Evolutionary processes in binary and multiple stars*. Cambridge University Press. – 2006. – P.332.

[4] M. MINGLIBAYEV, *Dynamics of gravitating bodies with variable masses and sizes.* LAMBERT Academic Publishing, Saarbrücken, 2012.

[5] M. MINGLIBAYEV; CH. OMAROV; A. IBRAIMOVA, New forms of the perturbed motion equation. *RNAS RK*. **2**(330), 5–13 (2020).

[6] IBRAIMOVA A.T., MINGLIBAYEV M.ZH., PROKOPENYA A.N. Study of Secular Perturbations in the Restricted Three-Body Problem of Variable Masses Using Computer Algebra // Computational Mathematics and Mathematical Physics. **63**(1), 115–125 (2023).