Renato Huzak

Address
Department of Mathematics and Statistics
Hasselt University, Belgium, email: renato.huzak@uhasselt.be

Education

- Ph.D.: Jan 2010-Oct 2013, Dept of Math, Hasselt University, Belgium
- Master: Oct 2003-Feb 2008, Dept of Math, University of Zagreb, Croatia

Professional Experience

- 2021-: Associate Professor, Dept of Math, Hasselt University, Belgium
- 2016-2021: Assistant Professor, Dept of Math, Hasselt University, Belgium
- 2015-2016: Postdoctoral Researcher, Dept of Math, York University, Toronto, Canada
- 2014-2015: Postdoctoral Researcher, Dept of Math, Hasselt University, Belgium

Short Term Visits

University of Groningen, The Netherlands; University of Zagreb, Croatia; York University, Toronto, Canada; Plymouth University, England; Institute of Mathematics, Hanoi, Vietnam; TU Dresden, Germany; School of Mathematics and Maxwell Institute of Mathematical Sciences, University of Edinburgh, United Kingdom

Publications

1. R. Huzak, P. De Maesschalck, F. Dumortier, *Limit cycles in slow-fast codimension 3 saddle and elliptic bifurcations*, J. Differ. Equations 255, No. 11, 4012–4051 (2013).
2. R. Huzak, P. De Maesschalck, F. Dumortier, *Primary birth of canard cycles in slow-fast codimension 3 elliptic bifurcations*, Commun. Pure Appl. Anal. 13, No. 6, 2641–2673 (2014).
3. R. Huzak, P. De Maesschalck. *Slow divergence integrals in generalized Liénard equations near centers*, Electron. J. Qual. Theory Differ. Equ. 2014, No. 66, 1–10.
4. P. De Maesschalck, R.Huzak. *Slow divergence integrals in classical Liénard equations near centers*, J. Dyn. Differ. Equations 27, No. 1, 177–185 (2015).
5. R. Huzak, *Cyclicity of the origin in slow-fast codimension 3 saddle and elliptic bifurcations*, Discrete Contin. Dyn. Syst. 36, No. 1, 171–215 (2016).
6. R. Huzak, *Normal forms of Liénard type for analytic unfoldings of nilpotent singularities,* Proc. Am. Math. Soc. 145(10), 4325–4336 (2017).
7. R. Huzak, *Regular and slow-fast codimension 4 saddle-node bifurcations*, J. Differ. Equations 262, No. 2, 1119–1154 (2017).
8. R. Huzak, *Cyclicity of degenerate graphic DF2a of Dumortier-Roussarie-Rousseau program*, Commun. Pure Appl. Anal. 17, No. 3, 1305–1316 (2018).
9. R. Huzak, *Box dimension and cyclicity of canard cycles.* Qual. Theory Dyn. Syst., 17 (2018), 475–493.
10. R. Huzak, *Predator-prey systems with small predator's death rate*, Electron. J. Qual. Theory Differ. Equ., 2018, No. 86, 1–16.
11. R. Huzak, D. Vlah. *Fractal analysis of canard cycles with two breaking parameters and applications*, Commun. Pure Appl. Anal. 18, No. 2, 959–975 (2019).
12. R. Huzak, *The slow divergence integral on a Möbius band*, J. Differ. Equations 266, No. 10, 6179–6203 (2019).
13. R. Huzak, *Quartic Liénard equations with linear damping*, Qual. Theory Dyn. Syst. 18, No. 2, 603–614 (2019).
14. R. Huzak, *Canard Explosion Near Non-Liénard Type Slow-Fast Hopf Point*, J. Dyn. Differ. Equations 31, No. 2, 683–709 (2019).
15. R. Huzak, *Finite cyclicity of the contact point in slow-fast integrable systems of Darboux type*, Electron. J. Differ. Equ. 2020, Paper No. 90, 15 p. (2020).

16. R. Huzak, V. Crnkovic, D. Vlah, *Fractal dimensions and two-dimensional slow-fast systems*, J. Math. Anal. Appl. 501, No. 2, Article ID 125212, 21 p. (2021).
17. R.Huzak, D. Rojas, *Period function of planar turning points*, Electron. J. Qual. Theory Differ. Equ. 2021, No. 16, 1–21.
18. L. Horvat Dmitrovic, R. Huzak, D. Vlah, V. Zupanovic, *Fractal analysis of planar nilpotent singularities and numerical applications*, J. Differ. Equations 293, 1–22 (2021).
19. P. De Maesschalck, R. Huzak, Y. Patsios, N. Popovic, *Jump-induced mixed-mode oscillations through piecewise-affine maps*, J. Math. Anal. Appl., 505, No. 1, Article ID 125641, 29 p. (2022).
20. R. Huzak, *Cyclicity of canard cycles with hyperbolic saddles located away from the critical curve*, J. Differ. Equations 320, 479–509 (2022).
21. R. Huzak, D. Rojas *Abelian Integrals and Non-generic Turning Points*, Qual. Theory Dyn. Syst. 21, No. 3, Paper No. 77, 18 p. (2022).
22. H. J. Kojakhmetov, R. Huzak, *Slow-fast torus knots*, Bull. Belg. Math. Soc. Simon Stevin 29 (2022), no. 3, 371—388.
23. J. Yao, R. Huzak, *Cyclicity of the Limit Periodic Sets for a Singularly Perturbed Leslie–Gower Predator–Prey Model with Prey Harvesting*, J Dyn Diff Equat (2022). https://doi.org/10.1007/s10884-022-10242-2
24. R. Huzak, D. Vlah, D. Zubrinic, V. Zupanovic, *Fractal analysis of degenerate spiral trajectories of a class of ordinary differential equations*, Appl. Math. Comput. 438, Article ID 127569, 15 p. (2023).
25. R. Huzak, K. Uldall Kristiansen, *The number of limit cycles for regularized piecewise polynomial systems is unbounded*, J. Differ. Equations 342, 34–62 (2023).
26. P. De Maesschalck, R. Huzak, A. Janssens, G. Radunovic, *Fractal codimension of nilpotent contact points in two-dimensional slow-fast systems*, J. Differ. Equations 355, 162–192 (2023).
27. R. Huzak, P. Mardesic, M. Resman, V. Zupanovic, *Reading multiplicity in unfoldings from ϵ-neighborhoods of orbits*, submitted
28. P. De Maesschalck, R. Huzak, A. Janssens, G. Radunovic, *Minkowski dimension and slow-fast polynomial Liénard equations near infinity*, submitted.
29. J. Yao, J. Huang, R. Huzak, *Cyclicity of slow-fast cycles with two canard mechanisms*, submitted.
30. V. Crnkovic, R. Huzak, M. Resman, *Fractal analysis of hyperbolic saddles with applications*, submitted.

Talks

1. *A solution to fractal Hilbert's 16th problem for slow-fast Liénard equations*, Invited speaker, Bifurcations of Dynamical Systems and Numerics WORKSHOP 2023, May 9–13, Zagreb, Croatia
2. *A new approach for detection of nonzero Lyapunov coefficients*, Seminar, University of Groningen, The Netherlands, 18 April 2023
3. *A new approach for detection of nonzero Lyapunov coefficients*, International Online GSDUAB Seminar, Barcelona, 6 March 2023
4. *Detection of the first nonzero Lyapunov quantity in degenerate slow-fast Hopf bifurcations from fractality of planar contact points*, Online Talk, 17 October 2022, Central China Normal University, Wuhan
5. *Detection of the first nonzero Lyapunov quantity in degenerate slow-fast Hopf bifurcations from fractality of planar contact points*, Talk, ICDEA 2022, 18–22 July 2022, Paris-Saclay, France
6. *Predator-prey slow-fast cycles and Hilbert's 16th problem*, Talk, EQUADIFF, 11–15 July 2022, Brno, Czech Republic
7. *Fractal analysis of slow-fast systems*, Talk, Bifurcations of dynamical systems, Workshop, 9th–12th February, 2022, Zagreb, Croatia.
8. *Fractal dimensions and 2-dimensional slow-fast systems*, Talk, DynamicsDays2021, Nice, France, August 2021.
9. *Period function near planar turning points*, Talk, NoLineal 20-21 Online, Madrid, Spain, June 30-July 2, 2021.
10. *Period function near planar turning points*, Talk, SIAM Conference on Applications of Dynamical Systems (DS21), held virtually May 23-27, 2021.

11. *Slow-fast systems in dimensions 2 and 3*, Talk (Zoom platform), organized by Maja Resman, 4.11.2020, University of Zagreb, Croatia, http://degiorgi.math.hr/kolokvij/view.php?id=172
12. *Cyclicity of canard cycles with hyperbolic saddles located away from the slow curve*, Seminar, University of Edinburgh, UK, December 3-5, 2019
13. *Slow-fast Darboux systems*, Dynamics, Equations and Applications (DEA 2019), Invited speaker, Kraków, Poland, 16th to 20th September 2019
14. *Cyclicity of canard cycles with hyperbolic saddles located away from the slow curve*, Invited speaker, Advances in Qualitative Theory of Differential Equations, Castro Urdiales, Spain, June 17-21, 2019
15. *Slow-fast systems on a Möbius band*, Invited speaker, SIAM Conference on Applications of Dynamical Systems (DS19), Snowbird, Utah, May 19 - 23, 2019.
16. *The slow divergence integral on a Mobius band*, invited speaker, "Workshop on Algebraic and Analytical Methods for Dynamical Systems with Applications to Reaction Networks" organized by Sebastian Walcher, Aachen University, Germany, April 30, 2019.
17. *The slow divergence integral on a Mobius band* and *Quartic Lienard equations with linear damping*, Invited speaker, ZAGREB DYNAMICAL SYSTEMS WORKSHOP 2018, October 22–26, Zagreb, Croatia
18. *Slow-fast bifurcations and Hilbert's 16th problem*, Invited speaker, SPT 2018, Cagliary, Italy, June 2018
19. *Box dimension and cyclicity of canard cycles*, University of Zagreb, Croatia, April 2018
20. *Normal forms of Liénard type, slow-fast bifurcations and fractal geometry of canard cycles*, Hasselt University, Belgium, November, 2017
21. *Normal forms of Liénard type, slow-fast bifurcations and fractal geometry of canard cycles*, University of Toulouse, France, November, 2017
22. *Regular and slow-fast codimension 4 saddle-node bifurcations*, EquaDiff 2017
23. *Regular and slow-fast codimension 4 saddle-node bifurcations*, University of Zagreb, Croatia, April 2017
24. *Slow-fast predator-prey systems*, Talk given at The Annual Meeting of the Canadian Society of Applied and Industrial Mathematics (CAIMS 2016), Edmonton, Alberta, Canada, June 26–30, 2016
25. *Codimension 4 saddle-node bifurcations*, Talk given at York University, November 15 – 28, 2015, Toronto, Canada
26. *Geometric singular perturbation theory and planar slow-fast systems*, Talk given at Institute of Mathematics, Hanoi, Vietnam, September 7–19, 2015
27. *Limit cycles in Liénard equations and blow-up techniques*, Talks given at Plymouth University, April 12 – May 1, 2015, Plymouth, England
28. *Slow-fast codimension 3 bifurcations*, Talk given at Fourth PhD-Day: Royal Academy, September 9, 2013, Brussel, Belgium
29. *Cyclicity of the origin in slow-fast codimension 3 bifurcations*, Talk given at Workshop on Slow-Fast Dynamics: Theory, Numerics, Application to Life and Earth Sciences, June 3 – June 7, 2013, Barcelona, Spain
30. *Limit cycles in slow-fast codimension 3 saddle and elliptic bifurcations*, Talk given at The 9th AIMS Conference on Dynamical Systems, Differential Equations and Applications, July 1 – 5, 2012, Orlando, Florida, USA
31. Poster with P. De Maesschalck and F. Dumortier on *Limit cycles in slow-fast codimension 3 saddle and elliptic bifurcations*, September 12 – 16, 2011, Castro Urdiales, Spain

Promotor/co-promotor (PhD)

1. Promotor of Yiorgos Patsios Aug 2022, "Geometry of jump-induced mixed-mode oscillations and topological horseshoes in three-dimensional slow-fast systems"
2. Co-promotor of Maikel Bosschaert Jan 2023, "Homoclinic solutions in finite and infinite dimensional systems"