# RESUME – Assoc. Prof. Yizhar Or


Full name: Yizhar Or

Date and place of birth: 03.04.1974, Israel

Marital status: Married + 3

Web site: http://yizhar.net.technion.ac.il/

Contact: Office: +972-48295493, Email: izi@technion.ac.il


## ACADEMIC DEGREES

2001-2007: Ph. D. in Mechanical Engineering (direct doctoral track), Technion, Israel

1997-2001: B. Sc. Summa cum Laude in Mechanical Engineering, Technion, Israel

1997-2001: B. Sc. Summa cum Laude in Education in Computer Science, Technion, Israel

## ACADEMIC APPOINTMENTS

2018-present: Associate Professor, Faculty of Mechanical Engineering, Technion, Israel

2010-2017: Assistant Professor, Faculty of Mechanical Engineering, Technion, Israel
(this rank was named "Senior Lecturer" at the Technion until 2012)

2009-2010: Lecturer, Faculty of Mechanical Engineering, Technion, Israel

2007-2009: Postdoctoral Scholar, Dept. of Control and Dynamical Systems, California Institute of Technology (Caltech), California, USA

2007: Short-term postdoctoral scholar, Faculty of Mechanical Engineering and Russell Berrie Nanotechnology Institute (RBNI), Technion, Israel

## PROFESSIONAL EXPERIENCE

7/2002 – 9/2002 Intern at Guzik Technical Enterprises, Mountain View, CA, USA.
Summer program supported by the American Technion Society (ATS)

2001 System Integrator at Gene Bio-Applications Ltd.: Design of a User Interface (Visual Basic) managing an automated laboratory system including Vision, Image Processing, activation of a switching system, and activation of a special laboratory robot.

12/1996 – 6/1997 Teacher of Mathematics in Sde-Eliyahu high School (9th grade)

## RESEARCH INTERESTS

Dynamics and control of robotic locomotion, particularly legged locomotion and microswimmers.

Dynamics of low-Reynolds-number swimming in biological and bio-medical systems

Non-smooth dynamics of mechanical systems with intermittent frictional contacts.

Hybrid dynamical systems, Nonlinear dynamics and control, Geometric mechanics, Robotics

## TEACHING EXPERIENCE

**Instructor: (2009-present, Technion)**

New course – 036087 "Hybrid dynamics in mechanical systems" (joint undergraduate + graduate).
Approved 2014, was given twice under "Advanced topics in Mechanical Engineering".

036026 Kinematic, dynamics and control of robots (joint undergraduate + graduate)

034032 Linear systems (undergraduate)

034010 Dynamics (undergraduate)

035010 Kinematics of mechanisms (undergraduate)

034339/40 Robotics project 1/2 (undergraduate)

**Teaching assistant: (2001-2007, Technion)**

034032 Linear systems (undergraduate)

034040 Introduction to control (undergraduate)

034011 Theory of vibrations (undergraduate)

035188 Control Theory (undergraduate)

036026 Kinematics, dynamics and control of robots (joint undergraduate + graduate)

## DEPARTMENTAL ACTIVITIES

2009 – present: Head of the Laboratory of Bio-Dynamics and Mechanics of Locomotion

2009 – present: Head of "Reamim" program for excellent undergraduate students

2009-2015: Member of graduate studies committee

## PUBLIC PROFESSIONAL ACTIVITIES

### Reviewer:

**Scientific Journals:** Science Robotics, Phys. Rev. Letters, Phys. Rev E, Proc. Roy. Soc. A, Journal of Fluid Mechanics, Small (Wiley), Soft Robotics, IEEE Transaction on Robotics, IEEE Transaction on Automatic Control, IEEE Transaction on Automation Science & Engineering, Automatica, PLOS One, Journal of Nonlinear Science, International Journal of Nonlinear Mechanics, SIAM Journal on Applied Dynamical Systems, Nonlinear Dynamics, Physica D, European Physical Journal E, Bioinspiration and Biomimetics, Mechanisms and Machine Theory, Journal of Sound and Vibration, European Journal of Mechanics - B/Fluids, Discrete and Continuous Dynamical System – B, Mechanics Research Communications, Mathematical Problems in Engineering.

**Research grant proposals:** Israel Science Foundation.

**Conference Proceedings:** IEEE Conference on Decision and Control (CDC), IEEE Conference on Robotics and Automation (ICRA), IEEE/ASME American Control Conference (ACC), IFAC Symposium on Nonlinear Control Systems (NOLCOS), IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)

## MEMBERSHIP IN PROFESSIONAL SOCIETIES

IEEE Control Systems society + Robotics and Automation Society

American Physical Society (APS), Division of Fluid Dynamics (DFD)

## AWARDS AND HONORS

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|---|---|
| 1997-2001 | Certificate of excellence in B.Sc. studies, President of the Technion (for all 8 semesters of undergraduate studies) Two B.Sc. Degrees Summa Cum Laude, Average grade 94.4 |
| 2002 | Outstanding achievements scholarship - Graduate School, Technion |
| 2001 - 2005 | Technion Award for Excellence in Teaching, awarded six times |
| 2004 | Ne'eman scholarship for excellent Ph.D beginners, Technion. |
| 2005 | Lev-Zion scholarship for excellent Ph.D students from peripheral areas, Planning and Budgeting Committee, Israeli Council for Higher Education (VATAT) |
| 2007 | Pnueli Prize for excellent Ph.D. thesis, Faculty of Mech. Eng. Technion |
| 2007-2008 | Fulbright Postdoctoral Fellowship |
| 2007-2009 | Bikura Postdoctoral Scholarship (ISF) for two academic years |
| 2009 | Guan Zhao-Zhi Best Paper Award, IEEE International conference on Decision and Control (CDC) 2009, (paper C11) |
| 2010 | David Posnack Memorial Academic Lectureship |
| 2011 | Award of excellence in teaching, (034010 Dynamics, spring term 2011) |
| 2013 | Award of excellence in teaching, (034032 Linear Systems, spring term 2013) |
| **2014** | **Moshe Yanai Prize for excellence in teaching, Technion** |
| 2015 | Uzi and Michal Halevy Fund for Innovative Applied Engineering, Research Grant no. 2020992, joint with Amir Gat |
| 2013 | Award of excellence in teaching, (034032 Linear Systems, spring term 2013) |
| 2017 | Technion's remarkable excellence in teaching, spring term 2017. |

## GRADUATE STUDENTS

**Ph.D. students - graduated:** (J - journal paper, C- conference paper, T - conference talk)

1. Emiliya Gutman, Currently at Rafael, "Analysis of the Dynamics of Miniature Swimmers", graduated January 2016. [J12, J15, J17, J18, J20]

**Ph.D. students - ongoing:**

1. Oren Wiezel, "Optimal control of simplified microswimmer models", direct PhD track, candidacy qualified May 2016, expected graduation 2019. [J21,C17, J28,J32]

2. Benny Gamus (co-supervisor Amir Gat), "Dynamic walking locomotion of soft robots with embedded fluidic networks", qualified PhD candidacy, expected graduation 2020. [J26].

3. Lior Salem (co-supervisor Amir Gat), "Soft legged robot actuated by embedded fluidic network", started 3/2015, direct PhD track (qualified PhD candidacy Nov. 2017) at Technion Autonomous Systems Program. Expected graduation 2/2020 [J26].

**M.Sc. students - graduated:**

1. Benny Gamus, "Analysis of dynamic bipedal robot walking with contact transitions", Graduated 2013. [J16, C15]

2. Adi Cohen, "Dynamics and control of a robotic walking exoskeleton for disabled persons", Graduated 2014. Currently at KAMAG, Israel. [J27]

3. Asaf Gross, "Analysis of Dynamic Jumping Motion of a Robotic Leg", graduated 2014 [T27].

4. Lior Lasker, "Motion planning of parallel manipulator with joint clearances", graduated 2015 [T18].

5. Motti Moravia (Brakim program*), "Influence of foot slippage on the dynamics and performance of simple legged locomotion models", graduated 2015 [J19].

6. Ofir Chakon (Brakim program*), "Dynamics and control of the Twistcar toy vehicle", graduated October 2015 [T22, J24].

7. Paz Aranyi (Brakim program* ,co-supervisor with J. Dayan), "Optimization of a hybrid robot's weight lifting ability", graduated 2017 [T30]

8. Evgenia Virozub (co-supervisor Alon Wolf), "Dynamics and gait optimization of a multi-link swimming robot using "perfect fluid" model", graduated 2017. [J28, T33]

9. Yuval Harduf (Brakim program*), "Analysis of stability transitions in a superparamagnetic microswimmer" graduated 2017. [J29,T35,T37,T43]

**M.Sc. students - ongoing:**

10. Roee Keren, "Analysis of dynamics and actuation and preliminary design of an exoskeleton - a device for assistance in legged motion and load carrying", thesis defended October 2017. [J25,J30]

11. Eran Ben-Haim (Brakim program*, co-supervisor with Amir Gat), "Dynamics of two-legged flattened soft robots powered by embedded fluid-filled channel networks", expected graduation 4/2018. [J26]

12. Oriel Halbani, "Investigation of the hybrid nonholonomic dynamics of the twistcar vehicle under stick-slip transitions", started Nov. 2014, expected graduation 2018.

13. Dan Kellner, "Lyapunov Stability of a Planar Rigid Body Supported by Two Frictional Contacts ", started Sep. 2015, expected graduation 2018.

14. Tal Yona, "Investigation of singular configurations in the dynamics of the kinematic snake robot model", started Sep. 2015, expected graduation 2018.

*Brakim program – a pre-military program for excellent students who complete both BSc and MSc degrees in 4.5 years.

## RESEARCH GRANTS

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|---|---|
| 2010 | Bikura research grant for a new faculty (ISF) - 29,000$ |
| 2011 | Technion Autonomous Systems Program (TASP) – 20,000$, "Control of bipedal robotic locomotion", with M. Zacksenhouse and P.O. Gutman. [J15, C14, C15] |
| 2012 | Technion Autonomous Systems Program (TASP) – 30,000$, "Control of bipedal robotic locomotion", with M. Zacksenhouse & P.O. Gutman. [J15, C14, C15] |
| 2014-2018 | Israel Science Foundation – 235,392$, "Investigation of robotic microswimmers' propulsion, dynamics and control". |
| 2015-2017 | Ministry of Defense (MAFAT) – 700,000ILS, "Soft-robots based on embedded fluidic networks", joint with Amir Gat (700,000 to each PI for 3 years). |
| 2015 | Uzi and Michal Halevy Fund for Innovative Applied Engineering Research – 20,000$, "Soft-robots based on embedded fluidic networks", joint with Amir Gat. |
| 2016 | Ministry of Defense (MAFAT) – 200,000ILS, "Feasibility investigation of a wearable passive device for energy saving in outdoor walking with heavy loads". |
| 2017 | Ministry of Science and Technology (MOST): 1.1 Millions NIS for 3 years, "Dynamic Legged Locomotion of a Soft Robot Actuated by flow in an Embedded Channel Network", joint with Amir Gat. |

## PUBLICATIONS

Supervised students are underlined. Publications are also available online **here**.

### Ph. D. Thesis:

Frictional Equilibrium Postures for Robotic Locomotion – Computation, Geometric Characterization, and Stability Analysis", Advisor: Prof. Elon Rimon, Technion, Israel

### Refereed papers in professional journals my name in bold

### Published papers

J1. **Y. Or** and E. Rimon, "Computation and Graphical Characterization of Robust Multiple-Contact Postures in Two-Dimensional Gravitational Environments", *Int. J. of Robotics Research*, 25(11): 1071-1086, 2006.

J2. E. Rimon, R. Mason, J. W. Burdick and **Y. Or**, "A General Stance Stability Test Based on Stratified Morse Theory with Application to Quasi-Static Locomotion Planning", *IEEE Trans. on Robotics*, 24(3):626-641, 2008.

J3. **Y. Or** and R. M. Murray, "Dynamics and Stability of a Class of Low Reynolds Number Swimmers Near a Wall", *Physical Review E*, 79(4):045302R, 2009. (4 pages)

J4. **Y. Or** and E. Rimon, "Analytic Characterization of a Class of 3-Contact Frictional Equilibrium Postures in Three-dimensional Gravitational Environments*", Int. J. of Robotics Research*, 29(1): 3-22, 2010.

J5. D. G. Crowdy and **Y. Or**, "Two-dimensional point singularity model of a low Reynolds number swimmer near a wall", *Physical Review E,* 81(3):036313, 2010

J6. **Y. Or**, "Dynamics and stability of Purcell's three-link microswimmer near a wall", *Physical Review E*, 82(6):065302(R), 2010.

J7. **Y. Or** and A. R. Teel, "Zeno Stability of the Set-Valued Bouncing Ball", *IEEE Trans. on Automatic Control,* 56(2):447-452, 2011.

J8. **Y. Or** and A. D. Ames, "Stability and Completion of Zeno Equilibria in Lagrangian Hybrid Systems*", IEEE Trans. on Automatic Control* 56(6):1322-1336, 2011.

J9. **Y. Or**, S. Zhang and R. M. Murray, "Dynamics and stability of low-Reynolds-number swimming near a wall", *SIAM J. Applied Dynamical Systems*, 10(3):1013-1041, 2011.

J10. **Y. Or** and E. Rimon, "Investigation of Painlevé's Paradox and Dynamic Jamming During Mechanism Sliding Motion", *Nonlinear Dynamics*, 67:1647–1668, 2012**.**

J11.**Y. Or**, "Asymmetry and stability of shape kinematics in microswimmers' motion", *Physical Review Letters*, 108:258101, 2012. Marked as "Editor's Suggestion".

J12. E. Passov (Gutman) and **Y. Or**, "Dynamics of Purcell's three-link microswimmer with a passive elastic tail", *European Physical Journal E* 35(8):78, 2012. (invited paper at special issue on active matter)

J13. **Y. Or**, "Painlevé's paradox and dynamic jamming in simple models of passive dynamic walking", *Regular and Chaotic Dynamics*, 19(1):64-80, 2014. (Springer, invited paper at a special issue: 150$^{th}$ anniversary of anniversary Paul Painlevé's birthday)

J14. D. Alkaher, A. Moshaiov and **Y. Or**, "Guidance laws based on optimal feedback linearization pseudo-control with time-to-go estimation", *AIAA Journal of Guidance, Control, and Dynamics*, 37(4): 1298-1305, 2014.

J15. E. Gutman and **Y. Or**, "Simple model of a planar undulating magnetic microswimmer", *Physical Review E* 90(1):013012, 2014. (6 pages)

J16. B. Gamus and **Y. Or**, "Analysis of simple rigid-body models of dynamic bipedal walking under stick-slip transitions", *SIAM J. Applied Dynamical Systems* 14(2):609-642, 2015.

J17. B. Jang, E. Gutman, N. Stucki, B. Seitz, P. García-Wendel, T. Newton, J. Pokki, O. Ergeneman, S. Pané, **Y. Or**, and B. J. Nelson, "Undulatory locomotion of magnetic multi-link nanoswimmers", *ACS Nano Letters* 15(7):4829-4833, 2015

J18. E. Gutman and **Y. Or**, "Symmetries and gaits for Purcell's three-link microswimmer model", *IEEE Trans. Robotics* 32(1):53-69, 2016.

J19. M. Moravia and **Y. Or**, "Analysis of foot slippage effects on an actuated spring-mass model of dynamic legged locomotion", *International Journal of Advanced Robotic Systems* 13:69, 2016.

J20. E. Gutman and Y. Or, "Optimizing an undulating magnetic microswimmer for cargo towing", *Physical Review E* 93(6):063105, 2016.

J21. O. Wiezel and **Y. Or**, "Optimization and small-amplitude analysis of Purcell's three-link microswimmer model", *Proc. Roy. Soc. A*, 472: 20160425, 2016.

J22. P. L. Varkonyi and **Y. Or**, “Lyapunov stability of a rigid body with two frictional contacts”, *Nonlinear Dynamics* (Springer), 88(1),363-393, 2017. DOI: 10.1007/s11071-016-3247-6

J23. **Y. Or** and E. Rimon, “Characterization of frictional multi-legged equilibrium postures on uneven terrains”, *International Journal of Robotics Research*, 36(1):105-128, 2017.

J24. O. Chakon & **Y. Or**, “Analysis of underactuated dynamic locomotion systems using perturbation expansion - the twistcar toy example”, *J. Nonlinear Science,* 27(4):1215-1234, 2017.

J25. R. Keren and **Y. Or**, "Energy performance analysis of a backpack suspension system with a timed clutch for human load carriage", published online at *Mechanism and Machine Theory (Elsevier)* 120 (2018), pp. 250–264.

J26. B. Gamus, E. Ben-Haim, L. Salem, A. D. Gat and **Y. Or**, "Interaction between Inertia, Viscosity and Elasticity in Soft Robotic Actuator with Fluidic Network", IEEE Transaction on Robotics, published online December 2017. DOI: 10.1109/TRO.2017.2765679

**Accepted papers:**

J27. A. Cohen and **Y. Or**, “Modelling the Dynamics and Control of Rehabilitative Exoskeleton with Robotic Crutches", revision submitted.

**Submitted papers:**

J28. E. Virozub, O. Wiezel and **Y. Or**, "Multi-link swimmers: experiments and theoretical investigation using 'perfect fluid' Model".

J29. Y. Harduf, D. Jin, **Y. Or**, and L. Zhang, "Nonlinear parametric excitation effect induces stability transitions in swimming direction of flexible superparamagnetic microswimmers".

J30. R. Keren and **Y. Or**, "Theoretical Analysis of a passive wearable spring-clutch mechanism for reducing metabolic energy cost during human walking".

J31. I. Fouxon and **Y. Or**, "Inertial self-propulsion of spherical microswimmers by rotation-translation coupling". Submitted Nov 2017. *arXiv preprint arXiv:1710.10677*.

J32. O. Wiezel, L. Giraldi, A. DeSimone, **Y. Or** and F. Alouges, "Energy-optimal small-amplitude strokes for multi-link microswimmers: Purcell's loops and Taylor's waves reconciled". Submitted January 2018. *arXiv preprint arXiv:1801.04687*.

**Refereed papers in Conference proceedings**

**Published papers** (graduate students – underlined, presenter – marked by ‘*’)

C1. **Y. Or*** and E. Rimon, “Robust Multiple-Contact Postures in a Two- Dimensional Gravitational Field”, *Proc. 2004 IEEE Int. Conf. on Robotics and Automation*, pp. 4783-4788, New Orleans, LA, April 26 - May 1, 2004

C2. **Y. Or** and E. Rimon*, “Computation and Graphical Characterization of Robust Multiple-Contact Postures in 2D Gravitational Environments”, *Proc. 2005 IEEE Int. Conf. on Robotics and Automation*, pp. 247-252, Barcelona, Spain, April 18-22, 2005

C3. **Y. Or**[*] and E. Rimon, "Computing 3-Legged Equilibrium Stances in Three- Dimensional Gravitational Environments", *Proc. 2006 IEEE Int. Conf. on Robotics and Automation*, pp. 1984-1989, Orlando, FL, May 15-19, 2006

C4. **Y. Or**[*] and E. Rimon, "Geometric Characterization and Experimental Validation of Frictional 3-Contact Equilibrium Stances in Three Dimensions", *Proc. 2007 IEEE Int. Conf. on Robotics and Automation*, pp. 193-198, Rome, Italy, April 10-14, 2007

C5. D. Meltz, **Y. Or**[*] and E. Rimon, "Experimental Verification and Graphical Characterization of Dynamic Jamming in Frictional Rigid-Body Mechanics", *Proc. 2007 IEEE Int. Conf. on Robotics and Automation*, pp. 580-585, Rome, Italy, April 10-14, 2007

C6. **Y. Or**[*] and E. Rimon, "On the Hybrid Dynamics of Planar Mechanisms Supported by Frictional Contacts. I: Necessary Conditions for Stability", *Proc. 2008 IEEE Int. Conf. on Robotics and Automation*, pp. 1213-1218, Pasadena, CA, May 19-23, 2008

C7. **Y. Or**[*] and E. Rimon, "On the Hybrid Dynamics of Planar Mechanisms Supported by Frictional Contacts. II: Stability of Two-Contact Rigid Body Postures", *Proc. 2008 IEEE Int. Conf. on Robotics and Automation*, pp. 1219-1224, Pasadena, CA, May 19-23, 2008

C8. **Y. Or**[*] and A. D. Ames, "Stability of Zeno Equilibria in Lagrangian Hybrid Systems", *Proc. 2008 IEEE Conf. on Decision and Control (CDC)*, pp. 2770-2775, Cancun, Mexico, December 9-11, 2008

C9. **Y. Or** and A. D. Ames[*], "Existence of Periodic Orbits with Zeno Behavior in Completed Lagrangian Hybrid Systems", in *Proc. Hybrid Systems: Computation and Control, Lecture Notes on Computer Science*, Springer-Verlag, 2009, pp. 291-305, San Francisco, CA, April 13-15, 2009.

C10. **Y. Or**[*] and A. D. Ames, "Formal and Practical Completion of Lagrangian Hybrid Systems", in *Proc. 2009 American Control Conference (ACC*), pp. 3624-3631, St. Louis, MO, June 10-12, 2009.

C11. **Y. Or**, J. Vankerschaver[*], S. D. Kelly, R. M. Murray and J. E. Marsden, "Geometric Control of Particle Manipulation in a Two-Dimensional Fluid", in *Proc. 2009 IEEE Conf. on Decision and Control (CDC)*, pp. 19-26, Shanghai, China, December 16 – 18, 2009. **Winner of Guan Zhao-Zhi Best Paper Award**

C12. S. Zhang[*], **Y. Or** and R. M. Murray, "Experimental demonstration of the dynamics and stability of a low Reynolds number swimmer near a plane wall", in *Proc. 2010 American Control Conference (ACC)* pp. 4205-4210, Baltimore, MD, June 30 - July 2, 2010

C13. **Y. Or**[*] and A. R. Teel, "Using the Set-Valued Bouncing Ball for Bounding Zeno Solutions of Lagrangian Hybrid Systems", *2010 IFAC Symposium on Nonlinear Control Systems (NOLCOS)* pp. 801-806, Bologna, Italy, September, 01-03, 2010

C14. J. Spitz[*], **Y. Or** and M. Zacksenhouse, "Towards a Biologically Inspired Open Loop Controller for Dynamic Biped Locomotion", *Proceedings of the 2011 IEEE conference on Robotics and Biomimetics (ROBIO)*, pp. 503-508, Phucket, Thailand, December 7-11, 2011

C.15 B. Gamus and **Y. Or**, "Analysis of dynamic bipedal robot locomotion with stick-slip transitions", *Proc. 2013 IEEE Int. Conf. on Robotics and Automation*, pp. 3333-3340, Karlsruhe, Germany, May 6-10, 2013

C.16 H. Ziso*, **Y. Or** and M. Shoham. "Numerical model of magnetic bead chain for minimal radius of curvature passage based on linear programming", *Proc. 14th World Congress in Mechanism and Machine Science*, pp. 606-611, Taipei, Taiwan, 25-30 October, 2015.

C17. O. Wiezel* and **Y. Or**, "Using optimal control to obtain maximum displacement gait for Purcell's three-link swimmer", *Proc. 2016 IEEE Conf. on Decision and Control (CDC)*, pp. 4463-4468. Las Vegas, USA, 12-15 December 2016.

## CONFERENCES

**Invited talks at international workshops (funded travel):**

I1. Invited lecture in the International Workshop on Geometric and Topological Methods in Control and Robotics, October 4-6, 2010, Madrid, Spain - "Geometric mechanics, control and stabilization of low-Reynolds-number swimming near boundaries", (1 out of 10 invited speakers).

I2. Invited lecture in the workshop on impact with friction and the Painlevé paradox, Bristol University, UK, 21-22 Nov. 2011 - "Dynamic jamming and Painlevé's paradox". Organizer: Prof. Alan Champneys

**Invited talks at local workshops and at invited sessions in local conferences:**

I3. **Y. Or**, "Exact geometric characterization of equilibrium postures on a frictional terrain in three dimensions", CRI Workshop on Geometry and Topology in Robotics, Haifa University, Israel, January 10, 2010

I4. **Y. Or** and A. R. Teel, "The set-valued bouncing ball and its application to Lagrangian hybrid systems", special session on switched and hybrid systems (organizer: Prof. Michael Margaliot, Tel-Aviv University), IEEE 26th Convention of Electrical and Electronics Engineers in Israel, Eilat, Israel, Nov. 17-20, 2010

I5. **Y. Or,** "Symmetries and stability in the dynamics of robotic microswimmers", CRI Workshop on Topological Robotics, Haifa University, Israel, December 25, 2012.

I6. **Y. Or,** "Dynamics and control of (bio-)robotic locomotion: Nonlinear, nonholonomic and hybrid mechanical systems", 2nd Sweden-Israel Control Conference, Technion, November 9-11, 2014.

I7. **Y. Or**, "Dynamics and control of robotic locomotion", Symposium on Control Theory and Power Engineering (organizers: Prof. Michael Margaliot, and Prof. George Weiss), ICSEE 2016 Conference of IEEE Israel, Eilat, Nov. 16-18, 2016

**Conference talks** (supervised students – underlined, presenter – marked by '*')

T1. **Y. Or**, "Towards Motion Planning and Control of Walking Multi-Legged Robots Under Gravity", Workshop of Graduate Students in Control (GSC 2005), Ben Gurion University, Beer Sheva, Israel, January 3, 2005

T2. **Y. Or*** and E. Rimon, "Computation and Graphical Characterization of Robust Multiple-Contact Postures in 2D Gravitational Environments", The 30th Israeli Conference on Mechanical Engineering, Tel-Aviv, Israel, May 29-30, 2005

T3. **Y. Or*** and E. Rimon, "Computing 3-Legged Equilibrium Stances in Three-Dimensional Gravitational Environments", The 1st Israeli Conference on Robotics (ICR 2006), Tel-Aviv University, Israel, June 29, 2006

T4. **Y. Or***, D. Meltz and E. Rimon, "Dynamic jamming - experimental demonstration of inconsistency in frictional rigid-body dynamics", ICRA 2008 Workshop on Contact Models for Manipulation and Locomotion, Pasadena, CA, May 19, 2008

T5. E. Rimon* and **Y. Or**, "Geometric Characterization and Experimental Validation of Frictional 3-Contact Equilibrium Stances in Three Dimensions", ICRA 2008 Workshop on Algorithmic Automation, Pasadena, CA, May 20, 2008

T6. D. Meltz*, **Y. Or** and E. Rimon, "Experimental Verification and Graphical Characterization of Dynamic Jamming in Frictional Rigid-Body Mechanics", 2nd Israeli Conference on Robotics (ICR 2008), Herzlia, Israel, November 19-20, 2008

T7. **Y. Or*** and R. M. Murray, "Dynamics and stability of low Reynolds number swimming near a plane wall", 61st Annual Meeting of the APS Division of Fluid Dynamics (DFD), San Antonio, Texas, November 23–25, 2008

T8. **Y. Or*** and R. M. Murray, "Dynamics and stability of low Reynolds number swimming near a wall" (poster), IMA Workshop: "Natural Locomotion in Fluids and on Surfaces: Swimming, Flying, and Sliding", University of Minnesota, June 1-5, 2010

T9. **Y. Or*** and E. Rimon, "Investigation of Painlevé's paradox and dynamic jamming during mechanism sliding motion", 7th European Nonlinear Dynamics Conference (ENOC 2011), July 24-29, 2011, Rome, Italy.

T10. **Y. Or***, "Dynamics and stability of Purcell's three-link microswimmer near a wall", 7th European Nonlinear Dynamics Conference (ENOC 2011), July 24-29, 2011, Rome, Italy.

T11. B. Gamus* and **Y. Or**, "Analysis of a Bipedal Walking Robot with Hybrid Dynamics", 32nd Israeli Conf. on Mechanical Engineering, Tel Aviv, Israel, October 17-18, 2012.

T12. E. Gutman* and **Y. Or**, "Dynamics of Purcell's Three-Link Microswimmer with a Passive Elastic Tail", 32nd Israeli Conf. on Mechanical Eng., Tel Aviv, Oct. 17-18, 2012.

T13. **Y. Or***, "Asymmetry and stability of shape kinematics in microswimmers' motion", 65th Annual Meeting of APS Division of Fluid Dynamics, San Diego, CA, USA, November 18-20, 2012.

T14. E. Gutman and **Y. Or***, "Dynamics of Purcell's three-link microswimmer with a passive elastic tail", 65th Meeting of APS Division of Fluid Dynamics, San Diego, CA, November 18-20, 2012.

T15. **Y. Or***, "Asymmetry and stability of shape kinematics in microswimmers' motion", 5th International Symposium on Bifurcations and Instabilities in Fluid Dynamics (BIFD 2013), Haifa, Israel, July 8-11, 2013.

T16. E. Gutman and **Y. Or***, "Dynamics of Purcell's three-link microswimmer with a passive elastic tail", 5th International Symposium on Bifurcations and Instabilities in Fluid Dynamics (BIFD 2013), Haifa, Israel, July 8-11, 2013.

T17. E. Gutman* and **Y. Or**, "Analysis of the dynamics and motion control of miniature swimmers", 4th Israeli Conference on Robotics (ICR 2013), Tel Aviv, Israel, November 19-20, 2013.

T18. L. Lasker* and **Y. Or***, "Path planning of planar parallel manipulator with joint clearances", 4th Israeli Conference on Robotics (ICR 2013), Tel Aviv, Israel, November 19-20, 2013.

T19. B. Gamus and **Y. Or***, "Analysis of dynamic bipedal robot walking with stick-slip transitions", Dynamic Walking 2014, June 10-13, 2014, ETH University, Zurich, Switzerland.

T20. B. Gamus and **Y. Or***, "Analysis of dynamic bipedal robot walking with stick-slip transitions", 8th European Nonlinear Dynamics Conference (ENOC 2014), July 6-11, 2014, Vienna, Austria.

T21. E. Gutman* and **Y. Or**, "Simple model of a planar undulating magnetic microswimmer", 8th European Nonlinear Dynamics Conference (ENOC 2014), July 6-11, 2014, Vienna, Austria.

T22. O. Chakon* and **Y. Or**, "Theoretical and Experimental Investigation of the Twistcar Vehicle's Dynamics", 33rd Israeli Conf. on Mechanical Eng., Tel Aviv, March 2-3, 2015.

T23. A. Cohen* and **Y. Or**, "Dynamics and control of rehabilitative exoskeleton with robotic crutches", 33rd Israeli Conf. on Mechanical Eng., Tel Aviv, March 2-3, 2015.

T24. E. Gutman* and **Y. Or**, "Simple model of a planar undulating magnetic microswimmer", 33rd Israeli Conf. on Mechanical Eng., Tel Aviv, March 2-3, 2015.

T25. E. Gutman and **Y. Or***, "Optimizing an undulating magnetic microswimmer for cargo towing**",** 68th Annual Meeting of APS Division of Fluid Dynamics (DFD), Boston MA, Nov. 22–24, 2015.

T26. I. Perel*, H. Bunis* and **Y. Or**, "Control of a truck and trailer system in reverse", 33rd Israeli Conf. on Mechanical Eng., Tel Aviv, March 2-3, 2015.

T27. A. Gross* and **Y. Or**, "Analysis of Dynamic Jumping Motion of a Robotic Leg", 33rd Israeli Conf. on Mechanical Eng., Tel Aviv, March 2-3, 2015.

T28. **Y. Or***, "Analysis of foot slippage in simple theoretical models of dynamic legged locomotion in sagittal plane", CRM conference on open problems in nonsmooth dynamics, February 1-5, 2016, Barcelona, Spain.

T29. O. Wiezel* and **Y. Or**, "Optimization and small-amplitude analysis of Purcell's three-link microswimmer model", 5th Israeli Conf. on Robotics (ICR 2016), Herzlia, Israel, April 13-14, 2016

T30. P. Aranyi*, **Y. Or** and J. Dayan, "Optimization of a hybrid robot's weight lifting ability", 5th Israeli Conf. on Robotics (ICR 2016), Herzlia, Israel, April 13-14, 2016

T31. M. Goltsman, A. L. Yamamori and **Y. Or***, "Stabilization and path tracking control of a vehicle with trailers in reverse", 5th Israeli Conf. on Robotics (ICR 2016), Herzlia, Israel, April 13-14, 2016

T32. O. Wiezel* and **Y. Or**, "Optimal control, optimization and asymptotic analysis of Purcell's microswimmer model", Israeli Conf. of Mechanical Engineering, Technion Haifa, Nov 22-23, 2016.

T33. E. Virozub* and **Y. Or**, "Dynamics and gait optimization of a swimming snake robot using 'perfect fluid' model", Israeli Conf. of Mechanical Engineering, Technion Haifa, Nov 22-23, 2016.

T34. R. Keren* and **Y. Or**, "Analysis of energy performance of a suspension system with a timed clutch mechanism for human load carriage", Israeli Conf. of Mechanical Engineering, Technion Haifa, Nov 22-23, 2016.

T35. Y. Harduf* and **Y. Or**, "Dynamics and stability analysis of a microswimmer with a superparamagnetic head under a planar oscillating magnetic field", Israeli Conf. of Mechanical Engineering, Technion Haifa, Nov 22-23, 2016.

T36. **Y. Or*** and P. L. Varkonyi "Lyapunov stability of a rigid body with two frictional contacts", Israeli Conf. of Mechanical Engineering, Technion Haifa, Nov 22-23, 2016.

T37. Y. Harduf* and **Y. Or**, "Stability transitions and directional flipping in a microswimmer with superparamagnetic links"**,** 69th Annual Meeting of APS Division of Fluid Dynamics (DFD), Portland OR, Nov. 20–22, 2016.

T38. O. Wiezel* and **Y. Or**, "Optimal control, optimization and asymptotic analysis of Purcell's microswimmer model"**,** 69th Annual Meeting of APS Division of Fluid Dynamics (DFD), Portland OR, Nov. 20–22, 2016.

T39. Y. Harduf* and **Y. Or**, "Analysis of stability transitions in a microswimmer with superparamagnetic head", Annual Conference of the Israeli Association of Theoretical and Applied Mechanics (ISTAM), February 22, 2017, Tel Aviv. (ISTAM Best student lecture distinction).

T40. P. Varkonyi* and **Y. Or**, "Lyapunov stability of a planar rigid body with two frictional point contacts", 9th European Nonlinear Dynamics Conference (ENOC 2017), June 25-30, 2017, Budapest, Hungary.

T41. **Y. Or*** and O. Chakon, "Analysis of underactuated dynamic locomotion systems using perturbation expansion - the twistcar toy example", European Nonlinear Dynamics Conference (ENOC 2017), June 25-30, 2017, Budapest, Hungary.

T42. **Y. Or*** and R. Keren, "Analysis of passive wearable spring-clutch device for energy saving during walking", 9th European Nonlinear Dynamics Conference (ENOC 2017), June 25-30, 2017, Budapest, Hungary.

T43. Y. Harduf and **Y. Or***, "Analysis of stability transitions in a microswimmer with superparamagnetic head", 9th European Nonlinear Dynamics Conference (ENOC 2017), June 25-30, 2017, Budapest, Hungary.

T44. D. Jin*, Y. Harduf, **Y. Or** and L. Zhang, "Stability transitions in swimming direction of flexible superparamagnetic microswimmers under oscillating magnetic field", poster presentation at International Conference of Micro/Nanomachines (ICMNM), Wuhan, China, August 25-28, 2017.

T45. **Y. Or**, "Soft Robotics: shape-changing legged locomotion", presented at Workshop on Security and Defense Research, Nov 21, 2017, at the Technion.

## Participation in organizing conferences

Program committee chair and member of steering committee, 3rd Israeli Conference on Robotics, 10-11 November, 2010, Herzlia, Israel.

Organizer, Belfer Symposium on "Dynamics of micro-swimmers", held at the Technion in Jan 12th, 2015. Keynote speakers: Prof. Eric Lauga, UC San Diego; Prof. Bradley Nelson, ETH Zurich

Co-Organizer, IAAC Workshop on Motion Control Methods in Robotics, 23 November, 2015, Herzlia, Israel. (Co-organized with Asst. Prof. Amir Degani).

Conference Editorial Board, IEEE International Conf. Robotics and Automation (ICRA), 2015,2016

International Program Committee, IFAC Conference on Nonlinear Control Systems (NOLCOS), 2016

## Seminar talks

S1. Y. Or, "Computing Stable Equilibrium Stances of a Legged Robot in Frictional Environments", Center of Foundations of Robotics Seminar, Robotics Inst., Carnegie Mellon University, Pittsburgh, PA, May 22, 2006

S2. Y. Or, "Frictional Dynamics, Hybrid Dynamics, and Stability of Planar Two-Contact Stances under Gravity", special GRASP seminar, GRASP Laboratory of Robotics Research and Education, University of Pennsylvania, Philadelphia, PA, June 11, 2007

S3. Y. Or, "Frictional Dynamics, Hybrid Dynamics, and Stability of Planar Two-Contact Stances under Gravity", CDS seminar, Dept. of Control and Dynamical Systems, California Inst. of Technology, Pasadena, CA, June 13, 2007

S4. Y. Or, "Dynamics, geometry and stability of low Reynolds number swimming near a Plane Wall", lecture in CDS 280a – Advanced Topics in Geometric Mechanics and Dynamical Systems (Instructor: Jerrold Marsden), Dept. of Control and Dynamical Systems, Caltech, Pasadena, CA, October 30, 2008

S5. Y. Or, "Dynamics and control of bio-locomotion: low Reynolds number swimming near a wall", Applied Math seminar, Dept. of Applied Mathematics and Computer Science, Weizmann Institute of Science, Rehovot, Israel. January 20, 2009

S6. Y. Or, "Dynamics and stability of swimming near a wall in low Reynolds number", Dept. of Mechanical and Aerospace Engineering, University of California, San Diego, CA, April 24, 2009

S7. Y. Or, "Dynamics and stability of swimming near a wall in low Reynolds number", Dept. of Aerospace and Mechanical Engineering, Univ. of Southern California, Pasadena, CA, June 1, 2009

S8. Y. Or, "Reversing symmetry and stability in low-Reynolds-number swimming", Dept. of Applied Mathematics and Mathematical Physics (AMMP), Imperial College, London UK, Nov. 24, 2011.

S9. Y. Or, "Dynamics and control of locomotion – from micro-swimming to walking", Dept. of Mechanical Engineering, Technion, Israel, June 26, 2013.

S10. Y. Or, "The nonlinear dynamics and mechanics of robotic locomotion", Dept. of Mechanical Engineering, Technion, Israel, November 7, 2017.