

Curriculum Vitae

- Personal information** **Ilaria Palomba**
Smart Mini Factory Laboratory
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- Education**
- 2016/02/29 Doctor of Philosophy in Mechatronics and Product Innovation Engineering from the Università degli Studi di Padova (University of Padua). Dissertation: "State estimation in multibody systems with rigid or flexible links"
 - 2012/10/16 Master Degree in Product Innovation Engineering from the University of Padua.
 - 2010/07/23 Bachelor Degree in Engineering and Management from the University of Padua.
- International experience**
- February 2020 visiting researcher at the Chiang May University, Dept. of Industrial Engineering and Dept. of Mechanical Engineering (Chiang May - Thailand).
 - May 2018 visiting researcher at the Chiang May University, Dept. of Mechanical Engineering (Worcester, Massachusetts, USA).
 - June-July 2015 visiting researcher at the Mechanical Engineering Laboratory of the University of La Coruña (Spain),
- Present appointment** 2017/07/01-2020/06/30 Fixed-term researcher (RTD) at the Free University of Bolzano-bozen (SS ING-IND/13)
- Professional qualification** 2013/10/16 Professional Engineer's License
- Professional experience**
- 2017/02/01-2017/06/30 Research collaborator at Fondazione Studi Universitari di Vicenza/University of Padua. Research topic: "Design and development of a mechatronic safety device for clamping blood tubes in a portable artificial kidney".
 - 2016/01/02-2017/01/31 Teaching assistant and research assistant at the Free University of Bolzano-Bozen. Research topic: "Study and development of robotic grasping systems for soft and fragile bodies".
 - 2013-2020 Contract professor at I.T.S. Meccatronico, Fondazione Istituto Tecnico Superiore, Nuove Tecnologie per il Made in Italy - Comparto Meccatronico.
 - 2012/11/13-2012/12/31 Research collaborator at Fondazione Studi Universitari di Vicenza/University of Padua. Research topic "Experimental modal analysis of an ultrasonic sonotrode".
- Research projects**
- "COVI: CONfinement of Vlbrations by passive modifications in flexible multibody systems". Free University of Bozen-Bolzano Internal Research Funds (call 2019) - Role: principal investigator; type: Free University of Bozen-Bolzano Internal Project Code: TN200Y.
 - "WIRECOBOTS: Wire harness assembly using collaborative robots to increase efficiency and ergonomics". ESMERA (European SMEs for Robotic Applications)-funded project (H2020-ICT 780265). Project leader: Carretta Srl. Role: Unibz principal investigator.
 - "SME 4.0 – Industry 4.0 for SMEs - Smart Manufacturing and Logistics for SMEs in an X-to-order and Mass Customization Environment", European Union's Horizon 2020 RISE program under the Marie Skłodowska-Curie

grant agreement No 734713. Coordinator: Free University of Bolzano. Role: team member for the WP 3.3. and 6.3.

- “dolo MULTI - Design Of Lightweight Optimized structures and systems under MULTIdisciplinary considerations through integration of MULTIfysics dynamics in a MULTIfysics framework”. Free University of Bozen-Bolzano Internal Research Funds (call 2017) - Role: team member; type: Free University of Bozen-Bolzano Internal Project Code: TN2091.
- “Functional Mechanical Design of an Innovative Vending Machine for Pizzas”, TN2343-C – Contract for research project, partners: Fraunhofer Italia, Cibolabs. Role: team member.
- “D-VINO - Dynamic models for Vibration and NOise reduction in planetary gear trains”. Free University of Bozen-Bolzano Internal Research Funds (call 2016) - Role: team member; type: Free University of Bozen-Bolzano Internal Project Code: TN2077.
- “GRASPS - GRAsping And Soft-bodies Picking Systems”. Free University of Bozen-Bolzano Internal Research Funds (call 2014) - Role: team member; type: Free University of Bozen-Bolzano Internal Project Code: TN2025.

Awards

- Winner of the IFToMM best paper award at the First International Conference of IFToMM ITALY, IFIT 2016, December 1-2, 2016, Vicenza, Italy.
- Outstanding paper award - IEEE International Conference on Industrial Engineering and Management 2018, December 16-19, 2018, Bangkok, Thailand.

Research area

Dr. Palomba's research activities chiefly concern theoretical and experimental investigations in the fields of mechanics of machines, mechanical vibrations, multibody dynamics, and robotics and automation. In particular, her research interests are focused on the following topics:

- Parametric representation of the eigenpairs of flexible multibody systems as function of the system generalized coordinates.
- Improvement of the energy efficiency of multibody systems through the concurrent use of systems to recovery the breaking energy and systems to store the elastic energy.
- Non-linear state estimation for multibody systems with rigid and flexible links.
- Model reduction of vibrating systems.
- Robotic grasping systems for soft and fragile bodies.
- Structural modifications and model updating of vibrating systems.
- Design of advanced mechatronic systems

List of publications

International referred journals

- [1] Ilaria Palomba, Renato Vidoni. “FLEXIBLE-LINK MULTIBODY SYSTEM EIGENVALUE ANALYSIS PARAMETERIZED WITH RESPECT TO RIGID-BODY MOTION”. Applied Sciences, 2019, vol.9. DOI: 0.3390/app9235156
- [2] Ilaria Palomba, Dario Richiedei, Alberto Trevisani, Emilio Sanjurjo, Alberto Luaces, Javier Cuadrado. “ESTIMATION OF THE DIGGING AND PAYLOAD FORCES IN EXCAVATORS BY MEANS OF STATE OBSERVERS”. Mechanical Systems and Signal Processing, 2019, vol. 134. DOI: 10.1016/j.ymssp.2019.106356
- [3] Lorenzo Scalera, Ilaria Palomba, Erich Wehrle, Alessandro Gasparetto, Renato Vidoni. “NATURAL MOTION FOR ENERGY SAVING IN ROBOTIC AND MECHATRONIC SYSTEMS”. Applied Sciences, 2019, vol. 9 (17). DOI: 10.3390/app9173516

- [4] Paolo Boscarior, Giovanni Boschetti, Aldo Dalla Via, Nicola De Rossi, Mauro Neri, Ilaria Palomba, Dario Richiede, Claudio Ronco, Alberto Trevisani. "DESCRIPTION AND IN-VITRO TEST RESULTS OF A NEW WEARABLE/PORTABLE DEVICE FOR EXTRACORPOREAL BLOOD ULTRAFILTRATION". *Machines*, 2019, vol. 7 (2). DOI: 10.3390/machines7020037
- [5] Ilaria Palomba, Dario Richiede, Alberto Trevisani. "REDUCED-ORDER OBSERVERS FOR NONLINEAR STATE ESTIMATION IN FLEXIBLE MULTIBODY SYSTEMS". *Shock and Vibration*, 2018, vol. 2018, 12 pages. DOI: 10.1155/2018/6538737.
- [6] Roberto Belotti, Roberto Caracciolo, Ilaria Palomba, Dario Richiede, Alberto Trevisani. "AN UPDATING METHOD FOR FINITE ELEMENT MODELS OF FLEXIBLE-LINK MECHANISMS BASED ON AN EQUIVALENT RIGID-LINK SYSTEM". *Shock and Vibration*, 2018, vol. 2018, 14 pages. DOI: 10.1155/2018/1797506.
- [7] Ilaria Palomba, Dario Richiede, Alberto Trevisani. "A REDUCTION STRATEGY AT SYSTEM LEVEL FOR FLEXIBLE-LINK MULTIBODY SYSTEMS". *International Journal of Mechanics and Control*, 2017, vol. 18 (2), pp. 59-68.
- [8] Ilaria Palomba, Dario Richiede, Alberto Trevisani. "TWO-STAGE APPROACH TO STATE AND FORCE ESTIMATION IN RIGID-LINK MULTIBODY SYSTEMS". *Multibody System Dynamics*, 2017, 39(1), pp. 115-134. DOI: 10.1007/s11044-016-9548-1.
- [9] Ilaria Palomba, Dario Richiede, Alberto Trevisani. "KINEMATIC STATE ESTIMATION FOR RIGID-LINK MULTIBODY SYSTEMS BY MEANS OF NONLINEAR CONSTRAINT EQUATIONS". *Multibody System Dynamics*, 2016, pp. 1-22. DOI: 10.1007/s11044-016-9515-x
- [10] Ilaria Palomba, Dario Richiede, Alberto Trevisani. "MODE SELECTION FOR REDUCED ORDER MODELING OF MECHANICAL SYSTEMS EXCITED AT RESONANCE". *International Journal of Mechanical Sciences*, 2016, 114, pp. 268-276. DOI: 10.1016/j.ijmecsci.2016.05.026
- [11] Ilaria Palomba, Dario Richiede, Alberto Trevisani. "ENERGY-BASED OPTIMAL RANKING OF THE INTERIOR MODES FOR REDUCED-ORDER MODELS UNDER PERIODIC EXCITATION". *Shock and Vibration*, 2015, vol. 2015, 10 pages. DOI: 10.1155/2015/348106

Papers in International Conference Proceeding

- [12] Giovanni Carabin, Ilaria Palomba, Erich Wehrle, Renato Vidoni. "ENERGY EXPENDITURE MINIMIZATION FOR A DELTA-2 ROBOT THROUGH A MIXED APPROACH". In: *Computational Methods in Applied Sciences*, 2020, vol.53, pp. 383-390. DOI: 10.1007/978-3-030-23132-3_46
- [13] Ilaria Palomba, Erich Wehrle, Renato Vidoni, Alessandro Gasparetto. "PARAMETRIC EIGENVALUE ANALYSIS FOR FLEXIBLE MULTIBODY SYSTEMS". In: *Mechanisms and Machine Science*, 2019, vol. 73, pp. 4117-4126. DOI: 10.1007/978-3-030-20131-9_410
- [14] Luca Gualtieri, Rafael Rojas, Giovanni Carabin, Ilaria Palomba, Erwin Rauch, Renato Vidoni, Dominik T. Matt. "ADVANCED AUTOMATION FOR SMES IN THE I4.0 REVOLUTION: ENGINEERING EDUCATION AND EMPLOYEES TRAINING IN THE SMART MINI FACTORY LABORATORY". In: *IEEE International Conference on Industrial Engineering and Management 2019-December* 8607719, pp. 111-1115. DOI: 10.1109/IEEM.2018.8607719
- [15] Paolo Boscarior, Giovanni Boschetti, Aldo Dalla Via, Nicola De Rossi, Mauro Neri, Ilaria Palomba, Dario Richiede, Claudio Ronco, Alberto Trevisani. "RAP: A NEW WEARABLE/PORTABLE DEVICE FOR EXTRACORPOREAL BLOOD ULTRAFILTRATION". In: *Carbone G., Gasparetto A. (eds) Advances in Italian Mechanism Science. IFToMM ITALY 2018. Mechanisms and Machine Science*, 2019, vol. 68. Springer, Cham. DOI: 10.1007/978-3-030-03320-0_42.
- [16] Ilaria Palomba, Renato Vidoni, Erich Wehrle. "APPLICATION OF A PARAMETRIC MODAL

- ANALYSIS APPROACH TO FLEXIBLE-MULTIBODY SYSTEMS". In: Gasparetto A., Ceccarelli M. (eds) Mechanism Design for Robotics. MEDER 2018. Mechanisms and Machine Science, 2019, vol. 66. Springer, Cham. DOI: 10.1007/978-3-030-00365-4_46.
- [17] Erich Wehrle, Ilaria Palomba, Renato Vidoni. "IN-OPERATION STRUCTURAL MODIFICATION OF PLANETARY GEAR SETS USING DESIGN OPTIMIZATION METHODS". In: Gasparetto A., Ceccarelli M. (eds) Mechanism Design for Robotics. MEDER 2018. Mechanisms and Machine Science, 2019, vol. 66. Springer, Cham. DOI: 10.1007/978-3-030-00365-4_47.
- [18] Erich Wehrle, Ilaria Palomba, Renato Vidoni. "VIBRATIONAL BEHAVIOR OF EPICYCLIC GEAR TRAINS WITH LUMPED-PARAMETER MODELS: ANALYSIS AND DESIGN OPTIMIZATION UNDER UNCERTAINTY".
In: 14th International Conference on Multibody Systems, Nonlinear Dynamics, and Control, DETC2018. August 26–29, 2018, Quebec City, Quebec, Canada.
DOI: 10.1115/DETC2018-86427.
- [19] Ilaria Palomba, Dario Richiedei, Alberto Trevisani. "NONLINEAR STATE ESTIMATION IN FLEXIBLE-LINK MULTIBODY SYSTEMS THROUGH REDUCED-ORDER MODELS". In: The 5th Joint International Conference on Multibody System Dynamics, IMSD 2018, June 24 –28, 2018, Lisbon, Portugal.
- [20] Giovanni Carabin, Ilaria Palomba, Dominik Matt, Renato Vidoni. "EXPERIMENTAL EVALUATION AND COMPARISON OF LOW-COST ADAPTIVE MECHATRONIC GRIPPERS". In: Ferraresi C., Quaglia G. (eds) Advances in Service and Industrial Robotics. RAAD 2017. Mechanisms and Machine Science, 2018, vol 49. Springer, Cham. DOI: 10.1007/978-3-319-61276-8_66.
- [21] Ilaria Palomba, Dario Richiedei, Alberto Trevisani. "A MODEL REDUCTION STRATEGY FOR FLEXIBLE-LINK MULTIBODY SYSTEMS." In: Boschetti G., Gasparetto A. (eds) Advances in Italian Mechanism Science. IFToMM ITALY 2016. Mechanisms and Machine Science, 2017, vol 47. Springer, Cham. DOI: 10.1007/978-3-319-48375-7_20.
- [22] Roberto Belotti, Giacomo Caneva, Ilaria Palomba, Dario Richiedei, Alberto Trevisani. "MODEL UPDATING IN FLEXIBLE-LINK MULTIBODY SYSTEMS". Journal of Physics: Conference Series (2016), 744 (1). DOI: 10.1088/1742-6596/744/1/012073.
- [23] Roberto Belotti, Ilaria Palomba, Dario Richiedei, Alberto Trevisani. "PARTIAL EIGENSTRUCTURE ASSIGNMENT IN VIBRATING SYSTEMS THROUGH HOMOTOPY OPTIMIZATION". Proceeding of the ICoEV 2015, International Conference on Engineering Vibration, September 7-10, Ljubljana, Slovenia. ISBN: 978-961-6536-97-4
- [24] Ilaria Palomba, Dario Richiedei, Alberto Trevisani. "SIMULTANEOUS ESTIMATION OF KINEMATIC STATE AND UNKNOWN INPUT FORCES IN RIGID-LINK MULTIBODY SYSTEMS". Proceedings of the ECCOMAS 2015, Thematic Conference on Multibody Dynamics, pp. 229-240, June 29 –July 2, 2015, Barcelona, Spain. ISBN: 978-84-944244-0-3
- [25] Roberto Belotti, Ilaria Palomba, Dario Richiedei, Alberto Trevisani. "A NEW METHOD FOR PASSIVE PARTIAL EIGENSTRUCTURE ASSIGNMENT IN VIBRATING SYSTEMS". Proceedings of the IOMAC 2015, 6th International Operational Modal Analysis Conference, May 12-14, 2015, Gijón , Spain. ISBN: 978-846173880-9
- [26] Roberto Belotti, Ilaria Palomba, Dario Richiedei, Alberto Trevisani. "INTERIOR MODE SELECTION IN THE CRAIG BAMPTON REDUCTION TECHNIQUE BASED ON AN ENERGY APPROACH". Proceedings of the IOMAC 2015, 6th International Operational Modal Analysis Conference, May 12-14, 2015, Gijón, Spain. ISBN: 978-846173880-9
- [27] Ilaria Palomba, Dario Richiedei, Alberto Trevisani. "NONLINEAR KINEMATIC STATE ESTIMATION IN RIGID-LINK MULTIBODY SYSTEMS BY SIMPLEX SIGMA POINT

UNSCENTED KALMAN FILTERS". Proceedings of the ISMA 2014, International Conference on Noise and Vibration Engineering and USD 2014, International Conference on Uncertainty in Structural Dynamics, pp. 2899-2914, September 15-17, 2014, Leuven, Belgium. ISBN: 978-907380291-9.

- [28] Ilaria Palomba, Dario Richiedei, Alberto Trevisani. "ENERGY-BASED INTERIOR MODE SELECTION FOR REDUCED-ORDER MODELS UNDER HARMONIC EXCITATION". Proceedings of the ISMA 2014, International Conference on Noise and Vibration Engineering and USD 2014, International Conference on Uncertainty in Structural Dynamics, pp. 2899-2914, September 15-17, 2014, Leuven, Belgium. ISBN: 978-907380291-9.
- [29] Ilaria Palomba, Dario Richiedei, Alberto Trevisani. "A RANKING METHOD FOR THE SELECTION OF THE INTERIOR MODES OF REDUCED ORDER RESONANT SYSTEM MODELS". Proceedings of the ASME 2014 12th Biennial Conference on Engineering Systems Design and Analysis, ESDA 2014, Vol. 2, July 25-27, 2104, Copenhagen, Denmark. DOI: 10.1115/ESDA2014-20607.
- [30] Reza Ashfar, Ilaria Palomba, Dario Richiedei, Alberto Trevisani. "MODE SELECTION IN REDUCED-ORDER MODELS FOR ULTRASONIC HORNS UNDER LONGITUDINAL VIBRATION". Proceedings of the IOMAC 2013, 5th International Operational Modal Analysis Conference, May 13-15, 2013, Guimarães, Portugal.