Prof. Renato Vidoni

Full Professor, SSD IIND/02-A
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CURRENT POSITION

- October 2024 – ongoing: ***Full Professor*** **in Applied Mechanics for Machinery** (SSD IIND/02-A), Dipartimento Politecnico di Ingegneria e Architettura (DPIA), University of Udine (I)
- 2023 – Ongoing: Member of the Italian Evaluation committee for the national scientific qualification to function as associate or full professor in Italian Universities for the SSD IIND/02-A.
- Since 2019 – Member of the ASE Advanced-Systems Engineering PhD Programme (collegio docenti) - Faculty of Science and Technology of the Free University of Bolzano (coordinator of the working group for the establishment of the PhD program and for the XXXVth cycle)
- Since 2022 - Member of the D-RIM PhD Programme - National Doctorate in Robotics and Intelligent Machines – coordinator prof G Cannata (university of Genova).

RESEARCH AREAS

The research activity, projects and publications deal with the following research fields, all related to the 09/A2 (ING-IND/13) Scientific Sector – Applied Mechanics for Machinery:

- **Modelling, simulation and optimizazion of multibody systems dynamics**
- **Advanced mechatronics and industrial (collaborative) robotic systems**
- **Mechatronic and robotic solutions for Agro-Forestry**

EDUCATION AND PROFESSIONAL QUALIFICATION

2017 - National Qualification (ASN) for the role of Full Professor in the SSD Applied Mechanics for Machinery - unanimous opinion of the Committee
2009 - PhD in Industrial and Information Eng., curriculum: Applied Mechanics for Machinery. University of Udine (Italy)
2006 - Engineering qualification - abilitazione all'esercizio della professione di Ingegnere
2005 - Master Degree in Electronic Engineering, curriculum: Industrial Automation. University of Udine (Italy)

ACADEMIC EXPERIENCE

- October 2019 – September 2024: *Full Professor* in Applied Mechanics for Machinery (SSD ING-IND/13), Faculty of Science and Technology, Free University of Bozen-Bolzano
- 2016 – 2024 *Degree Course director for the Master Degree course in Industrial Mechanical Engineering* of the Faculty of Science and Technology of the Free University of Bolzano
- 2019-20 –XXXV cycle - Coordinator of the Advanced-Systems Engineering PhD Programme - Faculty of Science and Technology of the Free University of Bolzano
- 2019- 2024 *Responsible of the "First LAB: Field Robotics South-Tyrol Laboratory*" project and applied research laboratory of the Free University of Bozen-Bolzano (co-responsible prof Karl Von Ellenrieder) at the NOI tech-Park.
- 2018 – 2024 *Co-Responsible of the "SMF - Smart-Mini-Factory" laboratory* for Industry 4.0 of the Free University of Bozen-Bolzano (for Mechatronics and Robotics).
- April 2015-Sept. 2019: Associate Professor in Applied Mechanics for Machinery at the Free University of Bozen
- 2024 (1 month) - Visiting Professor (secondment under the SME5.0 research project) – University of Malta (Malta)
- April 2017 and April 2018 – visiting professor at the Chiang Mai University – Dept. Mechanical and Industrial Engineering (Chiang Mai - Thailand)
- July 2013: visiting researcher at the Westfälische Hochschule, Dept. Mechanical Eng. (Bocholt – Germany)
- April 2011 – March 2015: Researcher in Applied Mechanics for Machinery at the Free University of Bozen
- January 2010 – March 2011: Research fellowship in Applied Mechanics for Machinery (SSD ING-IND/13) at DIEGM Dip. di Ing. Elettrica Gestionale e Meccanica, University of Udine (I).
- 2009: Research fellowship in Applied Mechanics for Machinery (SSD ING-IND/13) at DTG-University of Padua (I).
  May - August 2008: Visiting PhD student - KLT group, University of Murcia (Spain) - prof. R. Martinez Bejar.

AWARDS AND HONOURS

- 2023 and 2024 “World’s top 2% scientist list" Stanford University.
- 2024 – Best Application Paper Award at IFIT2024
- 2022- co-author of Best student paper at IFIT2022
- 2020 - Best Application Paper Award at the 23rd CISM IFToMM ROMANSY 2020 and Best Paper Award sponsored by Hitachi Ltd at the 23rd CISM IFToMM ROMANSY 2020
- 2020 - Best Application Paper Award - 29th Int Conf RAAD2020
- 2019 - Best Application Paper Award - 28th Int Conf on Robotics in Alpe-Adria-Danube Region (RAAD2019) – 3rd place
- 2018 - 1st prize – outstanding paper award IEEE Int Conf on Industrial Engineering and Management 2018
- 2° prize at “EURON/EUnited Robotics Technology Transfer Award 2009” with the project: “Automation and control of a tunnel digging robotic machine”, A.Gasparetto, R.Vidoni, V.Zanotto.
- 1° prize at “Premio Nicola Chiari per la Migliore Applicazione di Misura e Automazione 2010”, National Instruments Italia

RECENT RESEARCH PROJECTS

Prof. Vidoni has been and is currently involved in scientific projects funded by different and important institutions (e.g. European, National, Regional, Provincial and internal) as principal investigator or team member.

- 2024-2026 Renato Vidoni (PI-unibz) Redundancy for resilience in smart factories of the future through hybrid mobile robotic systems, Joint Project FWF – Partner: RTWH Aachen (Ger)
- 2022-2025 Renato Vidoni (PI-unibz) Sestosenso: Physical Cognition for Intelligent Control and Safe Human-Robot Interaction, HORIZON-RIA; Lead: uniGenova
- 2018-2021 Renato Vidoni (PI) ERDF 2014-2020: Asse 1 Ricerca e Innovazione (3rd call) - FiRST Lab: Research laboratory and infrastructures for robotics and mechatronics applications for the alpine environment
- 2019-2022 Renato Vidoni (PI) Free University of Bolzano - CRC competitive call 2018 - SPRUCE-ROBOT: Smart PRUning and Climbing treEs ROBOT
- *2019-2021 Carretta Automazioni and unibz (PI Dr Palomba and prof R Vidoni) H2020-ESMERA 1st call - WIRE-COBOTS: Wire harness assembly using collaborative robots to increase efficiency and ergonomics*
- *2019-2020 Renato Vidoni (Responsible of the unibz unit) - COVR-EU2020 1st call 2019 - CoHoMe - Comparison and Homogenization Of Safety Measurements*

INTERNATIONAL COOPERATION PARTNERS (5)

- RTWH Aachen (Germany)
- JOANNEUM RESEARCH Forschungsgesellschaft mbH - Institut für Robotik und Mechatronik (Austria),
- TUMunich (Germany)
- Chiang Mai University (Chiang Mai - Thailand)
- University of Malta (Malta)

EDITORIAL AND REVIEWER ACTIVITY

- Associate Editor ASME JOE – since 2021
- Editorial Board Mathematical Problems in Engineering – since 2018
- Editorial Board (EB) of JOMAC International Journal of Mechanics and Control - dynamics of mechanical systems – since 2017
- Review activity for (… j): IEEE/ASME Transactions on Mechatronics, Robotics and Autonomous Systems, Mechatronics, Robotics and Computer Integrated Manufacturing, Mechatronics, Journal of Bionic Engineering, IEEE Transactions on Human-Machine Systems

MEMBERSHIPS

- I-RIM since 2022
- ASME-American Society of Mechanical Engineers- Professional Member since 2014
- IfToMM Italy – International Federation for the Promotion of Mechanism and Machine Science, since 2015
- Member of the expert reviewers’ board of the NSERC of Canada and of the National Center for Sci. and Tech. Eval., Kazakhstan; the National Research and for the Development Agency (ANID) of the Ministry of Science, Technology, Knowledge and Innovation of Chile.
- ISBE-International Society of Bionic Engineering

CONFERENCE ORGANIZATION (RECENT)

- Organization/co-Chair of ISIEA2022 and 2024 International Symposium on Industrial Engineering and Automation, Bolzano (I)
- Organization/Chair of the ROBO-zen 2020: International Winter School on Mechanism Design and Motion Planning for Robotics, Jan 2020 under the IFToMM Italy activities and with the support of the International Federation for the Promotion of Mechanism and Machine Science (IFToMM).
- Member of the Technical/Scientific/Advisory Committee of many International Conferences (e.g. IEEE REV2023, ICQIS2024, IEEE METROAGRIFOR2021, ICFIR2019, IFIT2018, MECHATRONICS 2018, MEDER2018, …)
- Member of the Organizing Committee and co-organizer of the topic "Mobile Robots and Unmanned Ground Vehicles" inner the track "Dynamics, Vibration, and Control" at ASME-IMECE (USA) conf. since 2017.

RECENT PUBLICATIONS – 2019-2023

Journal papers

- Leitner, S., Carabin, G., Spinelli, R., Renzi, M., Vidoni, R., Skyline force estimation and limitation during cable yarding: A novel technical solution for within the carriage (2024) Measurement: Journal of the International Measurement Confederation, 235, art. no. 114931
- Gualtieri, L., Fraboni, F., Brendel, H., Pietrantoni, L., Vidoni, R., Dallasega, P., Updating Design Guidelines for Cognitive Ergonomics in Human-Centred Collaborative Robotics Applications: an Expert Survery, Applied Ergonomics, 117, art. no. 104246
- Pagliari L, Nezzi C, Vidoni R, Concli F, An innovative architecture of a three-speed automatic internal shifting hub for regular commuting bicycles: Kinematic analysis and preliminary sizing (Dec. 2023) Engineering Science and Technology, an International Journal, 48, art. no. 101587
- Leitner S et al., Technical, Safety and Environmental Challenges in the Electrification of Cable Yarding Equipment (2023) Current Forestry Reports, 9 (4), pp. 263-275
- Leitner S et al., Tower yarder powertrain performance simulation analysis: electrification study (2023) European Journal of Forest Research, 142 (4), pp. 739-761., doi=10.1007%2fs10342-023-01553-0Gufler, V., Wehrle, E., Achleitner, J., Vidoni, R., A semi-analytical approach to sensitivity analysis with flexible multibody dynamics of a morphing forward wing section (2023) Multibody System Dynamics, 58 (1), pp. 1-20.
- V. Gufler, E. Wehrle, R. Vidoni, "Analytical sensitivity analysis of flexible multibody dynamics with index-1 differential-algebraic equations and baumgarte stabilization", International Journal of Mechanics and Control, Vol. 24, No. 01, 2023, pp. 03-14.
- Leitner, S., Perez Estevez, M.A., Renzi, M., Spinelli, R., Mazzetto, F., Vidoni, R., Tower yarder powertrain performance simulation analysis: electrification study (2023) European Journal of Forest Research.
- Gualtieri, L., Rauch, E., Vidoni, R., Human-robot activity allocation algorithm for the redesign of manual assembly systems into human-robot collaborative assembly (2023) International Journal of Computer Integrated Manufacturing, 36 (2), pp. 308-333.
- Saeed, R.A., Tomasi, G., Carabin, G., Vidoni, R., von Ellenrieder, K.D., *Conceptualization and Implementation of a Reconfigurable Unmanned Ground Vehicle for Emulated Agricultural Tasks* (2022) Machines, 10 (9), art. no. 817.
- Gualtieri, L., Rauch, E., Vidoni, R., *Human-robot activity allocation algorithm for the redesign of manual assembly systems into human-robot collaborative assembly*, International Journal of Computer Integrated Manufacturing, 36 (2), pp. 308-333.
- Scalera, L., Giusti, A., Vidoni, R., Gasparetto, A., *Enhancing fluency and productivity in human-robot collaboration through online scaling of dynamic safety zones* (2022) International Journal of Advanced Manufacturing Technology, 121 (9-10), pp. 6783-6798.
- Leitner, S., Renzi, M., Spinelli, R., Vidoni, R., *On the Design of Hybrid Tower Yarder Drivetrains: A Case Study* (2022) Forests, 13 (9), art. no. 1520
- de Paula Monteiro, R., Lucatto Marra, A., Vidoni, R., Garcia, C., Concli, F., *A Hybrid Finite Element Method–Analytical Model for Classifying the Effects of Cracks on Gear Train Systems Using Artificial Neural Networks* (2022) Applied Sciences (Switzerland), 12 (15), art. no. 7814.
- Rojas, R.A., Giusti, A., Vidoni, R., *Online Computation of Time-Optimization-Based, Smooth and Path-Consistent Stop Trajectories for Robots* (2022) Robotics, 11 (4), art. no. 70.
- Gualtieri, L., Rauch, E., Vidoni, R., *Development and validation of guidelines for safety in human-robot collaborative assembly systems* (2022) Computers and Industrial Engineering, 163, art. no. 107801.
- Rojas, R.A., Vidoni, R., *Designing Fast and Smooth Trajectories in Collaborative Workstations* (2021) IEEE Robotics and Automation Letters, 6 (2), art. no. 9353211, pp. 1700-1706.
- Carabin, G., Wehrle, E., Vidoni, R., *Smart Mechanical Systems for Manufacturing in the Era of Industry 4.0: Condition-Based Predictive Maintenance and Dynamic System Modification for Small and Medium-Sized Enterprises* (2021) Chiang Mai University Journal of Natural Sciences, 20 (2), art. no. e2021028, pp. 1-11.

- Gualtieri, L., Rauch, E., Vidoni, R., *Methodology for the definition of the optimal assembly cycle and calculation of the optimized assembly cycle time in human-robot collaborative assembly* (2021) International Journal of Advanced Manufacturing Technology, 113 (7-8), pp. 2369-2384.
- Palomba, I., Gualtieri, L., Rojas, R., Rauch, E., Vidoni, R., Ghedin, A., *Mechatronic re-design of a manual assembly workstation into a collaborative one for wire harness assemblies* (2021) Robotics, 10 (1), art. no. 43.
- Gualtieri, L., Rauch, E., Vidoni, R., *Emerging research fields in safety and ergonomics in industrial collaborative robotics: A systematic literature review* (2021) Robotics and Computer-Integrated Manufacturing, 67, art. no. 101998.
- Carabin, G., Scalera, L., Wongratanaphisan, T., Vidoni, R., *An energy-efficient approach for 3D printing with a Linear Delta Robot equipped with optimal springs* (2021) Robotics and Computer-Integrated Manufacturing, 67, art. no. 102045.
- Carabin, G., Vidoni, R., *Energy-saving optimization method for point-to-point trajectories planned via standard primitives in 1-DoF mechatronic systems* (2021) International Journal of Advanced Manufacturing Technology, 116 (1-2), pp. 331-344.
- Monteiro, R.P., Vidoni, R., Concli, F., *A multibody dynamic model for evaluating the vibrating modes of gear train systems* (2021) International Journal of Transport Development and Integration, 5 (3), pp. 264-277.
- Belotti, R., Palomba, I., Wehrle, E., Vidoni, R., *An approximation-based design optimization approach to eigenfrequency assignment for flexible multibody systems* (2021) Applied Sciences (Switzerland), 11 (23), art. no. 11558.
- Rojas, R., Wehrle, E., Vidoni, R., *A new motion planning approach for combining Smoothness and Speed in Collaborative Assembly Systems*, Applied Sciences 2020, SI in Robotics and Vibration Mechanics
- Scalera, L., Giusti, A., Di Cosmo, V., Riedl, M., Vidoni, R, Matt, D.T., *Human Robot Activity Allocation (HRAA) Algorithm for the Redesign of Manual Assembly Systems into Human-Robot Collaborative Assembly*, International Journal of Mechanics and Control, 2020
- Gualtieri, L., Palomba, I., Merati, F.A., Rauch, E., Vidoni, R., *Design of Human-Centered Collaborative Assembly Workstations for the Improvement of Operators' Physical Ergonomics and Production Efficiency: A Case Study* (2020) Sustainability, 12, 3606.
- Wehrle, E., Gufler, V., Vidoni, R., *Optimal in-operation redesign of mechanical systems considering vibrations-a new methodology based on frequency-band constraint formulation and efficient sensitivity analysis* (2020) Machines, 8 (1), n. 11.
- Scalera, L., Boscariol, P., Carabin, G., Vidoni, R., Gasparetto, A., *Enhancing energy efficiency of a 4-DOF parallel robot through task-related analysis* (2020) Machines, (1), art. no. 10.
- Palomba, I., Wehrle, E., Carabin, G., Vidoni, R., *Minimization of the energy consumption in industrial robots through regenerative drives and optimally designed compliant elements* (2020) Applied Sciences (Switzerland), 10 (21), art. no. 7475, pp. 1-18.