Curriculum Vitae
Fabio Ruggiero

Personal information

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Nationality(-ies)	Italian
Date of birth	16 Dec 1983
Gender	M

Actual Position

Dec 2019 - Dec 2022	Assistant Professor (tenure track) for the Department of Electrical Engineering and Information Technology of University of Naples Federico II.

Past Positions

Dec 2016 - Dec 2019	Assistant Professor (fixed term) for the Department of Electrical Engineering and Information Technology of University of Naples Federico II.
Jan 2016 - Dec 2016	Fixed-term researcher for CREATE Consortium (www.create.unina.it): scientific and technical support for FP7 Ideas ERC RoDyMan (www.rodyman.eu) project.
Jan 2015 - Dec 2015	Project collaborator for CREATE Consortium, in scientific and technical support for the European FP7 Sherpa integrating project.
Nov 2014 - Dec 2014	Project collaborator for CREATE Consortium, in scientific and technical support for the European FP7 Ideas ERC RoDyMan project.
Nov 2012 - Oct 2014	Research Associate (Post-doc) at University of Naples Federico II, with a fellowship in "*Modeling and control (in free space and in contact with the environment) of flying robots equipped with a robotic arm*", funded by the European EU FP7 ARCAS project.
Dec 2010 - Oct 2012	Post-doc position at University of Naples Federico II, with a fellowship in "*Sensor data acquisition and fusion for the visual servoing of Micro Aerial Vehicles*", funded by the European EU FP7 AIRobots project.
Nov 2007 - Oct 2010	Ph.D. student in Computer Science and Automation Engineering, at Univeristà degli Studi di Napoli Federico II, under the supervision of Dr. V. Lippiello. Fabio Ruggiero ranked first in the competition test for the Ph.D. position.
Sep 2009 - Mar 2010	Visiting scholar at Department of Mechanical Engineering of Northwestern University, Evanson, Illinois (USA), under the supervision of Prof. K.M. Lynch.

Academic qualifications

15 Oct 2018 - 15 Oct 2024	Italian Scientific Qualification as Associate Professor (seconda fascia, art. 16, comma 1, Legge 240/10) for the 09/G1 academic recruitment field in "*Systems and Control Engineering*".

21 Dec 2010	Ph.D degree in Computer Science and Automation Engineering obtained at Università degli Studi di Napoli Federico II. Thesis: "*Grasp and manipilation of objects with a multi-fingered hand in unstructured environments*". Advisor: Dr. V. Lippiello. Received evaluation: top marks.
30 Oct 2007	Laurea degree (M.Sc.) in Automation Engineering, obtained at University of Naples Federico II. The thesis concerned "*Visual servoing based on Lie algebra*",in Italian, (B. Siciliano - V. Lippiello). Final mark: 110/110 with honours.
25 Oct 2005	Laurea degree (B.Sc.) in Automation Engineering, obtained at Università degli Studi di Napoli Federico II. The thesis concerned "*Robot programming in manufacturing field*", in Italian, (B. Siciliano). Final mark: 110/110 with honours.
Jul 2002	He attended the high school at "Liceo" specialising in scientific studies "Niccolò Copernico" in Naples. Final mark: 100/100.

Professional Activities

1 Nov 2019- 29 Feb 2020	Consultant for the experimental verification of advanced materials for ATEX drone according to he attached specification 654A3769-SPE-SYSD-006.0, commissioned by ENIProgetti SpA to the research consortium INSTM (OdL nr. 4310291968).
1 Jun 2018- 31 Jul 2018	Consultant for the realization of a feasibility study for innovative technical solutions about the aerial robotic domain, within the project IDEAS (ENI #654A3769-SPE-SYSD-001), commissioned by ENIProgetti SpA to the research consortium INSTM (ref. INSTM ID/DB 1460).

Research Activities

Fabio Ruggiero research activity is focused on model-based control design of robotic systems. In particular, his studies are specialized on control strategies for dexterous, dual-hand and nonprehensile robotic manipulation, robotic visual servoing, unmanned aerial vehicles (also equipped with small-scale robot manipulator for aerial manipulation, transportation, and cooperation with other vehicles), legged robots, human-robot force interaction, fault-tolerant control of drones, nonprehensile pushing objects with mobile robots, non-destructive testing and measurements with aerial robots, and so on.

Fabio Ruggiero is actually the co-author of 16 international journal papers, 8 book chapters, 31 international and 4 national conference papers, 1 Ph.D. thesis. From 2008 to 2018, he was a member of IEEE and IEEE Robotics and Automation Society. From 2019 he his a Senior member of IEEE and IEEE Robotics and Automation Society.

Research projects fund raising

HARMONY	*Title*: Enhancing Healthcare with Assistive Robotic Mobile Manipulation *Date*: 1 Jan 2021 - 30 Jun 2024 *Funding*: 7.1M EUR (total project funding), 827k EUR (local share) *Funding source*: European Uninion's Horizon 2020 *Role*: Co-proposer for the local team *Website*: https://harmony-eu.org
PRINBOT	*Title*: Grapevine Recognition and Winter Pruning Automation Based on Innovative Robots *Date*: 29 Aug 2019 - 28 Aug 2022 *Funding*: 466k EUR (total project funding), 194k EUR (local share) *Funding source*: Italian Ministry of University and Research *Role*: Proposer for the local team
WELDON	*Title*: Walking Robots: A Connection Between Legged Robots and Nonprehensile Manipulation *Date*: 1 Mar 2019 - 31 Aug 2021

Funding: 80k EUR
Funding source: University of Naples Federico II and Compagnia di San Paolo
Role: Individual proposer
Website: http://www.weldon.unina.it

Research projects participation

Jan 2021 - Dec 2024	MSC ITN AERO-TRAIN. *Role*: Early state researcher supervisor.
Jan 2021 - Jun 2024	H2020 HARMONY. *Role*: Workpackage leader.
Dec 2019 - Nov 2023	H2020 AERIALCORE. *Role*: Component of the research operative unit.
Sep 2019 - Aug 2022	PRINBOT. National project Programmi di Ricerca Scientifica di Rilevante Interesse Nazionale PRIN 2017. *Role*: **Scientific supervisor of the research unit**.
Mar 2019 - May 2021	WELDON. National project Programma STAR - Sostegno Territoriale alle Attività di Ricerca. *Role*: **Principal investigator**.
Apr 2018 - Oct 2020	Proscan. National project PON “Imprese e competitività” 2014-2020, Ministry of Economic Development. *Role*: Component of the research operative unit.
Jan 2018 - Dec 2021	H2020 Hyfliers. *Role*: Component of the research operative unit.
Jan 2017 - Dec 2018	RoMoLo. National project PON “Imprese e competitività” 2014-2020, Ministry of Economic Development. *Role*: Component of the research operative unit.
Jan 2015 - Dec 2015	EU FP7 Sherpa. *Role*: Component of the research operative unit.
Jun 2013 - May 2019	EU FP7 IDEAS RoDyMan (www.rodyman.eu). *Role*: Leader of the Research Task 2 “Dynamic manipulation control”.
Dec 2012 - Oct 2014	EU FP7 ARCAS. *Role*: task leader of T4.2 “Control strategies for one flying robot with a manipulator”.
Dec 2010 - Nov 2013	EU FP7 AIRobots. *Role*: Component of the research operative unit.
Feb 2008 - Jan 2012	EU FP7 DEXMART. *Role*: Component of the research operative unit.

Main research contributions

The results obtained by Fabio Ruggiero through his research and published in journals and proceedings of the international robotics community are here resumed. In particular, the innovation concerning the state of the art is highlighted in the following.

3D reconstruction of unknown objects

Performing tasks in unstructured environments is a challenging robotic research field. In applications like object fine manipulation, the surface of the object must be known to plan the coordinated movements of the robotic fingers properly. In the literature, some techniques have been adopted to reconstruct the shape of the unknown object to be manipulated: they span from superficial to volumetric object reconstruction, employing visual techniques which are often complicated from a computational point of view. In those applications where the object reconstruction has to be performed in real-time, the method proposed in [IC-1] and [BC-2] is, without doubt, a right and competitive choice. In the proposed algorithm, a robot equipped with a calibrated camera, mounted in an eye-in-hand configuration, follows some trajectories around the object to be reconstructed. Several images are acquired along these paths. After some standard image processing operations, an ellipsoid is virtually placed around the object, and it is sampled by points, in turn, interconnected through virtual springs and dampers. These points dynamically shrink toward the ellipsoid’s center and stop when they intercept the so-called visual-hull. In this way, it is possible to reconstruct in a fast and accurate way the surfaces of the objects in unstructured environments.

Optimal grasp planning in unstructured environments

Planning optimal grasps means that it should be possible to find either some points or surface areas on the object where it is possible to apply some forces by using the fingers of a robotic hand to obtain stable grasps. A grasp is stable when the fingers resist external forces applied to the object. If the object is not known apriori, the operation of finding a firm grasp becomes more complicated.

A method where the above-described object reconstruction process guides the multi-fingered robotic hand to grab the object in a (sub)optimal configuration is proposed in [IJ-1], [BC-2] and [IC-4]. This method allows performing the object reconstruction process in parallel with the optimal grasp planner. In this way, the total time to complete a grasp is reduced with respect to the methods presented in the literature. Moreover, the movements of the fingers can be compared with the ones performed by the human hand, as highlighted in [IC-5].

Inverse kinematics algorithm for dexterous manipulation

A well-known inverse kinematics algorithm for robot manipulator has been re-adapted in [BC-1] and [IC-6] to perform as both a planner and a kinematic controller for dual-arm/hand dexterous manipulation tasks. This method allows assigning the object motion directly and retrieves the movement of the single fingers implicitly. Moreover, in the proposed framework, it is possible to exploit the redundancy of the whole system in contact with the object, to ensure dexterity and perform stable grasps. Such a method is employed as a planner in [IJ-4], where a suitable parallel/force control is tested in the GraspIt! environment to prove its performance. A theoretical proof shows how such parallel controller can also deal with non-planar surfaces.

Robotic catching of thrown objects through a monocular vision system

Catching a thrown object through a robotic system requires several capabilities like smart sensing, object tracking, motion prediction, on-line trajectory planning, and motion coordination. In the robotic literature, several papers deal with such a problem as well as the problem of motion trajectory estimation. Most of the approaches use either a stereo vision system to solve the 3D catching problem or a single camera for the 2D case. This scenario is reasonable because 3D tracking of the ball takes benefits from triangulation methods while, in the case of a single camera, only 2D information is directly available.

However, high frame rate and optics with reasonable accuracy are required to achieve an accurate and fast trajectory prediction, i.e., a successful catch. By using only one camera, the cost of the equipment can be reduced. Moreover, the calibration procedure for one camera is more comfortable than in the stereo case. Hence, Fabio Ruggiero is the co-author of an approach in which only one camera in the eye-in-hand configuration is employed [IJ-5], [IJ-3], [IC-9]. A visual algorithm based on either the ball color or the circular shape, a new on-line trajectory estimation algorithm (a simple parabolic motion is assumed in [IC-11], while the air drag effect is included in [IJ-5], [IJ-3] and [IC-9]) and a partitioned-based visual approach are the principal components of the proposed solution. In particular, the answer in [IJ-5] also deals with rolling and bouncing balls.

Nonprehensile manipulation techniques

An object is manipulated in a nonprehensile way when it is not caged between the fingertips or the hand's palm. Moreover, the so-called "force closure" constraint does not hold at each time of the manipulation task. This means that the motion can also be performed thanks to unilateral constraints: the part can thus roll, slide and break the contact with the robot manipulating it. Examples of everyday nonprehensile manipulation tasks are pushing objects, folding clothes, carrying a glass on a tray, cooking in a pan, and so on. Nonprehensile manipulation can also be referred to as dynamic when the dynamics of both the object and the robot are essential to accomplishing the desired task. A standard approach within the robotics community is to split a complex nonprehensile manipulation task into several subtasks, that is more easy to deal with individually. Therefore, it is possible to define the so-called "manipulation primitives" like rolling (both holonomic and nonholonomic), throwing, bouncing, catching, sliding, and so on. The primary goal regarding Fabio Ruggiero's research is to design a common practical/theoretical framework where each motion primitive can be equipped with a proper motion planner and controller. A survey about nonprehensile manipulation is written by Fabio Ruggiero in [IJ-11], while the results of the RoDyMan project are resumed in [IJ-14][BC-8].

A holonomic rolling motion between two convex surfaces at contact is considered in [IJ-2] and [IC-8]. There are no constraints between the two surfaces but only the rolling one. In particular, the stabilization in full gravity of the unstable position of a disk free to roll on an actuated disk is addressed.

The same set-up is considered within [IJ-8] where passivity theory has been employed to solve the control problem and [IC-22][BC-5] in the presence of the so-called "matched disturbances" within the control action. The found solution exploits the port-Hamiltonian approach. By generalizing the method, in [IJ-7], under certain assumptions about the shapes of the rolling surfaces, a proper change of coordinates allows studying the general case of nonprehensile planar rolling through classic nonlinear control techniques, where the design of the controller is much simplified. The found assumptions are overcome in [IJ-15], where the interconnection and damping assignment passivity-based control, rooted within the port-Hamiltonian formalism, is found to be a valid method to generalize the nonprehensile planar rolling manipulation primitive, without explicitly solving the so-called matching equations. In truth, the approach in [IJ-15] can be applied to systems that do not belong to the class of nonprehensile manipulation tasks, as in [IC-27]. Limitations of [IJ-15] regarding the presence of a possible singular point in the controller have been overcome in [IJ-17].

A nonprehensile manipulation task in case of nonholonomic rolling can be considered the motion control of the 'ballbot", that is a spherical robot with a cylindrical top. A geometric control approach without coordinates is proposed in [IC-20]. Another task in which nonholonomic rolling is involved is the hula-hoop system. This system consists of a pole in contact with a hoop: the pole is intended to be moved for inducing, through contact, a spinning movement of the hoop. A high-gain observer and a controller are designed in [IC-25] to avoid both velocity measurements and the complete dependence on the mathematical model. A formal mathematical analysis, which guarantees ultimate boundedness of all coordinates, is presented in [IJ-10].

A further task concerning nonholonomic rolling is the classical ball-and-plate benchmarking system. A method to reconfigure in a nonprehensile way the position and the orientation of a sphere rolling on a plate is proposed in [IC-26]. The nonholonomic nature of the task is solved at a planning level. Then, an integral passivity- based control is designed to track the planned trajectory. The port-Hamiltonian formalism is employed to model the whole dynamics. A humanoid-like robot is used to bolster the proposed method experimentally.

The bouncing motion primitive is examined in [IC-21][IC-24], where the table tennis case study is addressed. A motion planner for the paddle, also considering its orientation, is introduced in the cited manuscript. The whole aerodynamics of the flying ball is taken into account without neglecting the real-time execution of the implemented algorithm. The assumption of having a constant predefined impact time is relaxed in [BC-4], while different metrics are compared to define the optimal impact time. The throw of a deformable object is instead addressed in [IC-19]. The example of a pizza-maker who acrobatically throws the pizza in the air to stretch the dough is considered. The model and the control are designed by using a geometric approach without making use of coordinates.

The friction-induced nonprehensile manipulation primitive is addressed in [IC-28] where, taking inspiration from the pizza-peel dexterous task, a plate which is intended to induce a rotating movement on a disk is studied. A dynamic model based on the Euler-Lagrange equations is first derived. Then, a controllability analysis of this model is carried out. Later, a closed-loop control strategy is proposed to induce the desired rotating speed in the disk, while maintaining the position of both the disk and the plate as close to zero as possible. A stability analysis is performed to show the boundedness of all the states, the oscillatory response of all of them, and the maximum amplitude of these oscillations.

Wheel slip may cause a significative worsening of control performance during the movement of a mobile robot, especially in those cases where the robot must push an object to the desired location. A method to avoid wheel slip is proposed in [IC-29] through a nonlinear model predictive control. The constraints included within the optimization problem limit the force exchanged between each wheel and the ground. The approach is validated in a dynamic simulation environment. The slippage may also occur between the robot and the object during pushing, preventing the correct achievement of the task. A linear time-varying model predictive control is designed in [IC-30] to include the unilateral constraint within the control action properly. The approach is verified in a dynamic simulation environment through a Pioneer 3-DX wheeled robot executing the pushing manipulation of a package. The extension of the nonprehensile pushing task for a multi-robot system is devised in [IC-35].

Friction becomes extremely important also when an object is transported in a non-prehensile way on a tray and we do not want any movement during the motion. The article [IJ-18] proposes a shared-control teleoperation architecture for robot manipulators transporting an object on a tray. The proposed approach automatically regulates the remote robot motion commanded by the user and the end-effector orientation to prevent the object from sliding over the tray. Furthermore, the human operator is provided with haptic cues informing about the discrepancy between the commanded and executed robot motion.

Control of vertical take-off and landing unmanned aerial vehicles equipped with small-scale robot manipulators

Dynamic equations of aerial robots are complicated due to both high instability of the platform and the presence of aerodynamic effects which are not merely to model. By attaching a small-scale robot manipulator to such an aerial system, it is straightforward to recognize that the dynamic coupling between the modelling terms becomes relevant. Representing in a proper way the dynamic model of the whole system is then crucial to develop suitable control laws. A literature review about aerial manipulation is published by Fabio Ruggiero in [IJ-13].

The dynamic model of vertical take-off and landing (VToL) unmanned aerial vehicles (UAVs) with an attached robotic arm is derived in [IC-10] and [IC-12] in a symbolic matrix form through the Euler-Lagrangian formalism. Fabio Ruggiero develops Cartesian impedance control for UAVs equipped with a robotic arm. A dynamic relationship between generalized external forces acting on the structure and the system motion, which is specified in terms of Cartesian space coordinates, is provided in [IC-10]. Through a suitable choice of such variables and for a given task, thanks to the added degrees of freedom offered by the robot arm attached to the UAV, it is possible to exploit the redundancy of the system to perform some useful subtasks [IC-12].

However, since most robotic arms placed on the UAVs are often small-size manipulators made up by servomotors, it is often not possible to directly control the joint torques. Hence, Fabio Ruggiero developed a method in [IC-14] and [IC-18] to control the aerial vehicle and the robotic manipulator separately. The latter can be moved through standard position-based and/or kinematic controller, while the former has to both compensate the movements of the arm and translate towards the desired position in the Cartesian space. Therefore, an estimator of generalized external forces (forces plus moments) acting on the aerial vehicle and based on the mechanical momentum of the system is developed. The estimation is fed back to the flying vehicle controller to take into account and compensate the robotic manipulator's movements. The overall controller design is made up by an inner and an outer loop which are shaped as mechanical impedances, whose stiffness and damping are programmable through the control gains, giving in this way some passivity properties to the entire scheme [IJ-6]. The overall architecture has been tested on both a UAV with unknown payload and external forces [IJ-6] and a UAV equipped with a 6-DOF small-size servo robotic arm [IC-18][BC-7].

In case of a dual-arm aerial manipulator, novel image-based visual-impedance controllers are developed in [IJ-12], allowing physical interaction of the platform equipped with a camera and a force/torque sensor. Visual information is employed both to coordinate the camera motion in an eye-in-hand configuration with the assigned task executed by the other robot arm, and to define the elastic wrench component of the proposed hybrid impedance equations directly in the image plane.

A hardware-in-the-loop simulator for human cooperation with an aerial manipulator is presented in [IC-36]. The simulator is meant to provide the user with realistic haptic feedback proper of a human-aerial manipulator interaction activity. The forces exchanged between the hardware interface and the human/environment are measured and supplied to a dynamically simulated aerial manipulator. In turn, the simulated aerial platform feeds back its position to the hardware allowing the human to both feel and evaluate the interaction effects.

Control of quadrotors in case of a propeller failure.

Both a PID [IC-17] approach and a backstepping [IC-16] one have been proposed to cope with the failure of a quadrotor's propeller. The presented methodologies suppose to turn off also the motor which is opposite to the broken one. In this way, a birotor configuration with fixed propellers is achieved. The birotor is hence controlled to follow a planned emergency trajectory. In truth, in both cases, theory shows that any point in the Cartesian space can be reached, provided that the possibility to control the yaw angle is lost.

Control of aerial vehicles for landing on oscillating platforms	Given the dynamic model of a UAV, a set of virtual geometric constraints is imposed on the system in [IC-23]. Once these constraints are reached through a feedback control law, it is possible to show that the system exhibits a limit cycle that is the periodic trajectory to track. The work aims to keep the UAV on such periodic trajectory. It is possible to stabilize the aerial vehicle on this oscillating motion through a modified LQR controller, which is designed based on a linear periodic system approximating the system dynamics around the desired orbit.
Stabilization of a wheeled VToL on a pipe	The task of stabilizing a wheeled unmanned aerial vehicle on a pipe, which is an application in oil and gas facilities for nondestructive measurements, is addressed in [IJ-16]. After the derivation of the dynamic model of the system, a discrete-time nonlinear model predictive controller is designed over a finite horizon. The analysis of the asymptotic stability of the designed controller is carried out. Numerical tests show the performance and the robustness of the proposed solution.
Control of redundant robot arms for human-robot interaction	The new generation of the robot should have the intrinsic ability to share the operating environment with humans. Often physical interaction occurs, and this may happen at any part of the manipulator body. The contact can be either intentional (i.e., required for collaborative tasks), or accidental (i.e., unexpected collisions). Suitable control strategies must be adopted to guarantee a safe robot reaction to physical interaction, which may require the measurement or the estimate of exchanged forces and moments. The problem of controlling the position and orientation, expressed in a singularity-free representation form, of the end-effector of a redundant robot, while addressing an active compliant behavior within the null-space is discussed in [IJ-9][BC-6]. To accomplish the task, a dynamic controller is designed without the need for any exteroceptive sensors information. A rigorous stability analysis is provided to confirm the developed theory.
Control of biped robots	A compass-like biped robot can go down a gentle slope without the need of actuation through a proper choice of its dynamic parameter and starting from a suitable initial condition. Addition of control actions is requested to generate additional gaits and robustify the existing one. An interconnection and damping assignment passivity-based control, rooted within the port-Hamiltonian framework, is designed in [IJ-17][IC-31] to generate further gaits with respect to state-of-the-art methodologies, enlarge the basin of attraction of existing gaits, and further robustify the system against controller discretization and parametric uncertainties.The performance of the proposed algorithm is validated through numerical simulations and comparison with existing passivity-based techniques. Energy pumping-and-damping passivity-based control is used instead in [IC-34] to increase the robustness against uncertainties on the initial conditions of the passive gait exhibited by planar biped robots. The stability analysis is carried out by exploiting the system's passivity and the hybrid zero dynamics method. Besides, the proposed approach is applied to new gaits that are generated using interconnection and damping assignment passivity-based control. Disturbance reconstruction and robust trajectory tracking control of biped robots with hybrid dynamics in the port-Hamiltonian form is investigated in [IJ-20]. A fractional proportional-integral-derivative filter is used to achieve finite-time convergence for position tracking errors. A fractional-order sliding mode controller acts as a centralized controller, ensuring the finite-time stability of the velocity tracking error. The undesired effects of unknown external disturbance and parameter uncertainties are compensated for using estimators. Two disturbance estimators are envisioned. The former is designed using fractional calculus. The latter is an adaptive estimator, and it is constructed using the general dynamic of biped robots. Stability analysis shows that the closed-loop system is finite-time stable in both contact-less and impact phases.
Control of quadruped robots	The main advantage of legged robots is the capability to move through complicated and challenging terrains. A powerful tool for robust control and disturbance rejection is the momentum-based observer due to its simple structure and high performance. The work in [IJ-19] presents an estimator of external disturbances for legged robots, based on the system's momentum. The estimator, along with a suitable motion planner for the trajectory of the robot's center of mass and an optimization problem based on the modulation of ground reaction forces, devises a whole-body controller for the robot. The designed solution is tested on a quadruped robot within a dynamic simulation environment. The quadruped is stressed by external disturbances acting on stance and swing legs indifferently.

Publications

Book editor

[BE-1] F. Ficuciello, F. RUGGIERO, A. Finzi (eds.), *Human Friendly Robotics. 10th International Workshop*, Springer Proceedings in Advanced Robotics, vol. 7, Springer International Publishing, 2018, ISBN: 978-3-319-89326-6.

International journal papers (refereed)

[IJ-21] Y. Farid, F. RUGGIERO, *Finite-time extended state observer and fractional-order sliding mode controller for impulsive hybrid port-Hamiltonian systems with input delay and actuators saturation: Application to ball-juggler robots*, in Mechanism and Machine Theory, vol. 167, 104577, 2022, DOI: 10.1016/j.mechmachtheory.2021.104577.

[IJ-20] Y. Farid, F. RUGGIERO, *Finite-time disturbance rejection and robust fractional-order controller design for hybrid port-Hamiltonian dynamics of biped robots*, in Robotics and Autonomous Systems, vol. 144, 103836, 2021, DOI: 10.1016/j.robot.2021.103836.

[IJ-19] V. Morlando, A. Teimoorzadeh, F. RUGGIERO, *Whole-body control with disturbance rejection through a momentum-based observer for quadruped robots*, in Mechanism and Machine Theory, vol. 164, 104412, 2021, DOI: 10.1016/j.mechmachtheory.2021.104412.

[IJ-18] M. Selvaggio, J. Cacace, C. Pacchierotti, F. RUGGIERO, P. Robuffo Giordano, *A shared-control teleoperation architecture for nonprehensile object transportation*, in IEEE Transactions on Robotics (in press), DOI: 10.1109/TRO.2021.3086773. **Finalist for the "Fabrizio Flacco" Young Author Best Paper Award 2021**.

[IJ-17] P. Arpenti, F. RUGGIERO, V. Lippiello, *A constructive methodology for the IDA-PBC of underactuated 2-DoF mechanical systems with explicit solution of PDEs*, in International Journal of Control, Automation and Systems, (in press).

[IJ-16] S. Zhao, F. RUGGIERO, G.A. Fontanelli, V. Lippiello, Z. Zhu, B. Siciliano, *Nonlinear model predictive control for the stabilization of a wheeled unmanned aerial vehicle on a pipe*, in IEEE Robotics and Automation Letters, vol. 4, n. 4, pp. 4314-4321, 2019, DOI: 10.1109/LRA.2019.2931821.

[IJ-15] D. Serra, F. RUGGIERO, A. Donaire, L.R. Buonocore, V. Lippiello, B. Siciliano, *Control of nonprehensile planar rolling manipulation: A passivity-based approach*, in IEEE Transactions on Robotics, vol. 35, n. 2, pp. 317-329, 2019, DOI: 10.1109/TRO.2018.2887356.

[IJ-14] F. RUGGIERO, A. Petit, D. Serra, A.C. Satici, J. Cacace, A. Donaire, F. Ficuciello, L.R. Buonocore, G.A. Fontanelli, V. Lippiello, L. Villani, B. Siciliano, *Nonprehensile manipulation of deformable objects: Achievements and perspectives from the RoDyMan project*, in IEEE Robotics & Automation Magazine, vol. 25, pp. 83-92, 2018, DOI: 10.1109/MRA.2017.2781306.

[IJ-13] F. RUGGIERO, V. Lippiello, A. Ollero, *Aerial manipulation: A literature review*, in IEEE Robotics and Automation Letters, vol. 3, n. 3, pp. 1957-1964, 2018, DOI: 10.1109/LRA.2018.2808541.

[IJ-12] V. Lippiello, G.A. Fontanelli, F. RUGGIERO, *Image-based visual-impedance control of a dual-arm aerial manipulator*, in IEEE Robotics and Automation Letters, vol. 3, n. 3, pp. 1856-1863, 2018, DOI: 10.1109/LRA.2018.2806091.

[IJ-11] F. RUGGIERO, V. Lippiello, B. Siciliano, *Nonprehensile dynamic manipulation: A survey*, in IEEE Robotics and Automation Letters, vol. 3, n. 3, pp. 1711-1718, 2018, DOI: 10.1109/LRA.2018.2801939.

[IJ-10] A. Gutiérrez-Giles, F. RUGGIERO, V. Lippiello, B. Siciliano, *Nonprehensile manipulation of an underactuated mechanical system with second order nonholonomic constraints: The robotic hula-hoop*, in IEEE Robotics and Automation Letters, vol. 3, n. 2, pp. 1136-1143, 2018, DOI: 10.1109/LRA.2018.2792403.

[IJ-9] F. Vigoriti, F. RUGGIERO, V. Lippiello, L. Villani, *Control of redundant robot arms with null-space compliance and singularity-free orientation representation*, in Robotics and Autonomous Systems, vol. 100, pp. 186-193, 2018, DOI: 10.1016/j.robot.2017.11.007.

[IJ-8] A. Donaire, F. RUGGIERO, V. Lippiello, B. Siciliano, *Passivity-based control for a rolling-balancing system: The nonprehensile disk-on-disk*, in IEEE Transactions on Control System Technology, vol. 25, n.6, pp. 2135-2142, 2017, DOI: 10.1109/TCST.2016.2637719.

[IJ-7] V. Lippiello, F. RUGGIERO, B. Siciliano, *The effects of shapes in input-state linearization for stabilization of nonprehensile planar rolling dynamic manipulation*, in IEEE Robotics and Automation Letters, vol. 1, n.1, pp. 492-499, 2016, DOI: 10.1109/LRA.2016.2519147.

[IJ-6] F. RUGGIERO, J. Cacace, H. Sadeghian, V. Lippiello, *Passivity-based control of VTOL-UAVs with a momentum-based estimator of external wrench and unknown dynamics*, in Robotics and Autonomous Systems, vol. 72, pp. 139-151, 2015, DOI: 10.1016/j.robot.2015.05.006.

[IJ-5] P. Cigliano, V. Lippiello, F. RUGGIERO, B. Siciliano, *Robotic ball catching with an eye-in-hand single-camera system*, in IEEE Transactions on Control Systems Technology, vol. 23, n. 5, pp. 1657-1671, 2015, DOI: 10.1109/TCST.2014.2380175.

[IJ-4] F. Caccavale, V. Lippiello, G. Muscio, F. Pierri, F. RUGGIERO, L. Villani, *Grasp planning and parallel control of a redundant dual-arm/hand manipulation system*, in Robotica, vol. 31, n. 7, pp. 1169-1625, 2013, DOI: 10.1017/S0263574713000647.

[IJ-3] V. Lippiello, F. RUGGIERO, B. Siciliano, *3D monocular robotic ball catching*, in Robotics and Autonomous Systems, vol. 61, n. 7, pp. 1615-1625, 2013, DOI: 10.1016/j.robot.2013.06.008.

[IJ-2] J.-C. Ryu, F. RUGGIERO, K. Lynch, *Control of nonprehensile rolling manipulation: Balancing a disk on a disk*, in IEEE Transactions on Robotics, vol. 29, n. 5, pp. 1152-1161, 2013, DOI: 10.1109/TRO.2013.2262775.

[IJ-1] V. Lippiello, F. RUGGIERO, B. Siciliano, L. Villani, *Visual grasp planning for unknown objects using a multi-fingered robotic hand*, in IEEE/ASME Transactions on Mechatronics, vol. 18, n. 3, pp. 1050-1059, 2013, DOI: 10.1109/TMECH.2012.2195500. **2015 I-RAS Young Author Best Paper Award**.

Book chapters (refereed)

[BC-10] F. RUGGIERO, D. Serra, V. Lippiello, B. Siciliano, *Control techniques to deal with the damage of a quadrotor propeller*, in Fault Diagnosis and Fault-tolerant Control of Robotic and Autonomous Systems, A. Monteriu et al. (eds.), vol. 126, pp. 25-42, The Institution of Engineering and Technology, 2020. DOI: 10.1049/PBCE126E_ch2.

[BC-9] J. Cacace, F. RUGGIERO, V. Lippiello, *Hierarchical task-priority control for human-robot co-manipulation*, in Human Friendly Robotics. 12th International Workshop, Springer Proceedings in Advanced Robotics, F. Ferraguti et al. (eds.), vol. 12, pp. 125-138, Springer, Cham, 2020. DOI: 10.1007/978-3-030-42026-0_10.

[BC-8] F. RUGGIERO, J.-T. Kim, A. Gutiérrez-Giles, A.C. Satici, A. Donaire, J. Cacace, L.R. Buonocore, G.A. Fontanelli, V. Lippiello, B. Siciliano, *Nonprehensile manipulation control and task planning for deformable object manipulation: Results from the RoDyMan project*, in Informatics in Control, Automation and Robotics, Lecture Notes in Electrical Engineering , Gusikhin O. and Madani K. (eds), vol. 613, pp. 76-100, Springer, Cham, 2020. DOI: 10.1007/978-3-030-31993-9_4.

[BC-7] F. RUGGIERO, *Decentralized control of aerial manipulators through a momentum-based estimator*, in Aerial Robotic Manipulation. Research, Development and Applications, Springer Tracts in Advanced Robotics, A. Ollero and B. Siciliano (eds), vol. 129, pp. 159-174, Springer, Cham, 2019. DOI: 10.1007/978-3-030-12945-3_11.

[BC-6] F. Vigoriti, F. RUGGIERO, V. Lippiello, L. Villani, *Tracking control of redundant manipulators with singularity-free orientation representation and null-space compliant behaviour*, in Human Friendly Robotics. 10th International Workshop, Springer Proceedings in Advanced Robotics, F. Ficuciello, F. Ruggiero, A. Finzi (eds), vol. 7, pp. 15-28, Springer, Cham, 2019. DOI: 10.1007/978-3-319-89327-3_2.

[BC-5] A. Donaire, M. Crespo, F. RUGGIERO, V. Lippiello, B. Siciliano, *Passivity-based control design and experiments for a rolling-balancing system*, in Informatics in Control, Automation and Robotics, Lecture Notes in Electrical Engineering, Madani K., Peaucelle D., Gusikhin O. (eds), vol. 430, pp. 230-255, Springer, Cham, 2018. DOI: 10.1007/978-3-319-55011-4_12.

[BC-4] D. Serra, F. RUGGIERO, A.C. Satici, V. Lippiello, B. Siciliano, *Time-optimal paths for a robotic batting task*, in Informatics in Control, Automation and Robotics, Lecture Notes in Electrical Engineering, Madani K., Peaucelle D., Gusikhin O. (eds), vol 430, pp. 256-276, Springer, Cham, 2018. DOI: 10.1007/978-3-319-55011-4_13.

[BC-3] L. Villani, F. Ficuciello, V. Lippiello, G. Palli, F. RUGGIERO, B. Siciliano, *Grasping and control of multi-fingered hands*, in Advanced Bimanual Manipulation: Results from the DEXMART Project, in Springer Tracts in Advanced Robotics 80, B. Siciliano (Ed.), pp. 219 – 266, Springer, Heidelberg, D, 2012, DOI: 10.1007/978-3-642-29041-1_5.

[BC-2] V. Lippiello, F. RUGGIERO, B. Siciliano, *Floating visual grasp of unknown objects using an elastic reconstruction surface*, in Robotics Research: The Fourteenth International Symposium, in Springer Tracts in Advanced Robotics 70, C. Pradalier, R. Siegwart and G. Hirzinger (Eds.), pp. 329-344, Springer, Heidelberg, D, 2011, DOI: 10.1007/978-3-642-19457-3_20.

[BC-1] V. Lippiello, F. RUGGIERO, L. Villani, *Inverse kinematics for object manipulation with redundant multi-fingered robotic hands*, in Robot Motion and Control 2009, in Lecture Notes in Control and Information Sciences, Krzysztof Kozlowski (Ed.), pp. 255-264, Springer, Heidelberg, D, 2009, DOI: 10.1007/978-1-84882-985-5_23.

International conference papers (refereed)

[IC-36] E. Cuniato, J. Cacace, M. Selvaggio, F. RUGGIERO, V. Lippiello, *A hardware-in-the-loop simulator for physical human-aerial manipulator cooperation*, 20th International Conference on Advanced Robotics, Slovenia, 2021. In press.

[IC-35] F. Bertoncelli, F. RUGGIERO, L. Sabattini, *Characterization of grasp configurations for multi-robot object pushing*, 3rd IEEE International Symposium on Multi-Robot and Multi-Agent Systems, United Kingdom, 2021. In press.

[IC-34] P. Arpenti, A. Donaire, F. RUGGIERO, V. Lippiello, *Energy pumping-and-damping for gait robustification of underactuated planar biped robots within the hybrid zero dynamics framework*, 2020 IEEE-RAS 20th International Conference on Humanoid Robots, Germany, 2021. In press.

[IC-33] Z. Pastori, F. RUGGIERO, V. Lippiello, M. Di Castro, *Bayesian optimization approach to input shaper design for flexible beam vibration suppression*, 21st IFAC World Congress, Germany, 2020, DOI: 10.1016/j.ifacol.2020.12.2159.

[IC-32] M. Nacusse, P. Arpenti, F. RUGGIERO, V. Lippiello, *Gait generation for underactuated compass-like robots using dissipative forces in the controller*, 21st IFAC World Congress, Germany, 2020, DOI: 10.1016/j.ifacol.2020.12.2022.

[IC-31] P. Arpenti, F. RUGGIERO, V. Lippiello, *Interconnection and damping assignment passivity-based control for gait generation in underactuated compass-like robots*, 2020 IEEE International Conference on Robotics and Automation, Paris, F, pp. 9802-9808, 2020, DOI: 10.1109/ICRA40945.2020.9196598.

[IC-30] F. Bertoncelli, F. RUGGIERO, L. Sabattini, *Linear time-varying MPC for nonprehensile object manipulation with a nonholonomic mobile robot*, 2020 IEEE International Conference on Robotics and Automation, Paris, F, pp. 11032-11038, 2020, DOI: 10.1109/ICRA40945.2020.9197173.

[IC-29] F. Bertoncelli, F. RUGGIERO, L. Sabattini, *Wheel slip avoidance through a nonlinear model predictive control for object pushing with a mobile robot*, 10th IFAC Symposium on Intelligent Autonomous Vehicles, Gdansk, PL, 2019, DOI: 10.1016/j.ifacol.2019.08.043. **Nominated for the Young Author Best Paper Award**.

[IC-28] A. Gutiérrez-Giles, F. RUGGIERO, V. Lippiello, B. Siciliano, *Closed-loop control of a nonprehensile manipulation system inspired by a pizza-peel mechanism*, European Control Conference, Naples, I, pp. 1580-1585, 2019, DOI: 10.23919/ECC.2019.8796077.

[IC-27] P. Arpenti, D. Serra, F. RUGGIERO, V. Lippiello, *Control of the TORA system through the IDA-PBC without explicit solution of the matching equations*, 3rd IEEE International Conference on Robotic Computing, Naples, I, 2019, DOI: 10.1109/IRC.2019.00069.

[IC-26] D. Serra, J. Ferguson, F. RUGGIERO, A. Siniscalco, A. Petit, V. Lippiello, B. Siciliano, *On the experiments about the nonprehensile reconfiguration of a rolling sphere on a plate*, 26th Mediterranean Conference on Control and Automation, Zadar, HR, pp. 13-20, 2018, DOI: 10.1109/MED.2018.8442769.

[IC-25] A. Gutiérrez-Giles, F. RUGGIERO, V. Lippiello, B. Siciliano, *Modelling and control of a robotic hula-hoop system without velocity measurements*, 20th IFAC World Congress, Toulouse, F, pp. 9808-9814, 2017, DOI: 10.1016/j.ifacol.2017.08.889.

[IC-24] D. Serra, F. RUGGIERO, V. Lippiello, B. Siciliano, *A nonlinear least squares approach for nonprehensile dual-hand robotic ball juggling*, 20th IFAC World Congress, Toulouse, F, pp. 11485-11490, 2017, DOI: 10.1016/j.ifacol.2017.08.1595.

[IC-23] V. Lippiello, F. RUGGIERO, *Orbital stabilization of a VToL UAV for landing on oscillating platforms*, 2016 International Symposium on Safety, Security and Rescue Robotics, Lausanne, CH, pp. 131-138, 2016, DOI: 10.1109/SSRR.2016.7784289.

[IC-22] M. Crespo, A. Donaire, F. RUGGIERO, V. Lippiello, B. Siciliano, *Design, implementation and experiments of a robust passivity-based controller for a rolling-balancing system*, 13th International Conference on Informatics in Control, Automation and Robotics, Lisbon, P, pp. 79-89, 2016, DOI: 10.5220/0005981700790089. **Best Paper Award**.

[IC-21] D. Serra, A.C. Satici, F. RUGGIERO, V. Lippiello, B. Siciliano, *An optimal trajectory planner for a robotic batting task: The table tennis example*, 13th International Conference on Informatics in Control, Automation and Robotics, Lisbon, P, pp. 90-101, 2016, DOI: 10.5220/0005982000900101. **Nominated for the Best Student Paper Award**.

[IC-20] A.C. Satici, F. RUGGIERO, V. Lippiello, B. Siciliano, *Intrinsic Euler-Lagrange dynamics and control analysis of the ballbot*, 2016 American Control Conference, Boston, MA, USA, pp. 5685-5690, 2016, DOI: 10.1109/ACC.2016.7526560.

[IC-19] A.C. Satici, F. RUGGIERO, V. Lippiello, B. Siciliano, *Coordinate-free framework for robotic pizza tossing and catching*, 2016 IEEE International Conference on Robotics and Automation, Stockholm, S, pp. 3932-3939, 2016, DOI: 10.1109/ICRA.2016.7487582.

[IC-18] F. RUGGIERO, M. Trujillo, R. Cano, H. Ascorbe, A. Viguria, C. Peréz, V. Lippiello, A. Ollero, B. Siciliano, *A multilayer control for multirotor UAVs equipped with a servo robot arm*, 2015 IEEE International Conference on Robotics and Automation, Seattle, WA, USA, pp. 4014-4020, 2015, DOI: 10.1109/ICRA.2015.7139760.

[IC-17] V. Lippiello, F. RUGGIERO, D. Serra, *Emergency landing for a quadrotor in case of a propeller failure: A PID approach*, 2014 IEEE/RSJ International Conference on Intelligent Robots and Systems, Chicago, IL, USA, pp. 4782-4788, 2014, DOI: 10.1109/IROS.2014.6943242.

[IC-16] V. Lippiello, F. RUGGIERO, D. Serra, *Emergency landing for a quadrotor in case of a propeller failure: A backstepping approach*, 12th IEEE International Symposium on Safety, Security and Rescue Robots, Toyako-Cho, Hokkaido, J, 2014, DOI: 10.1109/SSRR.2014.7017647.

[IC-15] L.R. Buonocore, V. Lippiello, S. Manfredi, F. Ruggiero, *Effects on packet losses on formation control of unmanned aerial vehicles*, 19th World Congress of the International Federation of Automatic Control, Cape Town, ZA, pp. 1234-1240, 2014, DOI: 10.3182/20140824-6-ZA-1003.02216.

[IC-14] F. RUGGIERO, J. Cacace, H. Sadeghian, V. Lippiello, *Impedance control of VToL UAVs with a momentum-based external generalized forces estimator*, 2014 IEEE International Conference on Robotics and Automation, Hong Kong, C, pp. 2093-2099, 2014, DOI: 10.1109/ICRA.2014.6907146.

[IC-13] V. Lippiello, R. Mebarki, F. RUGGIERO, *Visual coordinated landing of a UAV on a mobile robot manipulator*, IEEE International Symposium on Safety, Security and Rescue Robotics, Linkoping, S, pp. 1-7, 2013, DOI: 10.1109/SSRR.2013.6719338.

[IC-12] V. Lippiello, F. RUGGIERO, *Exploiting redundancy in Cartesian impedance control of UAVs equipped with a robotic arm*, 2012 IEEE/RSJ International Conference on Intelligent Robots and Systems, Vilamoura, P, pp. 3768-3773, 2012, DOI: 10.1109/IROS.2012.6386021.

[IC-11] V. Lippiello, F. RUGGIERO, *Monocular eye-in-hand robotic ball catching with parabolic motion estimation*, 10th International IFAC Symposium on Robot Control, Dubrovnik, HR, pp. 229-234, 2012, DOI: 10.3182/20120905-3-HR-2030.00015.

[IC-10] V. Lippiello, F. RUGGIERO, *Cartesian impedance control of a UAV with a robotic arm*, 10th International IFAC Symposium on Robot Control, Dubrovnik, HR, pp. 704-709, 2012, DOI: 10.3182/20120905-3-HR-2030.00158.

[IC-9] V. Lippiello, F. RUGGIERO, *3D monocular robotic ball catching with an iterative trajectory estimation refinement*, 2012 IEEE International Conference on Robotics and Automation, St. Paul, MN, pp. 3950-3955, 2012, DOI: 10.1109/ICRA.2012.6224994.

[IC-8] J.-C. Ryu, F. RUGGIERO, K.M. Lynch, *Control of nonprehensile rolling manipulation: Balancing a disk on a disk*, 2012 IEEE International Conference on Robotics and Automation, St. Paul, MN, pp. 3232-3237, 2012, DOI: 10.1109/ICRA.2012.6225044.

[IC-7] M. Momeni-K., S.C. Diamantas, F. RUGGIERO, B. Siciliano, *Height estimation from a single camera view*, International Conference on Computer Vision Theory and Applications, Roma, I, 2012.

[IC-6] F. Caccavale, G. Muscio, V. Lippiello, F. Pierri, F. RUGGIERO, L. Villani, *Kinematic control with force feedback for a redundant bimanual manipulation system*, 2011 IEEE/RSJ International Conference on Intelligent Robots and Systems, San Francisco, CA, pp. 4194-4200, 2011, DOI: 10.1109/IROS.2011.6094865.

[IC-5] V. Lippiello, F. RUGGIERO, B.Siciliano, L. Villani, *Human-like visual grasp of unknown objects*, International Conference on Applied Bionics and Biomechanics, Venice, I, 2010.

[IC-4] V. Lippiello, F. RUGGIERO, B. Siciliano, L. Villani, *Preshaped visual grasp of unknown objects with a multi-fingered hands*, 2010 IEEE/RSJ International Conference on Intelligent Robots and Systems, Taipei, ROC, pp. 5894-5899, 2010, DOI: 10.1109/IROS.2010.5650680.

[IC-3] V. Lippiello, F. RUGGIERO, L. Villani, *Floating visual grasp of unknown objects*, 2009 IEEE/RSJ International Conference on Intelligent Robots and Systems, St. Louis, MO, pp. 1290-1295, 2009, DOI: 10.1109/IROS.2009.5354350.

[IC-2] V. Lippiello, F. RUGGIERO, L. Villani, *Exploiting redundancy in closed-loop inverse kinematics for dexterous object manipulation*, IEEE International Conference on Advanced Robotics, Munich, D, 2009.

[IC-1] V. Lippiello, F. RUGGIERO, *Surface model Reconstruction of 3D objects from multiple views*, 2009 IEEE International Conference on Robotics and Automation, Kobe, J, pp. 2400—2405, 2009, DOI: 10.1109/ROBOT.2009.5152652.

National conference papers (refereed)

[NC-4] F. RUGGIERO, *Latest developments in robotic nonprehensile dynamic manipulation*, Convegno Annuale dei docenti e ricercatori italiani in AUTOMATICA, Roma, I, 2016.

[NC-3] V. Lippiello, F. RUGGIERO, *3D robotic monocular ball catching*, Convegno Annuale dei docenti e ricercatori italiani in AUTOMATICA, Pisa, I, 2011.

[NC-2] V. Lippiello, F. RUGGIERO, B. Siciliano, L. Villani, *Kinematic motion control for visual grasp of unknown objects*, Convegno Nazionale Anipla Motion Control, Milano, I, 2010.

[NC-1] V. Lippiello, F. RUGGIERO, B. Siciliano, L. Villani, *Exploiting redundancy in kinematic motion control for dexterous object manipulation*, Convegno Nazionale Anipla Motion Control, Milano, I, 2010.

Other contributions (not refereed)

F. RUGGIERO, V. Lippiello, A. Ollero, *Introduction to the special issue on aerial manipulation*, IEEE Robotics and Automation Letters, vol. 3, pp. 2734-2737, 2018, DOI: 10.1109/LRA.2018.2830750.

F. Ficuciello, V. Lippiello, F. RUGGIERO, B. Siciliano(speaker), L. VIllani, *Grasping and control of multifingered hands*, International Expert Days organized by Schunk, Hause, 2012.

V. Lippiello, F. RUGGIERO, L. Villani, *Motion coordination of multi-arm and multi-fingered robotic systems*, Control Themes in Hyperflexible Robotic Workcells, F.Basile and P.Chiacchio (Eds.), 2010.

V. Lippiello, F. RUGGIERO, B. Siciliano(speaker), L. Villani, *Fast visual grasp of unknown objects with a multi-fingered hand*, International Expert Days organized by Schunk, Hausen, 2010.

F. Ficuciello, V. Lippiello, F. RUGGIERO, B. Siciliano(speaker), L. Villani, *Grasping unknown objects with robotics hands using vision and touch*, Italian National Meeting SIDRA, Siracusa, 2009.

V. Lippiello, F. RUGGIERO, L. Villani(speaker), *A framework for task description and inverse kinematics of cooperative robot manipulators*, Italian National Meeting SIDRA, Vicenza, 2008.

Ph.D. Thesis

[TH] F. RUGGIERO, *Grasp and manipulation of objects with a multi-fingered hand in unstructured environments*, Ph.D Thesis, Dec 2010.

Awards

ICINCO 2016 Best Paper Award — The paper "*Design, implementation and experiments of a robust passivity-based controller for a rolling-balancing system*", authored by M. Crespo, A. Donaire, F. RUGGIERO, V. Lippiello and B. Siciliano, has received the Best Paper Award at the 13th International Conference on Informatics in Control, Automation and Robotics, held in Lisbon, July 2016.

I-RAS Chapter Young Author Best Paper Award 2015 — On September, 9th 2015 at Automatica.it 2015 in Bari, Fabio Ruggiero has received the 2015 I-RAS Young Author Best Paper Award for the paper entitled "*Visual grasp planning for unknown objects using a multifingered robotic hand*", co-authored with Vincenzo Lippiello, Luigi Villani and Bruno Siciliano, published in the IEEE/ASME Transactions on Mechatronics in June 2013. The award is given to an author or co-author of a recent paper published in one of the journals (co-)sponsored by the IEEE Robotics and Automation Society (RAS). The publication date should be during 2013-2014; the author must be a member of I-RAS during 2015; the author's birth date must be later or equal than January, 1st 1980. The IEEE RAS Italian Chapter Young Author Best Paper has been selected by a Committee formed by the Chair of the Chapter and by 4 other IEEE RAS members nominated by the Chair. The Chapter Chair is the President of the Committee, he/she will vote only in case of parity. The 2015 Award Committee was composed by Arianna Menciassi, Daniele Nardi, Gianluca Antonelli, Paolo Rocco and Lucia Pallottino (Chapter Chair and President of the Committee).

Honors

"Fabrizio Flacco" Young Author Best Paper Award 2021 finalist — The paper "*A shared-control architecture for non-prehensile object transportation*", authored by M. Selvaggio, J. Cacace, C. Pacchierotti, F. RUGGIERO and P. Robuffo Giordano, has received the nomination for the "Fabrizio Flacco" Young Author Best Paper Award 2021, issued by the I-RAS Chapter. Young author: Mario Selvaggio.

IAV 2019 Young Author Best Paper Award finalist — The paper "*Wheel slip avoidance through a nonlinear model predictive control for object pushing with a mobile robot*", authored by F. Bertoncelli, F. RUGGIERO and L. Sabattini, has received the nomination for the Young Author Best Paper Award at the 10th IFAC Symposium on Intelligent Autonomous Vehicles, held in Gdansk, Poland, July 2019. Student: Filippo Bertoncelli.

FFABR 2017 — Fabio Ruggiero was among the recipients of the FFABR 2017, fund for the ordinary financing of Italian state universities.

ICINCO 2016 Best Student Paper Award finalist — The paper "*An optimal trajectory planner for a robotic batting task: The table tennis example*", authored by D. Serra, A. Satici, F. RUGGIERO, V. Lippiello and B. Siciliano, has received the nomination for the Best Student Paper Award at the 13th International Conference on Informatics in Control, Automation and Robotics, held in Lisbon, July 2016. Student: Diana Serra.

Invited speaker and delivered seminars

11 Jul 2020 — F. RUGGIERO, *Nonprehensile Dynamic Manipulation*, delivered within the international workshop "Robotic manipulation: mechatronic tools, modeling, identification and control", held during the 1st Virtual IFAC World Congress, Germany. 0.5 hours.

23 Jan 2019 — F. RUGGIERO, *Nonprehensile Robotic Manipulation*, delivered at Università degli Studi di Modena e Reggio Emilia. 1 hour.

31 May 2014 — F. RUGGIERO, *External generalized forces estimation in aerial manipulation*, delivered within the international workshop "Aerial robots physically interacting with the environment", held during the 2014 IEEE International Conference on Robotics and Automation, Hong Kong. 0.5 hours.

4 Jul 2013	F. RUGGIERO, *Kalman filter: Theory and applications in robotics* (in Italian), delivered at Dipartimento di Ingegneria Elettrica e Tecnologie dell'Informazione, Università degli Studi di Napoli Federico II, in range of the training course *Corso di alta formazione per specialisti in sistemi e tecnologie di Driver Monitoring*, 3 hours.
10 May 2012	F. RUGGIERO, *On the catching of thrown balls and the use of redundancy in fine and aerial manipulation tasks*, delivered at the Laboratory for Intelligent Mechanical Systems, Northwestern University. 1 hour.
3 Nov 2010	F. RUGGIERO, *Fast visual grasp of unknown objects with a multi-fingered hand*, delivered at School of Electrical and Electronic Engineering, University of Manchester. 1 hour.

Journal and conference service

Organizer co-chair	Fabio Ruggiero is an organizer co-chair of the 10th International Workshop on Human-Friendly Robotics (HFR 2017 - www.hfr2017.unina.it), organized on November 6-7, 2017, in Naples, Italy.
Journal Associate Editor	Sice July 2021, Fabio Ruggiero is Associate Editor for the IEEE Transactions on Robotics. From February 2018 to July 2021, Fabio Ruggiero was Associate Editor for the IEEE Robotics and Automation Letters.
Guest Editor	Guest Editor for the special issue entitled "Aerial manipulation" on the IEEE Robotics and Automation Letters, proposed by V. Lippiello, F. RUGGIERO and A. Ollero. The special issue appeared on March 2018.
Conference Associate Editor	2022 IEEE International Conference on Robotics and Automation. 2021 IEEE International Conference on Robotics and Automation. 2020 IEEE International Conference on Robotics and Automation. 2019 IEEE International Conference on Robotics and Automation. 2018 IEEE International Conference on Robotics and Automation. 2017 IEEE International Conference on Robotics and Automation. 2016 IEEE International Conference on Robotics and Automation. 2015 IEEE International Conference on Robotics and Automation.
Program Committee member	HFR 2021. Automatica.it 2021. 1st International Workshop on Internet of Autonomous Unmanned Vehicles. International Conference on Computer Vision Theory and Applications 2014.
Speaker in conference sessions	2020 IEEE International Conference on Robotics and Automation. 26th Mediterranean Conference on Control and Automation. Convegno Annuale dei docenti e ricercatori italiani AUTOMATICA 2016. 2016 IEEE International Conference on Robotics and Automation. 2015 IEEE International Conference on Robotics and Automation. 2014 IEEE International Conference on Robotics and Automation. 10th International IFAC Symposium on Robot Control. 2012 IEEE International Conference on Robotics and Automation. International Conference on Computer Vision Theory and Applications 2012. International Conference on Applied Bionics and Biomechanics 2010. International Conference on Advanced Robotics 2009.
Session chair	18th European Control Conference. 10th International Workshop on Human-Friendly Robotics. 2016 IEEE International Conference on Robotics and Automation. 10th International IFAC Symposium on Robot Control. International Conference on Computer Vision Theory and Applications 2012. International Conference on Applied Bionics and Biomechanics 2010.
Reviewer for international journals	Fabio Ruggiero has been reviewer for papers submitted to the following international journals: Robotics and Automation Magazine, IEEE Transactions on Robotics, IEEE Transactions on Automatic Control, IEEE Transactions on Control Systems Technology, IEEE Robotics and Automation Letters, IEEE Transactions on Aerospace and Electronic Systems, Robotica, Robotics and Computer Integrated Manufacturing, Robotics and Autonomous Systems, Sensors, Nonlinear Dynamics.

Reviewer for international conferences

Fabio Ruggiero has been reviewer for papers submitted to the following international conferences: IEEE International Conference on Robotics and Automation, IEEE/RSJ International Conference on Intelligent Robots and Systems, International IFAC Symposium on Robot Control, IEEE/RSJ International Conference on Advanced Intelligent Mechatronics, International Conference on Applied Bionics and Biomechanics, Symposium on Robot Control, International Conference on Human Robot Interaction.

Attended courses, conferences and workshops

21 Jun 2019 — Seminar on *"PID passivity-based control: Application to energy and mechanical systems"*, delivered by Prof. R. Ortega, at University of Naples Federico II. 1 hour. **Fabio Ruggiero was the organizer of this seminar**.

20 Feb 2019 — Seminar on *"Issues in robotic manipulation of deformable objects"*, delivered by Prof. C. Bouzgarrou, at University of Naples Federico II. 1 hour. **Fabio Ruggiero was the organizer of this seminar**.

2-6 Jul 2018 — Seminars on *"Introduction to modelling and control of mechanical systems with constraints"*, delivered by Prof. A. Shiriaev, at University of Naples Federico II. 10 hours. **Fabio Ruggiero was the organizer of these seminars**.

17 Jan 2018 — Seminar on *"Dynamic control: Mathematical challenges and applications"*, delivered by Prof. E. Zuazua, at University of Naples Federico II. 1 hour.

8 Nov 2017 — Seminar on *"From control to interaction in multi-robot systems"*, delivered by Dr. L. Sabattini, at University of Naples Federico II. 2 hours. **Fabio Ruggiero was the organizer of this seminar**.

28 Oct 2016 — Seminar on *"Legged robots for challenging environments"*, delivered by Prof. M. Hutter, at University of Naples Federico II. 1 hour.

14 Jan 2016 — Seminar on *"Arts et Metiers – Lille campus: Factory of the (near) future"*, delivered by Prof. R. Bearee, at University of Naples Federico II. 1 hour.

12 Nov 2015 — Seminar on *"On motion planning, motion representation and its orbital stabilization for mechanical system"*, delivered by Prof. A.S. Shiriaev, at University of Naples Federico II. 1 hour.

21 Apr 2015 — Seminar on *"Colloquium on robotics: Six keynote talks by International Experts 2015"*, organized by Prof. B. Siciliano, speakers: Prof. O. Khatib, Prof. T. Asfour, Prof. R. Lumia, Prof. G. Indiveri, Prof. K. Kyriakopoulos, Dr. R. Madhavan, at University of Naples Federico II. 4 hours.

15 Jan 2015 — Seminar on *"Mechanics of solids: From beam theory to rapid prototyping for surgery planning"*, delivered by Prof. F. Auricchio, at University of Naples Federico II. 2 hours.

14 Jan 2015 — Seminar on *"Smoothed particle machine perception: A proposed method for sensor fusion and physical-spacial perception"*, delivered by Dr. N. Hockings, at University of Naples Federico II. 1 hour.

16 Sep 2014 — Seminar on *"Towards agile flight of vision-controlled micro-flying robots: From frame-based to event-based vision"*, delivered by Prof. D. Scaramuzza, at University of Naples Federico II. 1 hour.

23 Jun 2014 — Seminar on *"Control systems design using energy properties of physical systems"*, delivered by Dr. A. Donaire, at University of Naples Federico II. 1 hour.

17 May 2012 — Seminar on *"Body intelligence in the hand: From human to artificial haptic"*, delivered by Prof. A. Bicchi, at University of Naples Federico II. 2 hours.

12 Jul 2012 — Seminar in *"Vibro-elastography and image guidance for prostate cancer interventions"*, delivered by Prof. T. Salcudean, at University of Naples Federico II. 2 hours.

23 Nov 2011 — Seminar on *"Building Energy Doctors: SPC and Kalman Filter-based Fault Detection"*, delivered by Prof. P.B. Luh, at University of Naples Federico II. 2 hours.

17 Nov 2011 — Seminar on *"Guidance and control of fish shoals using biomimetic robots"*, delivered by Prof. M. Porfiri, at University of Naples Federico II. 2 hours.

16 Nov 2011	Seminar on *"e-Heritage Projects in Italy, Cambodia, and Japan: Lesson learned"*, delivered by Prof. K. Ikeuchi, at Università degli Studi di Napoli Federico II. 2 hours.
24 Oct 2011	Seminar on *"Human-friendly robotics"*, tdelivered by Prof. O. Khatib, at University of Naples Federico II. 2 hours.
19 Oct 2011	Seminar on *"Mobile manipulation — A key technology for the factory of the future"*, delivered by Dr. R. Bischoff, at University of Naples Federico II. 2 hours.
15 Jun 2011	Seminar on *"Reengineering the Hand: Novel Approaches to Robotic Manipulation"*, delivered by Prof. A. Dollar, at University of Naples Federico II. 2 hours.
4 May 2011	Seminar on *"A mechatronic approach to modeling and control of non-rigid robots in industrial practice"*, delivered by Eng. A. Bottero, at University of Naples Federico II. 2 hours.
27 Apr 2011	Seminar on *"Robot Hands: Current Trends in Design and Control"*, delivered by Prof. C. Melchiorri, at University of Naples Federico II. 2 hours.
23 Mar 2011	Seminar on *"Fault diagnosys for robotic systems: From theory to practical implementation"*, delivered by Prof. F. Caccavale, at University of Naples Federico II. 2 hours.
17 Jan 2011	Seminar on *"Robotics from fundamental research to market success"*, delivered by Prof. R. Siegwart, at University of Naples Federico II. 2 hours.
25-29 Oct 2010	BRICS Research camping on *"Mobile manipulation"*, accepted through CV, publications and letters of references, at Club Playa Granada, Malaga. 5 full days.
6 Oct 2010	Workshop on *"Actuation and sensing in Robotics"*. 8 hours.
12-17 Jul 2010	Doctorate school SIDRA Antonio Ruberti on *"Robotics"*,in Italian, delivered by Prof.s G. Oriolo, D. Prattichizzo and L. Villani, at Centro Congressi di Bertinoro. 40 hours.
27 May 2010	Seminar on *"Isoperimetric problems"*, in Italian, delivered by Prof. Guido Trombetti, at University of Naples Federico II. 1 hour.
18 Sep 2009	Seminar on *"Composition of limit cycle controllers for gait transitions in legged locomotion"*, delivered by Prof. Daniel E. Koditschek, at Northwestern University, Evanston, Il, Usa. 1 hours.
18 Sep 2009	Seminar on *"Precision motion control for manufacturing applications"*, delivered by Prof. Andrew Alleyne, at Northwestern University, Evanston, Il, Usa. 1 hour.
13-18 Jul 2009	Doctorate school SIDRA Antonio Ruberti on *"Lyapunov techniques for robust control of dynamic systems"*,in Italian, delivered by Prof. F. Blanchini, at Centro Congressi di Bertinoro. 40 hours.
23 Jun 2009	Workshop on *"Robust and legible manipulation in human environments"*. 8 hours.
3 Jun 2009	Seminar on *"Human - Centered Robotics"*, delivered by Prof. Oussama Khatib, at University of Naples Federico II. 1 hour.
16-20 Feb 2009	Doctorate school on *"Information Engineering"*, at University of Naples Federico II. 40 hours.
18 Dec 2008	Seminar on *"Mirror neurons and point of view independence"*, delivered by Dr. R.Prevete, at University of Naples Federico II. 1 hour.
18 Dec 2008	Seminar on *"Mirror neurons and interaction"*, delivered by Eng. V.Cangiano, at University of Naples Federico II. 1 hour.
24 Oct 2008	Workshop on *"First workshop for young researchers on Human-friendly robotics"*, at Palazzo dell'Innovazione e della Conoscenza, Naples, Italy.
15 Sep 2008	Workshop on *"1st Dexmart Internal Workshop"*, at LAAS-CNRS, Toulose, Francia.
Jul 2008	Doctorate class on *"Analysis, Simulations and Applications of Nonsmooth Systems"*, delivered by Prof. P.T.Piiroinen, at University of Naples Federico II. 8 hours.
14-19 Jul 2008	Doctorate school SIDRA Antonio Ruberti on *"Introduction on non linear systems control"*, in Italian, delivered by Prof. A.Isidori, at Centro Congressi di Bertinoro. 40 hours.
Jun 2008	Doctorate class on *"H-infinity optimal control"*, in Italian, delivered by Prof. A.Pironti, at University of Naples Federico II. 15 hours.
May 2008	Doctorate class on *"Fuzzy Logic and Soft Computing"*, delivered by Prof. L.Iandoli, at University of Naples Federico II. 16 hours.
14 Mar 2008	Seminar on *"Robotics and disability"*, delivered by Prof. A.Casals, at University of Naples Federico II. 2 hours.
25-29 Feb 2009	Doctorate school on *"Information Engineer"*, at University of Naples Federico II. 40 hours.

20 Feb 2008	International symposium on *"Robotics: A New Science"*, at Accademia dei Lincei, Rome, Italy.

Ph.D. Tutoring

2019-2022	Student: Viviana Morlando. Doctorate cycle: XXXV. Project: Model-based control of legged robots. Tutoring percentage: 100%.
2018-2020	Student: Pierluigi Arpenti. Doctorate cycle: XXXIII. Project: Energetic approaches for model-based control of legged robots. Tutoring percentage: 50%.
2014-2016	Student: Diana Serra. Doctorate cycle: XXIX. Project: Model-based control of rolling nonprehensile manipulation primitives and multi-contact robot locomotion. Thesis title: Motion planning and control methods for nonprehensile manipulation and multi-contact locomotion tasks. Tutoring percentage: 50%.

Teaching activities

Summary	Fabio Ruggiero has conducted both main and supplementary teaching activities by carrying out theoretical and experimental lessons, as well as student tutorials.
2021-today	Lecturer for the class *"System theory"*, delivered at University of Naples Federico II.
2021-today	Lecturer for the class *"Mobile robots"*, delivered at University of Naples Federico II.
2020-today	Lecturer for the class *"Fields and service robotics"*, delivered at University of Naples Federico II.
2019-2020	Lecturer for the class *"Robots and automatic solutions"*, delivered at University of Naples Federico II.
2019	Lecturer for the class *"Elements of automatic control"*, delivered at University of Salerno.
2017-2020	Lecturer for the class *"Elements of dynamic systems"*, delivered at University of Naples Federico II.
2011-2016	Teaching assistant for the class *"Elements of dynamic systems"*, delivered by Prof. V. Lippiello, at University of Naples Federico II.
2011	Teaching assistant for the class *"Robot Control"*, delivered by Prof. B. Siciliano, at University of Naples Federico II.
2011	Teaching assistant for the class *"Manipulators"*, delivered by Dr. V. Lippiello, at University of Naples Federico II, in the range of the Second Level Master in Robotics and Intelligent Systems.
2009-2018	Teaching assistant for the class *"Advanced robotics"*, delivered by Prof. B. Siciliano, at University of Naples Federico II.
2009-2010	Teaching assistant for the class *"Elements of industrial robotics"*, in Italian, delivered by Prof. B. Siciliano, at University of Naples Federico II.
2009	Teaching assistant for the class *"Automatica"*, delivered by Prof. L. Villani, at University of Naples Federico II.
2009	Teaching assistant for the class *"Automation systems technologies"*, delivered by Dr. V. Lippiello, at University of Naples Federico II.

Supervision of students during their Bachelor and Master theses

Fabio Ruggiero supervised more than 50 students so far during their practical experiences in finalizing Bachelor and Master theses. This led to the realization of a number of interesting applications in the robotic field. Some examples are namely: the ball catching with a robot manipulator; the control of the position and the orientation of a ball on an actuated plane; the use of model predictive control for nonprehensile manipulation; the robotic pizza peel task; the re-programming commercial vacuum robots; the robotic batting manipulation primitive; the control of hyper-redundant robotic arm for pipe inspections; the simulation of walking robots in dynamic simulation environments; the robot self-collision avoidance; the fault detection of a quadrotor's propeller; the movement of robots through haptic devices, smartphones, and remote game controllers; the stabilization of a disk on another disk and a ball on another ball; the control of a robot through voice commands; the 3D object reconstruction from a mono or a stereo camera system; the bird diverters installation with an aerial manipulator; the use of LIDAR sensors in aerial robotics; the optimal grasp planning; the control of a humanoid robot; the realization of the nonprehensile inverse pendulum task with a robotic arm; the control of the TORA system; the identification of the mathematical model of flexible elements; the implementation of visual techniques for the autonomous landing of a drone on a pipe; and so on.

Some of the above theses had as follow-up the publication of the related results to peer-reviewed international conferences [IC-16][IC-17][IC-26].

Personal skills and competences

Mother tongue(s) **Italian language**

Other language(s) English language
French language

Self-assessment *European level*(*)	Understanding		Speaking		Writing
	Listening	Reading	Spoken interaction	Spoken production	
English language	C1 Proficient user	C1 Proficient user	C1 Proficient user	C1 Proficient user	C1 Proficient user
French language	A1 Basic user	B1 Independent user	A1 Basic user	A1 Basic user	A1 Basic user

(*) *Common European Framework of Reference (CEF) level*

Computer skills and competences

Programming languages
Very good knowledge of MATLAB-SIMULINK environment.
Good knowledge of the programming language C++.
Good knowledge of the robot oriented programming languages PDL2 and RAPID.
Basic knowledge of MATHEMATICA as well as of the programming languages BASIC, PASCAL, FORTRAN.

Middleware
Basic knowledge of ROS (Robot Operating Systems).

Operating systems
Windows. Linux.

Web
Very good knowledge of both PHP and HTML languages.
Good knowledge of the CSS language.
Reasonable knowledge of the SQL database language.
Basic knowledge of the FLASH language and environment.
Fabio Ruggiero has very good capabilities in creating, developing and realizing web sites.

21 Nov 2001
European Computer Driving Licence ECDL.

Fabio Ruggiero is aware that, pursuant to and in accordance with Art. 26 about the law 15/68, mendacious statements, false acts and use of false acts are punishable pursuant to and in accordance with the penal code and special laws. The undersigned allows the use of personal data pursuant to and in accordance with Law 196/03.