

Curriculum Vitae

Fabio Ruggiero



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16 Dec 1983

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Actual Position

Dec 2016 - Dec 2019

Assistant Professor (fixed term) for the Department of Electrical Engineering and Information Technology of University of Naples Federico II.

Past Positions

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, Evanston, Illinois (USA), under the supervision of Prof. K.M. Lynch.

Education and training

21 Dec 2010

Ph.D degree in Computer Science and Automation Engineering obtained at Università degli Studi di Napoli Federico II. Thesis: "*Grasp and manipulation 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 Università degli Studi di Napoli 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

- 20 Nov 2017-today 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 activities are focused on dexterous, dual-hand and non-prehensile robotic manipulation, robotic visual servoing, modeling and control of unmanned aerial vehicles, also equipped with small-scale robot manipulator for aerial manipulation, transportation, and cooperation with other vehicles. In particular, his studies are specialized on control strategies for bimanual manipulation of objects in unstructured environments, to grant to the robotic system the ability to autonomously decide between different manipulation options and to perform reactions to unexpected situations and events quickly. His interests are also focused on visual control, particularly in grasping context, where object reconstruction is needed to acquire data about unknown objects.

During his research period at Northwestern University, Fabio Ruggiero started to be interested also in nonprehensile dynamic manipulation issues, where robot dynamic is used to control the motion of the object.

Focusing on aerial manipulation, Fabio Ruggiero is interested in the impedance control and the estimation of external forces and moments for vertical take-off and landing unmanned aerial vehicles, endowed with a small robotic arm, so as to interact with the external environment and/or cooperate with other flying robots. His interests deal also with some control techniques to cope with the failure of one quadrotor’s propeller.

Fabio Ruggiero is actually the co-author of 10 international journal papers, 5 book chapters, 25 international and 4 national conference papers, 1 Ph.D. thesis. Since 2008, he is a member of IEEE and IEEE Robotics and Automation Society.

Participation to international research projects

From February 2008 until January 2012, Fabio Ruggiero was actively involved in the European research project EU FP7 DEXMART (www.dexmart.eu). From December 2010 until November 2013, he was involved in the research topics of the European project EU FP7 AIRobots (www.airobots.eu). From December 2012 until October 2014 he was involved in the EU FP7 ARCAS (www.arcas-project) European project. During 2015, Fabio Ruggiero was involved in the EU FP7 Sherpa (www.sherpa-project.eu) project. Since June 2013, he is involved in the research topics of the European project EU FP7 IDEAS RoDyMan (www.rodyman.eu), ERC grant given to Prof. B. Siciliano. Fabio Ruggiero gave a contribution in writing the proposal draft of RoDyMan. Since January 2017, Fabio Ruggiero is involved in the national project RoMoLO. Since January 2018, he is involved in the H2020 Hyfliers European project.

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 with respect to the state of the art is highlighted in the following.

3D reconstruction of unknown objects	<p>Performing tasks in unstructured environments is a challenging robotic research field. In applications like object fine manipulation, it is necessary that the object's surface is 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 complex 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 good 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.</p>
Optimal grasp planning in unstructured environments	<p>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.</p> <p>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].</p>
Inverse kinematics algorithm for dexterous manipulation	<p>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 Graspl! environment to prove its performance. A theoretical proof shows how such parallel controller can also deal with non-planar surfaces.</p>
Robotic catching of thrown objects through a monocular vision system	<p>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 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 solution in [IJ-5] also deals with rolling and bouncing balls.</p>

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 "motion 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].

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. 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].

The bouncing motion primitive is examined in [IC-21][IC-24], where the table tennis case study is considered. 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. Numerical tests are implemented to evaluate the algorithm. 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.

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. Cartesian impedance control for UAVs equipped with a robotic arm is developed by Fabio Ruggiero. 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].

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.

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 on the basis of a linear periodic system approximating the system dynamics around the desired orbit.

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). To guarantee a safe robot reaction to physical interaction, suitable control strategies must be adopted, 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]. To accomplish the task, a dynamic controller is designed without the need of any exteroceptive sensors information. A rigorous stability analysis is provided to confirm the developed theory.

Publications

International journal papers (refereed)

- [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, in press, 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 Robotics, 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-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: 110.1007/978-3-319-55011-4_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 Kozłowski (Ed.), pp. 255-264, Springer, Heidelberg, D, 2009, DOI: 10.1007/978-1-84882-985-5_23.

International conference papers (refereed)

- [IC-25] A. Gutierrez 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 as 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. Pérez, V. Lippiello, A. Ollero, B. Siciliano, *A multilayer control for multicopter 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. 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.

2015 I-RAS YABP Award

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

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.

Invited speaker and delivered seminars in other institutions

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

From February 2018, Fabio Ruggiero is 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 will appear on March 2018.

Guest Editor for the special issue entitled "Control and motion planning for nonprehensile dynamic manipulation" on the IEEE Robotics and Automation Letters, proposed by F. RUGGIERO, V. Lippiello and B. Siciliano. The special issue will appear on January 2018.

Conference Associate Editor

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

International Conference on Computer Vision Theory and Applications 2014.

Speaker in conference sessions

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.

Speaker in conference workshops

2014 IEEE International Conference on Robotics and Automation.

Session chair

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 Control Systems Technology, IEEE Robotics and Autonomous Letters, Robotica, Robotics and Computer Integrated Manufacturing, Robotics and Autonomous Systems, Sensors.

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

17 Jan 2018

Seminar on "*Dynamic control: Mathematical challenges and applications*", delivered by Prof. E. Zuazua, at l'Università degli Studi di Napoli Federico II. 1 hour.

8 Nov 2017

Seminar on "*From control to interaction in multi-robot systems*", delivered by Dr. L. Sabattini, at l'Università degli Studi di Napoli 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 l'Università degli Studi di Napoli 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 Università degli Studi di Napoli 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 Università degli Studi di Napoli 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 Università degli Studi di Napoli 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 Università degli Studi di Napoli 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 Università degli Studi di Napoli 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 Università degli Studi di Napoli Federico II. 1 hour.

23 Jun 2014

Seminar on "*Control systems design using energy properties of physical systems*", delivered by Dr. A. Donaire, at Università degli Studi di Napoli 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 Università degli Studi di Napoli Federico II. 2 hours.

12 Jul 2012

Seminar in "*Vibro-elastography and image guidance for prostate cancer interventions*", delivered by Prof. T. Salcudean, at Università degli Studi di Napoli 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 Università degli Studi di Napoli Federico II. 2 hours.

17 Nov 2011

Seminar on "*Guidance and control of fish shoals using biomimetic robots*", delivered by Prof. M. Porfiri, at Università degli Studi di Napoli 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*", delivered by Prof. O. Khatib, at Università degli Studi di Napoli Federico II. 2 hours.

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

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.
2018	Lecturer for the class " <i>Elements of dynamic systems</i> ", delivered at Università degli Studi di Napoli Federico II.
2018	Teaching assistant for the class " <i>Advanced robotics</i> ", delivered by Prof. B. Siciliano, at Università degli Studi di Napoli Federico II.
2017	Lecturer for the class " <i>Elements of dynamic systems</i> ", delivered at Università degli Studi di Napoli Federico II.
2016	Teaching assistant for the class " <i>Advanced robotics</i> ", delivered by Prof. B. Siciliano, at Università degli Studi di Napoli Federico II.
2016	Teaching assistant for the class " <i>Elements of dynamic systems</i> ", delivered by Dr. V. Lippiello, at Università degli Studi di Napoli Federico II.
2015	Teaching assistant for the class " <i>Advanced robotics</i> ", delivered by Prof. B. Siciliano, at Università degli Studi di Napoli Federico II.
2015	Teaching assistant for the class " <i>Elements of dynamic systems</i> ", delivered by Dr. V. Lippiello, at Università degli Studi di Napoli Federico II.
2014	Teaching assistant for the class " <i>Advanced robotics</i> ", delivered by Prof. B. Siciliano, at Università degli Studi di Napoli Federico II.
2014	Teaching assistant for the class " <i>Elements of dynamic systems</i> ", delivered by Dr. V. Lippiello, at Università degli Studi di Napoli Federico II.
2013	Teaching assistant for the class " <i>Advanced robotics</i> ", delivered by Prof. B. Siciliano, at Università degli Studi di Napoli Federico II.
2013	Teaching assistant for the class " <i>Elements of dynamic systems</i> ", delivered by Dr. V. Lippiello, at Università degli Studi di Napoli Federico II.
2012	Teaching assistant for the class " <i>Advanced robotics</i> ", delivered by Prof. B. Siciliano, at Università degli Studi di Napoli Federico II.
2012	Teaching assistant for the class " <i>Elements of dynamic systems</i> ", delivered by Dr. V. Lippiello, at Università degli Studi di Napoli Federico II.
2011	Teaching assistant for the class " <i>Robot Control</i> ", delivered by Prof. B. Siciliano, at Università degli Studi di Napoli Federico II.
2011	Teaching assistant for the class " <i>Elements of dynamic systems</i> ", delivered by Dr. V. Lippiello, at Università degli Studi di Napoli Federico II.
2011	Teaching assistant for the class " <i>Manipulators</i> ", delivered by Dr. V. Lippiello, at Università degli Studi di Napoli Federico II, in the range of the Second Level Master in Robotics and Intelligent Systems.
2010	Teaching assistant for the class " <i>Advanced robotics</i> ", delivered by Prof. B. Siciliano, at Università degli Studi di Napoli Federico II.
2010	Teaching assistant for the class " <i>Elements of industrial robotics</i> ", in Italian, delivered by Prof. B. Siciliano, at Università degli Studi di Napoli Federico II.
2009	Teaching assistant for the class " <i>Advanced robotics</i> ", delivered by Prof. B. Siciliano, at Università degli Studi di Napoli Federico II.
2009	Teaching assistant for the class " <i>Elements of industrial robotics</i> ", in Italian, delivered by Prof. B. Siciliano, at Università degli Studi di Napoli Federico II.
2009	Teaching assistant for the class " <i>Automatica</i> ", delivered by Prof. L. Villani, at Università degli Studi di Napoli Federico II.
2009	Teaching assistant for the class " <i>Automation systems technologies</i> ", delivered by Dr. V. Lippiello, at Università degli Studi di Napoli Federico II.

Supervision of students during their Bachelor and Master theses

Fabio Ruggiero supervised several students during their practical experiences in finalizing Bachelor and Master theses. This sort of collaboration has led to the realization of a number of interesting applications in the robotic field. Some examples are namely: the interception and catching of a thrown ball through a robotic hand directly mounted on the robot end-effector; the haptic interface between a Nintendo Wii controller and an industrial robot; the kinematic control of an industrial robot through an iPhone; the interface between the Novint Falcon haptic device, initially designed for recreational purposes, and an industrial robot manipulator so as to simulate remote control operations in contact with the environment.

Another thesis in which Fabio Ruggiero has been co-advisor was devoted to theoretical and simulative studies about the dynamic model of a robot humanoid endowed with 47 degrees of freedom. In particular, an impedance control without force measurement feedback has been implemented and simulated. Both theoretical and computational issues have been taken into account during the development of the aforementioned thesis.

Another thesis has been co-tutored by Fabio Ruggiero, in which the student was devoted to build, interface and control a small-scale robot manipulator that has been in turn mounted on a quadrotor to perform some aerial manipulation tasks. Some hardware problems have been initially fixed, including also the construction of electronic boards for the joint actuation. Later, the dynamic model of the small-scale robotic manipulator has been identified. A Cartesian impedance control taking into account both the aerial vehicle and the arm has been implemented and tested.

Moreover, Fabio Ruggiero has been co-advisor of a thesis whose follow-up has been the publication of two papers to international conferences, namely [IC-16] and [IC-17]. The goal of such a thesis was the control of a quadrotor in case one of its propellers is broken. The platform has been then modelled as a birotor and several control techniques have been proposed and tested through simulations, so as to prove that the aerial vehicle can track in principle any planned trajectory for emergency landing.

Personal skills and competences

Mother tongue(s)

Other language(s)

Self-assessment European level^()*

English language

French language

Computer skills and competences

Programming languages

Middleware
Operating systems

Web

Italian language

English language

French language

Understanding				Speaking				Writing	
Listening		Reading		Spoken interaction		Spoken production			
C1	Proficient user	C1	Proficient user	C1	Proficient user	C1	Proficient user	C1	Proficient user
A1	Basic user	B1	Independent user	A1	Basic user	A1	Basic user	A1	Basic user

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

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.

Basic knowledge of ROS (Robot Operating Systems).

Windows. Linux.

Very good knowledge of both PHP and HTML languages.

Good knowledge of the CSS language.

Reasonable knowledge of the SQL database language.

21 Nov 2001

Basic knowledge of the FLASH language and environment.

Fabio Ruggiero has very good capabilities in creating, developing and realizing web sites.

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.