Dario Sanalitro

Curriculum Vitae

Department of Electrical Electronic and Computer Engineering (DIEEI)
University of Catania, Catania, Italy

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Actual Position

(From *March 2023*) - Assistant Professor at the Department of Electrical, Electronics, and Computer Engineering (DIEEI) of the University of Catania under the project Sicilian Micro and Nano Technology Research and Innovation Center (SAMOTHRACE - E63C22000900006)

Education

(From *October 2018* to *September 2021*) Ph.D. in *Robotics* at LAAS-CNRS and the Doctoral School École Doctorale Systèmes (EDSYS) of the "Institut National des Sciences Appliquées de Toulouse" (INSA) in France. Degree awarded on April 8th, 2022. Thesis title: "*Aerial Cooperative Manipulation: full pose manipulation in air and in interaction with the environment*". Academic Advisor: Prof. Antonio Franchi.

(*May 16th 2019*) Test of English for International Communication (TOEIC).

(November 2017) Professional qualification as an Engineer.

(From *October 2015* to *October 2017*) Master's Degree in "*Automation Engineering and Control of Complex Systems*" from the University of Catania. Degree awarded on October 3rd, 2017, with a score of 110/110 cum laude. Thesis title: "*Digital particle image velocimetry analysis of RBCs flows in micro-channels*". Academic Advisor: Prof. Maide Bucolo.

(From *August 2015* to *November 2015*) Postgraduate Specialization Course "*Computer Expert in models and technologies for smart education*" organized by Links Management and Technology Spa as part of the EDOC@WORK3.0 Project, funded by the National Operational Programme for Research and Competitiveness 2007-2013 - Smart Cities and Communities and Social Innovation - Axis and Objective: Axis II - Integrated actions for sustainable development.

(From *October 2013* to *July 2015*) Bachelor's Degree in *Computer Engineering* from the University of Catania. Degree awarded on July 22nd, 2015, with a score of 109/110. Thesis title: "*Modeling and design of a bio-inspired system for underwater navigation*". Academic Advisor: Prof. Paolo Arena.

Professional Experience

(From *November 2022 to February 2023*) Winner of a public selection competition for a research scholarship titled "*Brain Computer Interface Algorithms for the control of home automation systems*" issued by the Department of Electrical, Electronics, and Computer Engineering (DIEEI) at the University of Catania with Decree No. 2957 dated September 5th, 2022. Academic Advisor: Prof. Maide Bucolo.

(From *May 2022* to *October 2022*) Winner of a public selection competition for a Post-Doctoral scholarship with the research program "*Integration and experimental evaluation of an aerial robotic platform for object transportation and manipulation*" issued by the LAAS-CNRS laboratory in Toulouse, France. Academic Advisors: Simon Lacroix, Juan Cortés.

(From *October 2021* to *April 2022*) Fixed-term contract of employment at CNRS (French National Centre for Scientific Research) pursuant to Article 36 of Law No. 2020-734 dated June 17, 2020, carrying out research activities in the context of Aerial Cooperative Manipulations in outdoor scenarios.

(From *July 2018* to *September 2018*) Software Engineer at MODIS Consulting S.r.l. for Fiat Chrysler Automobiles (FCA). Location: Turin.

(From *December 2015* to *February 2016*) Software Developer at Links Management and Technology Spa. Location: Via Rocco Scotellaro, 55, 73100 Lecce LE, Italy.

Teaching

(From *March 2023*) Engineering School at the University of Catania. "Biomedical Systems and Control" MSc in Automation Engineering and Control of Complex Systems. Module: Brain-Computer Interface

Participation in Funded Research Activities

The scholarship related to the Ph.D. activity was funded by the following project:

[PR-D1] (*2018-2022*) MuRoPhen Project funded by the French National Research Agency (ANR) (Project ANR-17-CE33-0007).

Additionally, during the Ph.D. course, collaborations and research activities were conducted in the following projects:

[PR-C1] (*2018-2022*) "Horizon 2020 Aerial Core" Project funded by the European Union (ID: 871479 AERIAL-CORE).

[PR-C2] (*2018-2022*) "Fly-crane: a multi-robot system for aerial transportation and manipulation" Project funded by the Occitanie region in 2018 under contract 2018 003431 - ESR PREMAT-000160.

[PR-C3] (*2022-2023*) "4-FRAILTY: Intelligent Sensing, Infrastructure, and Management Models for the Safety of Fragile Subjects" - CUP: E66C18000200005, Code: ARS01_00345

[PR-C4] (*2023-now*) Sicilian Micro and Nano Technology Research and Innovation Center (SAMOTHRACE) - CUP: E63C22000900006, Code: ECS_00000022

International Experiences

(From *May 2022* to *October 2022*) The Post-Doctoral activity was carried out at the LAAS-CNRS laboratories in Toulouse, Occitanie region, France, conducting research and experimental activities on the topic "*Integration and experimental evaluation of an aerial robotic platform for object transportation and manipulation*" as part of the project. [PR-C2].

(From *October 2018* to *October 2021*) The Ph.D. course was carried out at the LAAS-CNRS laboratories in Toulouse, Occitanie region, France, conducting research on the topic "*Aerial Cooperative Manipulation*" within the scope of the projects MuRoPhen [PR-D1], Aerial Core [PR-C1], and Flycrane [PR-C2].

Review Activities

Associate Editor for International Scientific Journals

Nonlinear Engineering, Modeling and Application since June 2023

Review Editor for International Scientific Journals

Frontiers in Neurorobotics since July 2023

Reviewer for international scientific journals

IEEE Transactions on Control Systems Technology

IEEE Robotics Automation-Letters

IEEE Transactions on Robotics

IEEE Transactions on Systems, Man and Cybernetics: Systems

Elsevier Control Engineering Practice

Reviewer for international scientific conferences

IEEE International Conference on Robotics and Automation (ICRA)

IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)

IEEE International Conference on Unmanned Aircraft Systems (ICUAS)

IEEE International Conference on Safety, Security, and Rescue Robotics (SSRR)

Participation in International Schools

(From *3rd to 7th July 2023*) Participation in the training organized by the Swartz Center for Computational Neuroscience (SCCN) University of California San Diego (UCSD) and CNR, titled "EEGLAB Workshop" with a duration of 32 hours in Aspet, Toulouse, France.

(From *1st to 5th March 2021*) Participation in the training organized by CNRS titled "Language C++14/17" with a duration of 35 hours.

(*June 2019*) Participation in the training organized by the EDSYS Doctoral School titled "Pedagogical Practices for the University" with a total duration of 18 hours.

(From *2nd to 5th July 2019*) Participation in the training course titled "*Mathematical Theory of Grasping and Manipulation*" held by Prof. Domenico Prattichizzo from the University of Siena for a total duration of 20 hours.

(From *26th June* to *1st July 2019*) Participation in the "*ETH Robotics Summer School*", Zurich, Switzerland.

International Competitions

[CO-1] (From *23rd to 27th February 2020*) Participation in the international robotics competition *MBZIRC*, Abu Dhabi, United Arab Emirates, with the team LAAS-CNRS.

Speaker at International Conferences and Scientific Events

(From *29th May* to *2nd June 2023*) IEEE International Conference on Robotics and Automation (ICRA), London, UK. Presentation of the work: **D. Sanalitro**, M. Tognon, A. E. Jimenez-Cano, J. Cortés, and A. Franchi, "*Indirect Force Control of a Cable-Suspended Aerial Multi-Robot Manipulator*"

(From *31st May* to *4th June 2020*) IEEE International Conference on Robotics and Automation (ICRA), Paris, France. Virtual presentation of the work: **D. Sanalitro**, H. J. Savino, M. Tognon, J. Cortés, and A. Franchi, "*Full-pose manipulation control of a cable-suspended load with multiple UAVs under uncertainties*". https://www.youtube.com/watch?v=3fQV2JNzZF0

(From *1st* to *4th September 2020*) IEEE International Conference on Unmanned Aerial Vehicles (ICUAS), Athens, Greece. In-person presentation of the work: A. Petitti, **D. Sanalitro**, M. Tognon, A. Milella, J. Cortés, and A. Franchi, "*Inertial estimation and energy-efficient control of a cable-suspended load with a team of UAVs*"

(*May 16th 2022*) Presentation at the European Researchers' Night organized by Université Fédérale - Toulouse Midi-Pyrénées.

Research Activity

(From *2017*) Since 2017, I have been involved in four main lines of research.

Aerial Cooperative Manipulation

In the context of aerial cooperative manipulation studies have been conducted on the *cooperative manipulation problem* within the projects [PR-C2], [PR-D1] and [PR-C1]. The main objective of these projects was to control one or more degrees of freedom of the load supported by the components of multi-robot systems. Several of the above-mentioned issues' solutions, to which I contributed, involve dynamic formulations and control strategies for cable-driven beam-load-control ([IJ-6], [IJ-1], [IC-2]), cable-driven full pose regulations in contact-free and in contact scenarios ([IJ-5], [IC-4], [IJ-3], [IJ-4]), and planning ([IC-3]), fostering versatile applications, including the competitive MBZIRC robotics event ([CO-1]).

In collaboration with:

(*2019*) Centro di Ricerca E. Piaggio, Dipartimento di Ingegneria dell'Informazione, Università degli Studi di Pisa. Head: Prof. Lucia Pallottino

(*2020*) Centro Sistemi e Tencologie Industriali Intelligenti per il Manifatturiero Avanzato, Consiglio Nazionale delle Ricerche (STIIMA CNR). Head: Prof. Antonio Petitti

(*2020*) Università degli Studi di Roma La Sapienza, Dipartimento di Ingegneria Informatica, Automatica e Gestionale (DIAG). Head: Prof. Giuseppe Oriolo.

(*2023*) University of Twente, Robotics and Mechatronics Lab. Head: Prof. Antonio Franchi.

Modeling of Microfluidic Processes and Applications

The manipulation of minute fluid quantities and micrometric particles within microfluidic devices for portable and cost-effective analysis of biological and chemical processes is a key biotechnology focus. Biphasic microfluidic processes, merging immiscible fluids or particles, are nonlinear and require precise flow management, monitoring, and modeling. This has led to several works where image-based particle velocity analysis and other techniques have been used for microcirculatory hemodynamics [IC-6] or for biofluids characterization [IC-1]. In the context of [PR-C4], future directions entail interdisciplinary investigations into microchannel geometries and materials, as well as modular, low-cost device engineering, with broader applications in medicine, biotech, and diagnostics.

In collaboration with:

(*2017*) Microfluidics Group - Università degli Studi di Catania. Head: Prof. Maide Bucolo

(*2017*) Microhemodynamics Lab - University of California San Diego (UCSD), USA. Head: Prof. Marcos Intaglietta

(*2023*) CNR ISASI - Institute of Applied Sciences and Intelligent Systems "E. Caianiello", Naples, Italy - Dr. Pasquale Memmolo

(*2023*) STLab - Science & Technology Laboratory, Catania, Sicily. Head: Dr. Massimo Camarda

Estimation of robot body parameters through bio-inspired models

In the dynamic realm of robotics, spatial awareness is pivotal for cognitive tasks. A bio-inspired neural network was developed, enabling a humanoid robot to estimate distances and navigate its surroundings, promising future advancements in holistic spatial learning [IC-5].

In collaboration with:

(*2018*) Biorobotics Group - Università degli Studi di Catania. Head: Prof. Paolo Arena

Brain-Computer Interfaces for Robotics Applications

In addition, I am currently pursuing a new research line focused on controlling robots using brain signals within the scope of the 4FRAILTY Project [PR-C3]. The main idea behind this research is to establish a direct connection between the human brain and robotic systems through brain-computer interfaces (BCIs). In this direction a study has been published. In particular, it explores the integration of brain-computer interfaces (BCIs) with home automation systems [IJ-2].

In collaboration with:

(*2019*) Centro di Ricerca E. Piaggio, Dipartimento di Ingegneria dell'Informazione, Università degli Studi di Pisa. Head: Prof. Lucia Pallottino

(*2019*) Emmevi S.r.l. Head: Eng. Alessandro Micali

Scientific Publications

Monographs

[M-1] **D. Sanalitro**, "Aerial cooperative manipulation: full pose manipulation in air and in interaction with the environment," Ph.D. dissertation, INSA de Toulouse, 2022.

Publications on Internationals Journals (IJ)

[IJ-1] C. Gabellieri, M. Tognon, **D. Sanalitro**, A. Franchi, "Equilibria, Stability, and Sensitivity for the Aerial Suspended Beam Robotic System Subject to Parameter Uncertainty" accepted to IEEE Transaction on Robotics, 2023.

[IJ-2] S. Cariello, **D. Sanalitro**, A. Micali, A. Buscarino, M. Bucolo, "Brain–Computer-Interface-Based Smart-Home Interface by Leveraging Motor Imagery Signals", MDPI Inventions, vol. 8, no. 4, pp. 91, 2023.

[IJ-3] A. Jiménez-Cano, **D. Sanalitro**, M. Tognon, A. Franchi, and J. Cortés, "Precise cable-suspended pick-and-place with an aerial multi-robot system," Journal of Intelligent & Robotic Systems, vol. 105, no. 3, pp. 1–13, 2022.

[IJ-4] **D. Sanalitro**, M. Tognon, A. Jimenez-Cano, J. Cortés, and A. Franchi, "Indirect force control of a cable-suspended aerial multi-robot manipulator," IEEE Robotics and Automation Letters, 2022.

[IJ-5] **D. Sanalitro**, H. J. Savino, M. Tognon, J. Cortés, and A. Franchi, "Full-pose manipulation control of a cable-suspended load with multiple UAVs under uncertainties," IEEE Robotics and Automation Letters, vol. 5, no. 2, pp. 2185–2191, 2020.

[IJ-6] C. Gabellieri, M. Tognon, **D. Sanalitro**, L. Palottino, and A. Franchi, "A study on force-based collaboration in swarms," Springer, Swarm Intelligence, vol. 14, pp. 57–82, 2020.

Publications in Proceedings of International Conferences (IC)

[IC-1] E. Cutuli, G. Stella, **D. Sanalitro**, L. Saitta, F. Guarino, G. Cicala, M. Bucolo, "3D-printed microoptofluidic chamber for cell population characterization and velocity detection", Accepted to the 27th International Conference on Miniaturized Systems for Chemistry and Life Sciences, 2023 (microTAS)

[IC-2] C. Gabellieri, M. Tognon, **D. Sanalitro**, A. Franchi, "Force-based Pose Regulation of a Cable-Suspended Load Using UAVs with Force Bias" accepted to 2023 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS).

[IC-3] E. Umili, M. Tognon, **D. Sanalitro**, G. Oriolo, and A. Franchi, "Communication-based and communication-less approaches for robust cooperative planning in construction with a team of UAVs," International Conference on Unmanned Aircraft Systems (ICUAS). IEEE, 2020, pp. 279–288.

[IC-4] A. Petitti, **D. Sanalitro**, M. Tognon, A. Milella, J. Cortés, and A. Franchi, "Inertial estimation and energy-efficient control of a cable-suspended load with a team of UAVs," International Conference on Unmanned Aircraft Systems (ICUAS). IEEE, 2020, pp. 158–165.

[IC-5] P. Arena, L. Patané, **D. Sanalitro**, and A. Vitanza, "Insect-inspired body size learning model on a humanoid robot," 7th IEEE International Conference on Biomedical Robotics and Biomechatronics (Biorob). IEEE, 2018, pp. 1127–1132.

[IC-6] F. Cairone, **D. Sanalitro**, M. Bucolo, D. Ortiz, P. J. Cabrales, and M. Intaglietta, "DPIV analysis of RBCs flows in serpentine micro-channel," European Conference on Circuit Theory and Design (ECCTD). IEEE, 2017, pp. 1–4.