# GiuliaMichieletto


## contacts

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## languages

Italian mother tongue
English fluent
(ESOL ISEE II -2008)
French fluent
(DELF B2 - 2009)
Spanish basic

## programming

Matlab
Simulink
Python
ROS
LaTeX

## current position

Nov 2019 – Now
**ASSISTANT PROFESSOR (RTDA)** — Vicenza, Italy
*Department of Management and Engineering, University of Padova*

**Additional Roles**

- Member of Space and Aerial Control Systems (SPARCS) team of Automatica group at University of Padova [https://sparcs.dei.unipd.it/]
- Responsible for publicity and dissemination of the Technical Committee on Multi-Robot Systems (TC MRS) of the IEEE Robotics and Automation Society [http://multirobotsystems.org/]

## past positions

Jun 2019 – Oct 2019
**PostDoctoral Fellow** — Padova, Italy
*Department of Information Engineering, University of Padova*
Research Topic: Multi-agent systems modeling and control with a special regard to networked formations of autonomous aerial vehicles and small satellites (ref. N05)

Oct 2017 – May 2019
**PostDoctoral Fellow** — Padova, Italy
*Department of Information Engineering, University of Padova*
Research Topic: Theoretical duality and methodological interplay between control and estimation problems related to multi-agent systems in 3D space (ref. N03)

## education and training

Oct 2014 – Oct 2017
**PhD in Information Engineering** — Padova, Italy
*Department of Information Engineering, University of Padova*
Curriculum: Information and Communication Science and Technologies (ICT)
Advisor: Prof. Angelo Cenedese
Thesis Title: Multi-Agent Systems in Smart Environments
Thesis Reviewers: Luca Zaccarian (LAAS-CNRS, France and UniTN, Italy)
. Hyo-Sung Ahn (DCASL-GIST, Korea)
Thesis Defence: February 22, 2018

Oct 2012 – Oct 2014
**Master Degree in Automation Engineering** [110/110] — Padova, Italy
*Department of Information Engineering, University of Padova*
Thesis Title: Distributed Localization of a Camera Sensor Networks in SE(3)
Thesis Supervisor: Prof. Angelo Cenedese
Thesis Co-Supervisor: Prof. Simone Milani
Final Examination: October 14, 2014

Oct 2009 – Jul 2012
**Bachelor Degree in Information Engineering** [99/110] — Padova, Italy
*Department of Information Engineering, University of Padova*
Thesis Title: Modelling and control of an active suspension
Thesis Supervisor: Prof. Maria Elena Valcher
Final Examination: July 26, 2012

Sep 2004 – Jun 2009
**Scientific High School Degree** [100/100] — Mogliano Veneto, Italy
*Liceo statale Giuseppe Berto*
Final Examination: July 13, 2009

### Graduate Schools

Jun 2015 — **SIDRA PhD Summer School** — Bertinoro, Italy
*Topic: Robot Control & Underwater Robotics*
Speakers: Alessandro De Luca, Gianluca Antonelli

Mar 2015 — **EECI Graduate School in Control** — Berlin, Germany
*Topic: Non-linear Control for Physical Systems*
Speakers: Roger W. Brockett, Alexander L. Fradkov

### International Workshops

May 2019 — **Control Days Workshop** — Padova, Italy
*Topic: Control Theory Research Subjects*

Oct 2018 — **IROS Workshop** — Madrid, Spain
*Topic: Future Challenges and Technological Ideas for Vision-Based Drones*

Dec 2016 — **CDC Workshop** — Las Vegas, USA
*Topic: Feedback Control of Hybrid Systems*

Oct 2016 — **Co$^4$ Workshop** — Toulouse, France
*Topic: Control subject to Computational and Communication Constraints*

Oct 2016 — **GIS Micro-Drones Workshop** — Toulouse, France
*Topic: UAVs Applications*

### Miscellaneous

May 2018 — **24CFU for teaching** [29.75/30] — Padova, Italy

Dec 2015 — **Information Engineering State Exam** [222/240] — Padova, Italy

Jul 2014 — **GRE Test - Quantitative Reasoning** [159/170] — Milano, Italy

## abroad research experiences

Sep 2016 – Feb 2017 — **LAAS-CNRS** — Toulouse, France
*Research Visitor at Laboratoire d'Analyse et d'Architecture des Systèmes*
Supervisor: Dr. Antonio Franchi
Team: Robotics and InteractionS (RIS)

Mar 2016 – Jun 2016 — **LAAS-CNRS** — Toulouse, France
*Research Visitor at Laboratoire d'Analyse et d'Architecture des Systèmes*
Supervisor: Dr. Antonio Franchi
Team: Robotics and InteractionS (RIS)

## teaching experiences

### Teaching Support

Feb 2017 – Jun 2017 — **Control Laboratory** — Padova, Italy
*LM-Automation Engineering course (second semester), University of Padova*
Teaching Support [16h]: laboratory lessons support

Oct 2015 – Jan 2016 — **Control Systems Design** — Padova, Italy
*LM-Automation Engineering course (first semester), University of Padova*
Tutor Junior [18h]: exercise frontal lessons and students support for final projects

Jun 2008 – Aug 2008 — **Child Care** — Scorzè, Italy
*Nursery School Gianni Rodari*
Summer activity [160h]: gaming and educational activities organization

### Supervision Activity

7 co-supervised Bachelor Degree Students: Laurea Degree final project in LT-Information Engineering

- Marco Zaggia, *Design di un controllore per l'atterraggio di un quadrirotore in un dato luogo*, ongoing
- Riccardo Barbiero, *Controllo di un quadrirotore: tracking di traiettoria e atterraggio*, 2020
- Alberto De Toni, *Progettazione di un controllore per la fase di atterraggio di un Quadrotor "Crazyflie 2.0"*, 2019
- Simone Tedesco, *Identificazione dei parametri inerziali di un quadrirotore*, 2018
- Pietro Iob, *Procedura di identificazione dei parametri di massa e inerzia per un veicolo aereo multirotore*, 2018
- Lorenzo Marchini, *Stima di massa ed inerzia di un quadricottero*, 2018
- Matteo Ferrarese, *Metodi di controllo per veivoli multirotore*, 2018

8 co-supervised Master Degree Students: Laurea Degree final project in LM-Automation Engineering

- Michele Franzan, *Analysis of controllability and rotor-failure robustness for a tilted octorotor*, ongoing
- Bleron Preniqi, *Non-Linear model predictive control for autonomous docking of CubeSats*, 2020
- Beniamino Pozzan, *Bearing Rigidity Theory: characterization and control of mixed formations and localization*, 2020
- Alessandra Scianatico, *Development and implementation of quadrotor control system in a Simulink-ROS integrated framework*, 2019
- Marco Marsella, *Multi-UAV formation control for UGV containment and path following*, 2018
- Luca Varotto, *Distributed Localization of Visual Sensor Networks based on Quaternions and Dual Quaternions*, 2018
- Marta Pasquetti , *Bearing Rigidity Theory for Formation Control of UAVs*, 2017
- Alessia Cocco, *SO(2) Rotation Estimation in Camera Networks*, 2016

## research activities

*Main focus on networked control and multi-agent systems.*

Principal methodological aspects involve:

- theory of pose representation
- distance and bearing rigidity theory
- distributed optimization over manifolds and over graphs
- nonlinear modeling and control of autonomous platforms
- cooperative and coordinated control of agents formations
- model predictive control theory applied to robotics

### Wireless Sensor Networks

A Wireless Sensor Network is a collection of a large number of tiny devices, distributed over a vast area, linked by a wireless medium and equipped with limited computational capabilities.
Applications of interest include:

- environmental sensing, i.e., continuous measurements acquisition for a variable of interest,
- working condition monitoring and event/failure detection through the implementation of clustering strategies for the network nodes.

### Multi-camera Systems

Multi-camera systems integrates a large number of spatially distributed smart visual sensors capable of processing and fusing images of a scene from a variety of viewpoints in order to perform some high-level tasks that are beyond the capacity and knowledge of each individual agent.
Applications of interest include:

- pose estimation problem in a realistic noisy environment, i.e., determination of position and attitude of each camera in the system expressed in a certain global inertial frame exploiting some noisy available measurements derived by the observed scene,
- perimeter patrolling problem, where the border of a certain area is required to be repeatedly and coordinately monitored by a set of cameras,

- tracking problem, requiring the multi-camera cooperative task assignment and decision taking in order to track a target in a constrained space.

### Aerial Multi-rotor Vehicles

Unmanned Aerial Vehicles represent a wide class of autonomous aerial platforms that are rapidly increasing in popularity thanks to their versatility.
Applications of interest include:

- theoretical analysis of actuation and robustness properties for multi-rotors having a variable number of propellers arbitrarily oriented,
- failure detection and fail-safe control problem, to allow the recovery from a propeller loss,
- path-following problem, wherein the vehicle is required to chase an object or desired path in presence of obstacles and disturbances,
- determination of optimal multi-vehicle formation under resources constraints,
- bearing rigidity-based stabilization of a multi-vehicle formation and agents coordinated motion while preserving some structural system properties.

### Small Satellites

Small – micro and nano – satellites are very appealing in the space community for their low complexity and high flexibility that simplify both their design and control (beyond lowering the costs for manufacturing and dispatch).
Applications of interest include:

- satellites alignment with respect to a desired orbit by exploiting relative measurements with respect to the ground or to other units,
- rendez-vous, assembly (hard/soft docking) and arrangement of two or more satellites resting upon the local agent capabilities.

## publications

### In Preparation

**X01** G. Michieletto, A. Cenedese, D. Zelazo. *A Unified Dissertation on Bearing Rigidity Theory.* IEEE Transactions on Control of Network Systems, 2019.- **under review (1st round)**

### Journal Papers

**J06** G. Michieletto, A. Cenedese, L. Zaccarian, A. Franchi. *Hierarchical non-linear control for multi-rotor asymptotic stabilization based on zero-moment direction.* Automatica, 2020.

**J05** N. Lissandrini, G. Michieletto, R. Antonello, M. Galvan, A. Franco, A. Cenedese. *Cooperative Optimization of UAVs Formation Visual Tracking.* MDPI Robotics, 2019

**J04** A. Franchi, P. Robuffo Giordano, G. Michieletto. *Online Leader Selection for Collective Tracking and Formation Control: the Second Order Case.* IEEE Transactions on Control of Network Systems, January 2019

**J03** A. Antonello, G. Michieletto, R. Antonello, A. Cenedese. *A Dual Quaternion Feedback Linearized Approach for Maneuver Regulation of Rigid Bodies.* IEEE Control Systems Letters, vol. 2, no. 3, pp. 327-332, July 2018

**J02** G. Michieletto, M. Ryll, A. Franchi. *Fundamental Actuation Properties of Multi-rotors: Force-Moment Decoupling and Fail-safe Robustness.* IEEE Transactions on Robotics, vol. 34, no. 3, pp. 702-715, June 2018

**J01** A. Cenedese, M. Luvisotto, G. Michieletto. *Distributed Clustering Strategies in Industrial Wireless Sensor Networks.* IEEE Transactions on Industrial Informatics, vol. 13, no. 1, pp. 228-237, February 2017

### Conference Papers

**C13** M. Fabris, G. Michieletto, A. Cenedese. *A Proximal Point Approach for Distributed System State Estimation.* IFAC World Conference 2020, 2020.

**C12** G. Michieletto, N. Lissandrini, A. Antonello, R. Antonello, A. Cenedese. *Dual Quaternion Delay Compensating Maneuver Regulation for Fully Actuated UAVs.* IFAC World Conference 2020, 2020.

**C11** G. Michieletto, A. Cenedese, A. Franchi. *Force-Moment Decoupling and Rotor-Failure Robustness for Star-Shaped Generically-Tilted Multi-Rotors.* IEEE International Conference on Decision and Control (CDC), 2019

**C10** G. Michieletto, A. Cenedese. *Formation Control for Fully Actuated Systems: a Quaternion-based Bearing Rigidity Approach.* Proceedings of European Control Conference (ECC), 2019

**C09** L. Varotto, M. Fabris, G. Michieletto, A. Cenedese. *Distributed Dual Quaternion Based Localization of Visual Sensor Networks.* Proceedings of European Control Conference (ECC), 2019

**C08** M. Fabris, G. Michieletto, A. Cenedese. *On the Distributed Estimation from Relative Measurements: a Graph-Based Convergence Analysis.* Proceedings of European Control Conference (ECC), 2019

**C07** F. Branz, M. Duzzi, L. Olivieri, F. Sansone, G. Michieletto, R. Antonello, A. Cenedese, A. Francesconi. *Laboratory Validation of Close Navigation, Rendezvous and Docking Technologies for Nanosats.* Proceedings of the 4S Symposium, 2018

**C06** G. Michieletto, S. Milani, A. Cenedese, G. Baggio. *Improving Consensus-based Distributed Camera Calibration via Edge Pruning and Graph Traversal Initialization.* IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), 2018

**C05** G. Michieletto, A. Cenedese, L. Zaccarian, A. Franchi. *Nonlinear Control of Multi-Rotor Aerial Vehicles Based on the Zero-Moment Direction.* IFAC World Congress 2017, pp. 13686–13691, 2017

**C04** G. Michieletto, M. Ryll, A. Franchi. *Conditions for Static Hoverability and Application to Rotor-Failure Robustness for Multi-Rotor Aerial Vehicles.* IEEE International Conference on Robotics and Automation (ICRA), pp. 2747–2752, 2017

**C03** G. Michieletto, A. Cenedese, A. Franchi. *Bearing Rigidity Theory in SE(3).* IEEE International Conference on Decision and Control (CDC), pp. 5950-5955, 2016

**C02** G. Belgioioso, A. Cenedese, G. Michieletto. *Distributed Partitioning Strategies with Visual Optimization for Camera Network Perimeter Patrolling.* IEEE Conference on Decision and Control (CDC), pp. 5912-5917, 2016

**C01** G. Bianchin, A. Cenedese, M. Luvisotto, G. Michieletto. *Distributed Fault Detection in Sensor Networks via Clustering and Consensus.* IEEE International Conference on Decision and Control (CDC), pp. 3828-3833, 2015

### Posters

**P01** A. Antonello, G. Michieletto, R. Antonello, A. Cenedese. *Maneuver Regulation for Fully Actuated Multi-rotor UAVs: An Improved Dual Quaternion Approach.* IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2018

## research projects

### National

**N05** *Distributed Secure Navigation and Control of Quadcopter Swarms*
BIRD [MIUR Dipartimenti d'Eccellenza] - Department of Information Engineering (2019-2020)
PI: S. Tomasin (TLC group, DEI, UniPD)
Role: participant (fellowship recipient 1y - junior grant)

**N04** *Multi-Agent Intelligent Control of time-critical Cyber-Physical Systems over wireless (MAgIC)*
BIRD - Department of Information Engineering (2017-19)
PI: L. Schenato (AUT group, DEI, UniPD)
Role: participant

**N03** *Formation control and attitude estimation in the 3D space: theoretical duality and methodological interplay with application to mobile camera networks and multiagent systems*
BIRD - Department of Information Engineering (2017-19)

PI: A. Cenedese (AUT group, DEI, UniPD)
Role: co-principal investigator (fellowship recipient 2y - junior grant)

**N02** *Development of a docking system for nano and microsatellites*
BIRD - Department of Industrial Engineering (2017-18)
PI: A. Francesconi (DII, UniPD)
Role: participant

**N01** *SEAL: Smart&safe Energy-aware Assisted Living*
Smart City and Communities call of Italian Ministry of University and Research - MIUR (2013-15)
PI: L. Fabbri (BTF)
Role: participant (fellowship recipient 1y - junior grant)

### International

**I01** *AErial RObotic system integrating multiple ARMS and advanced manipulation capabilities for inspection and maintenance (AEROARMS)*
EU H2020 project - LAAS-CNRS (2016-17)
PI: A. Ollero (University of Seville)
Role: collaborator

## editorial and dissemination activities

### Responsibilities and Duties

Responsible for publicity and dissemination of the Technical Committee on Multi-Robot Systems (TC MRS) of the IEEE Robotics and Automation Society

### Conference Activity

- *Chair*, Regular Session on Distributed Estimation at ECC19, Napoli, Italy, Jun 2019
- *Co-Chair*, Regular Session on Aerial Systems at IROS18, Madrid, Spain, Oct 2018

### Review Activity

- International Journals
  Automtica, IEEE Access, IEEE Control Systems Letters, IEEE Transactions on Automatic Control, IEEE Transactions on Control of Network Systems, IEEE Transaction on Industrial Informatics, IEEE Transaction on Mechatronics, IEEE Transaction on Mobile Computing, IEEE Transaction on Robotics
- International Conferences
  American Control Conference (ACC), International Conference on Decision and Control (CDC), International Conference on Decision and Information Technologies (CoDIT), European Control Conference (ECC), International Conference on Emerging Technologies and Factory Automation (ETFA), International Conference on Advanced Robotics and Mechatronics (ICARM), International Conference on Robotics and Automation (ICRA), International Conference on Industrial Technology (ICIT), International Conference on Unmanned Aircraft Systems (ICUAS), Annual Conference of the IEEE Industrial Electronics Society (IECON), IFAC World Conference, International Conference on Intelligent Robots and Systems (IROS), Symposium on Mathematical Theory of Networks and Systems (MTNS)

### Seminars and Invited Talks

- *The Sparkling World of GTMs*, Polytechnic University of Milan, Milan, Italy, Jan 2019
- *Multi-Agent Systems in Smart Environments*, University of Padova, Padova, Italy, Jan 2018
- *9months@LAAS*, LAAS-CNRS, Toulouse, France, Feb 2017
- *Bearing Rigidity Theory in SE(3)*, We-RoMe at LAAS-CNRS, Toulouse, France, Feb 2017
- *On the Rotation Estimation Problem for Camera Networks*, LAAS-CNRS, Toulouse, France, Apr 2017

### Conference Talks

- *On the Actuation Properties of Generically-tilted Multi-rotor UAVs: Force-Moment Decoupling and Fail-Safe Robustness*, Oral Session at Automatica.it2019, Ancona, Italy, Sep 2019
- *Formation Control for Fully Actuated Systems: a Quaternion-based Bearing Rigidity Approach*, Regular Session at ECC19, Napoli, Italy, Jun 2019
- *On the Distributed Estimation from Relative Measurements:a Graph-Based Convergence Analysis*, Regular Session at ECC19, Napoli, Italy, Jun 2019
- *Maneuver Regulation for Fully Actuated Multi-rotor UAVs: An Improved Dual Quaternion Approach*, Late Breaking Results Poster Session at IROS18, Madrid, Spain, Oct 2018
- *Bearing Rigidity Theory in SE(3)*, Regular Session at CDC16, Las Vegas, USA, Dec 2016

**Workshop Talks**

- *The Mathematics of Actuation, Decoupling, Robustness Properties for Generically Tilted Multi-rotor Platforms*, Control Days 2019, Padova, Italy, May 2019

**Other Dissemination Activities - Terza Missione**

- *KIDS University*, Padova, Italy, Oct 2019
- *KIDS University*, Padova, Italy, Oct 2018
- *KIDS University*, Padova, Italy, Oct 2017

## grants and fundings

Jun 2019 – May 2020
**Junior Research Grant (ref. NO5)**
Department of Information Engineering, University of Padova
Project: Distributed Secure Navigation and Control of Quadcopter Swarms

Jun 2017 – May 2019
**Junior Research Grant (ref. N03)**
Department of Information Engineering, University of Padova
Project: Formation control and attitude estimation in the 3D space: theoretical duality and methodological interplay with application to mobile camera networks and multiagent systems

Sep 2016 – Feb 2017
**Eiffel Scholarship Program of Excellence**
Campus France, French Ministry of Foreign Affairs and International Development

Jan 2016
**Short-Term Industrial Collaboration (ref. N01)**
BFT S.p.A.
Objective: Study of a Solution for the Integration of a Video Recognition System within an Access Control System

Dec 2014 – Nov 2015
**Junior Research Grant (ref. N01)**
Department of Information Engineering, University of Padova
Project: Optimization for Multi-agent Systems in Noisy Environment - Distributed Fault-detection and Localization Problem

## awards

Sep 2019
**finalist of `Fabrizio Flacco' Young Author Best Paper Award**
IEEE Robotics & Automation Society Italian Chapter