



Nicola Lissandrini

Ph.D. in Autonomous Mobile Robotics

Education

10/19 - 04/23 **Ph.D. School in Information Engineering** Unipd, Padova
University of Padova, Padova, Italy

Title Mobile Robotics in Unknown Environments: Towards Full Autonomy

- Activities**
- Design of a novel algorithm for high accuracy navigation in unknown, cluttered and narrow environments based on onboard sensors.
 - Mathematical characterization and proof of validity.
 - Extensive experimental validation campaigns with ROS/C++ computationally efficient implementation.
 - Coordination of master thesis students involved in related projects

2016 - 2019 **Master's Degree in Automation Engineering** School
University of Padova, Padova, Italy

Highlights Advanced linear and nonlinear control systems - Kalman filtering and estimation - Multiagent systems - Learning and System Identification

Final grade 110/110 with honors, (GPA: 29.27/30)

2013 - 2016 **Bachelor's Degree in Information Engineering** School
University of Padova, Padova, Italy

Highlights Advanced math and physics - Probability - Programming and algorithms - Basic electronics - Telecommunications - Basic signals and systems theory

Final grade 109/110

Experience

04/23 - 11/23 **Post-Doc Research Engineer** Unipd, Padova
University of Padova, Padova, Italy

Highlights Design and experimental validation of an extended robot navigation algorithm aiming at localizing and tracking a movable target via a RGB camera while overcoming unknown and cluttered obstacles.

10/21 - 07/22 **Visiting Research at Technical University Munich** TUM, Munich
Autonomous Aerial Systems Lab, Technical University Munich, Germany

Title Autonomous Manipulation of Aerial Robots in Unknown Environments

- Activities** Perception and Visual Odometry:
- Design of a novel motion estimation based on point clouds recorded by a depth camera mounted on a hexacopter.
 - Python prototyping and C++ implementation.
 - Experimental setup and validation with Intel Realsense and Vicon motion capture system.

01/20 - 03/20 **Visiting Research at KTH - Royal Institute of Technology** KTH, Stockholm
Smart Mobility Lab at KTH, Stockholm, Sweden

Activity Experiments for the master thesis project for publication of "Decentralized Nonlinear MPC for Robust Cooperative Manipulation by Heterogeneous Aerial-Ground Robots", presented at IROS world congress.

Tech Skills

C++17 Expert

ROS Expert

Physics simulators Expert

Linux Expert

Python Proficient

Matlab/Simulink Proficient

System modeling Proficient

3D print & design Intermediate

Arduino, PIC Beginner

Soft Skills

Teamwork

Communication

Sociable

Problem solving

Stress management

Presentation skills

Responsibility

Precision

Languages

Italian ★★★★★

English ★★★★★

04/19 - 09/19	Post-graduate Fellowship University of Padova, Padova, Italy	Unipd, Padova
Highlights	Main working activities: <ul style="list-style-type: none"> • Virtualization of a flying arena in a physics engine-based framework • Development of a ROS/Simulink interface for rapid prototyping • Tutoring sessions on ROS/Gazebo framework • Coordination of a small team of master thesis students 	
08/18 - 03/19	Master thesis at KTH - Royal Institute of Technology Smart Mobility Lab at KTH, Stockholm, Sweden	KTH, Stockholm
Title	Nonlinear MPC for Aerial-Ground Cooperative Robotics	
Highlights	Design of a state of the art distributed control algorithm based on nonlinear model predictive control for cooperative manipulation of an object by a ground mobile robot and a flying vehicle, both equipped with a lightweight manipulator, with obstacle avoidance. Developed and used technologies: <ul style="list-style-type: none"> • Differential kinematic models • Matlab/Simulink integration of a MPC framework • Virtualization of robots in Gazebo • Development of a flexible tool for generating a ROS node for the MPC • Simulations and experiments in the arena at KTH labs 	
12/17 - 05/18	Project Course Follow-up University of Padova, Padova, Italy	Unipd, Padova
Title	Cooperative optimization of UAVs formation visual tracking	
Highlights	Design and development of algorithms to optimize the view of a team of aerial vehicles employed to track an evader (a moving target) according to a <i>focus-on-event</i> policy. Developed technologies: <ul style="list-style-type: none"> • Pinhole model based f.o.v. approximation algorithm • Kalman filter implementation of a predictor of the target position • Optimization algorithm minimizing the probability of losing the target • ROS/Gazebo implementation and simulation for realistic validation 	
11/17 - 05/18	Robotics Challenge at IAS-Lab, Unipd Project for the course <i>Autonomous Robotics</i> , University of Padova Teamwork	Unipd, Padova
Title	Human-Robots cooperation for Assembly Tasks	
Highlights	Solution to a robotics challenge consisting of a 30 mins practical demo, proposed by <i>IAS-LAB</i> at University of Padova. The system was composed of a UR10 manipulator and a Turtlebot mobile robot, that were to cooperate and solve pick-and-place, navigation in narrow and unknown area and docking problems. Personal contribution: <ul style="list-style-type: none"> • Design of a novel navigation algorithm based on onboard sensors • Design of a fast and accurate docking algorithm • Design of the government algorithm of the multi-robot system • Simulations and experiments with real robots 	
06/16 - 09/16	Code Shift Keying: digital modulation for Galileo GNSS Bachelor thesis	Unipd, Padova
Highlights	Analytical study of code shift keying digital modulation technique, proposed in the scope of Galileo GNSS project of European Space Agency, with the purpose to understand how security protocols are involved in degradation of performances of satellite communications.	

Publications

- Lissandrini, N; Battistella, L.; Ryll, M.; Michieletto, G.; Cenedese, A.; **NAPVIG: Local Generalized Voronoi Approximation for Reactive Navigation in Unknown and Dynamic Environments**, *2023 American Control Conference (ACC)*, pp. 28-33. *IEEE*, 2023
- Lissandrini, N; Christos, V.; Pedro, R.; Cenedese, A.; Dimarogonas, D. V., **Decentralized Nonlinear MPC for Robust Cooperative Manipulation by Heterogeneous Aerial-Ground Robots**, *2020 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2020, pp 1531-1536
- Lissandrini, N.; Michieletto, G.; Antonello, R.; Galvan, M.; Franco, A.; Cenedese, A. **Cooperative Optimization of UAVs Formation Visual Tracking**. *MDPI Robotics*, 2019, 8, 52.
- Michieletto, G., Lissandrini, N, Antonello, A., Antonello, R., Cenedese, A., **Dual Quaternion Delay Compensating Maneuver Regulation for Fully Actuated UAVs**, *IFAC World Congress*, 2020
- Elaamery, B.; Pesavento, M.; Aldovini, T.; Lissandrini N.; Michieletto, G.; Cenedese A. **Model predictive control for cooperative transportation with feasibility-aware policy**. *MDPI Robotics*, 2021, 10, 84.