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Elia Costantini

Ph.D. Student in Aerospace Science and Technology

Biography

He is a doctoral candidate in Aerospace Science and Technology at the University of Bologna within the Flight Mechanics Laboratory. His research interests include performance analysis and optimization of rotary-wing aircraft; sizing of battery-powered unmanned vehicles; control system design, prototyping, and validation; development of estimation strategies. His work also focuses on innovative control strategies in cooperative transportation scenarios of UAVs.

Education

2022 - present
University of Bologna
Ph.D. in Aerospace Science and Technology

Title: "*Advanced Dynamics Modeling and Innovative Control Strategies for Cooperative Air Delivery Applications*"

10/2024 - 04/2025
University of Twente
Visiting PhD researcher at the Robotics and Mechatronics Laboratory, EEMCS Faculty

Theoretical, simulation, and experimental work on the control of a cable-suspended load manipulated by two aerial robots. Design of a robust formation control law for the two UAVs, tested in Matlab/Simulink and simulated in Gazebo Classic with PX4 Software-in-the-Loop (SITL). Experimental activities with two Holybro X500 quadrotors that allowed to validate:

- Filter for the estimation of the payload oscillation angle relying only on the on-board IMUs, without the need for any extra sensors
- Cooperative formation control algorithm in both unloaded and loaded configurations

2020 - 2022
University of Bologna
Master's degree in Aerospace Engineering

Thesis: "*Modeling, Simulation, and Control of a Formation of Multirotor Aircraft for Transportation of Suspended Loads*"

2017 - 2020
University of Bologna
Bachelor's Degree in Aerospace Engineering

Thesis: "*Analisi dinamica e ottimizzazione delle prestazioni per velivoli multirotore*"

Awards

January 2019 — **University of Bologna Merit Award**

"*Bando di concorso per l'assegnazione di incentivi alle iscrizioni a corsi di studio inerenti ad aree disciplinari di particolare interesse nazionale per l'Anno Accademico 2017/2018*"

Publications

2024 — **Journal Publications**

Costantini, E., "*Modeling, Simulation, and Control of a Formation of Multirotor Aircraft for Transportation of Suspended Loads*". *Aerotec. Missili Spaz.* 103, 233–244 (**2024**). https://doi.org/10.1007/s42496-023-00192-3

Costantini, E., de Angelis, E.L., Giulietti, F., "Cooperative Drone Transportation of a Cable-Suspended Load: Dynamics and Control", *Drones* **2024**, *8*, 434. https://doi.org/10.3390/drones8090434

Costantini E., de Angelis E. L., Giulietti F., "*Cooperative Transportation using Rotorcraft: Swing State Estimation and Control*". *[Submitted for review to Aerospace Science and Technology]*

2023 - 2024 — **Conference Papers**

Costantini, E., de Angelis, E.L., Giulietti, F., "*Cooperative Transportation of a Cable–Suspended Load Using Rotorcraft: A Minimal Swing Approach*", in: *Proc. of 49th European Rotorcraft Forum*, **2023**, 1– 14.

Costantini E., de Angelis E. L., Giulietti F., "Cooperative Transportation of a Cable-Suspended Load: Dynamics and Control", *2024 International Conference on Unmanned Aircraft Systems (ICUAS)*, Chania - Crete, Greece, **2024**, pp. 224-233, https://doi.org/10.1109/icuas60882.2024.10556923.

Costantini E., de Angelis E. L., Giulietti F., "*Cooperative Transportation Using Rotorcraft: Swing State Estimation and Control*", in: *Proc. of 50th European Rotorcraft Forum*, Marseille, France, **2024**

Languages

Italian	Native language
English	Advanced Listening, Speaking, Reading and Writing
	C1 level – Academic English Skills (AcES, 2024)
